



SECTION F

TECHNICAL SPECIFICATIONS

**COUNTY SERVICE AREA 20
JOSHUA TREE
PHASE II DESERT VIEW
CONSERVATION AREA
RECREATIONAL TRAILS PROJECT**

FOR

**COUNTY SERVICE AREA (CSA) 59
LAKE ARROWHEAD, CALIFORNIA**

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TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the protection of existing plants that are affected by execution of the Work, whether temporary or permanent construction.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Plant Pruning Schedule: Written schedule from arborist detailing scope and extent of pruning of plants to remain that interfere with or are affected by construction.
- C. Certification: From arborist, certifying that plants indicated to remain have been protected during construction according to recognized standards and that plants were promptly and properly treated and repaired when damaged.
- D. Maintenance Recommendations: From arborist, for care and protection of plants affected by construction during and after completing the Work.

1.3 QUALITY ASSURANCE

- A. Arborist Qualifications: An arborist certified by ISA or licensed in the jurisdiction where Project is located and approved by the County.
- B. Tree Pruning Standard: Comply with ANSI A300 (Part 1), "Tree, Shrub, and Other Woody Plant Maintenance--Standard Practices (Pruning)."

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Temporary Fence Material: 4' High orange thermoplastic fence material: Tenax Guardian visual barrier as distributed by the Home Depot.
- B. Temporary Fence Posts: 6' High green 'T' posts as distributed by the Home Depot.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Temporary Fencing: Install temporary fencing around plant protection zones to protect remaining trees and vegetation from construction damage. Maintain temporary fence and remove when construction is complete.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
- C. Do not store construction materials, debris, or excavated material inside protection zones. Do not permit vehicles or foot traffic within protection zones; prevent soil compaction over root systems.

3.2 EXCAVATION

- A. Install shoring or other protective support systems to minimize sloping or benching of excavations.
- B. Do not excavate within protection zones, unless otherwise indicated.
- C. Where utility trenches are required within protection zones, tunnel under or around roots by drilling, auger boring, pipe jacking, or digging by hand.
 - 1. Root Pruning: Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots with sharp pruning instruments; do not break or chop.

3.3 REGRADING

- A. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade beyond tree protection zones. Maintain existing grades within tree protection zones.
- B. Minor Fill: Where existing grade is 6 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.
- C. Moderate Fill: Where existing grade is more than 6 inches but less than 12 inches below elevation of finish grade, place drainage fill, filter fabric, and topsoil on existing grade as follows:
 - 1. Carefully place drainage fill against tree trunk approximately 2 inches above elevation of finish grade and extend not less than 18 inches from tree trunk on all sides. For balance of area within drip-line perimeter, place drainage fill up to 6 inches below elevation of grade.
 - 2. Place filter fabric with edges overlapping 6 inches minimum.

3. Place fill layer of topsoil to finish grade. Do not compact drainage fill or topsoil. Hand grade to required finish elevations.

3.4 PRUNING

- A. Prune plants to remain that are affected by temporary and permanent construction as directed by an arborist.
- B. Prune plants to remain to compensate for root loss caused by damaging or cutting root system. An arborist shall be on site to direct trimming for maintenance or construction access as approved by the owner's representative. Provide subsequent maintenance during Contract period as recommended by arborist.
- C. Pruning Standards: Prune according to ANSI A300 (Part 1)
- D. Cut branches with sharp pruning instruments; do not break or chop.
- E. Remove cut branches offsite.

3.5 TREE REPAIR AND REPLACEMENT

- A. Promptly repair plants damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to arborist's written instructions.

3.6 DISPOSAL OF WASTE MATERIALS

- A. Burning is not permitted.
- B. Disposal: Remove excess excavated material and displaced trees from Owner's property.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. See Division 31 "Earthwork" for base course fill under slabs-on-grade.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture.
- C. Shop Drawings: For steel reinforcement.
- D. Material test reports and certificates.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5 and Section 7, "Lightweight Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- C. Pre-installation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

1.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

1.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed.
 - 1. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class I zinc coated after fabrication and bending.
- B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufactured bar supports shall be from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

1.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class [C] [F].
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, graded, 3/4-inch nominal maximum coarse-aggregate size.
 - 1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
 - 2. Native Aggregate: Washed native material harvested from the site, free of soil, up to 1/4 inch in size for use in seeding the concrete surface.
- C. Water: ASTM C 94/C 94M and potable.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride. Provide color additive as indicated on plan and as approved.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

1.4 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1.5 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Water: Potable.
- C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

1.7 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned based on laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: 2500 PSI after 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.45
 3. Slump Limit: 4 inches for concrete plus or minus 1 inch.
 4. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.

1.8 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

1.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116 and furnish batch ticket information.

1. When the air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 2 - EXECUTION

2.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Chamfer: do not chamfer exterior corners and edges of permanently exposed concrete, unless otherwise indicated on drawings.

2.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded. Seed surface of concrete with approved aggregates in areas indicated.

2.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

2.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Landscape Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints at a depth equal to at least one-fourth of concrete thickness as follows:
 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into

concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

2.5 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
- C. Cold-Weather Placement: Comply with ACI 306.1.
- D. Hot-Weather Placement: Comply with ACI 301.

2.6 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities. Apply aggregates for seeded surfaces where indicated.
 - 1. Apply to concrete surfaces exposed to public view, to receive a troweled finish.
- C. Troweled Finish: Apply the following to smooth-formed as-cast concrete where indicated:
 - 1. Smooth-Troweled Finish: When water from the concrete surface has evaporated, apply a trowel finish to the surface. After finishing, apply an approved surface chemical retardant for exposing natural or seeded concrete.
 - 2. Where indicated, insert approved animal footprint devices into the concrete surface in a natural pattern simulating actual animal footprints walking on the

concrete surface. Provide a sample of each type of footprint for approval by the architect showing footprint spacing, depth, etc.

- D. Related formed Surfaces: At tops of walls, footings, horizontal offsets, and similar 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.

2.7 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during the curing period using cover material and waterproof tape.

2.8 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

END OF SECTION

SECTION 03 45 00
PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Architectural precast concrete.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for installing connection anchors in concrete.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.
- C. Shop Drawings:
 - 1. Detail fabrication and installation of architectural precast concrete units.
 - 2. Indicate dimensions, shapes, and cross sections of each unit.
 - 3. Indicate joints, reveals, drips, chamfers, and extent and location of each surface finish.
 - 4. Indicate separate face and backup mixture locations and thicknesses.
 - 5. Detail loose and cast-in hardware and connections.
 - 6. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
- D. Samples: Design reference samples for initial verification of design intent, for each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of three, representative of finish, color, and texture variations expected.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator
- B. Material Certificates: For the following items:
 - 1. Cementitious materials.
 - 2. Reinforcing materials and prestressing tendons.

3. Admixtures.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- B. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

1.5 COORDINATION

- A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground or other rehandling.
- B. Support units during shipment on nonstaining shock-absorbing material.
- C. Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.
- D. Place stored units so identification marks are clearly visible, and units can be inspected.
- E. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.
- F. Lift and support units only at designated points indicated on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. QCP Quick Crete Products Corp
- B. Approved equal that is Architectural Precast Association (APA) Certified.

2.2 PERFORMANCE REQUIREMENTS

- A. Design Standards: Comply with ACI 318 and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated.
- B. Structural Performance: Provide architectural precast concrete units and connections capable of withstanding design loads within limits and under conditions indicated:

2.3 MOLD MATERIALS

- A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.
 - 1. Mold-Release Agent: Commercially produced form-release agent that does not bond with, stain or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.
- B. Form Liners: Units of face design, texture, arrangement, and configuration. Use with manufacturer's recommended form-release agent that does not bond with, stain, or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.
- C. Surface Retarder: Chemical set retarder, capable of temporarily delaying final hardening of newly placed concrete mixture to depth of reveal specified.

2.4 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60 deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A706/A706M, deformed.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A185/A185M, fabricated from steel wire into flat sheets.
- D. Deformed-Steel Welded Wire Reinforcement: ASTM A497/A497M, flat sheet.
- E. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

2.5 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or Type III, gray, unless otherwise indicated.
- B. Supplementary Cementitious Materials:

1. Fly Ash: ASTM C618, Class C or F, with maximum loss on ignition of 3 percent.
 2. Metakaolin: ASTM C618, Class N.
 3. Silica Fume: ASTM C1240, with optional chemical and physical requirement.
- C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C33/C33M, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.
1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
 2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand compatible with coarse aggregate; to match approved finish sample.
- D. Coloring Admixture: ASTM C979/C979M, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.
- E. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.
- F. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.
- G. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

2.6 STEEL CONNECTION MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A36/A36M.
- B. Carbon-Steel-Headed Studs: ASTM A108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or Type B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

2.7 GROUT MATERIALS

- A. Sand-Cement Grout: Portland cement, ASTM C150/C150M, Type I, and clean, natural sand, ASTM C144 or ASTM C404. Mix at ratio of 1 part cement to 2-1/2 to 3 parts sand, by volume, with minimum water required for placement and hydration. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C1218/C1218M.

2.8 CONCRETE MIXTURES

- A. Prepare design mixtures for each type of precast concrete required.
 1. Use a single design mixture for units with more than one major face or edge exposed.

2. Where only one face of unit is exposed use either a single design mixture or separate mixtures for face and backup.
- B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.
 - C. Normal-Weight Concrete Mixtures: Proportion by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
 1. Compressive Strength (28 Days): 5000 psi minimum.
 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - D. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to ASTM C642, except for boiling requirement.
 - E. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

2.9 MOLD FABRICATION

- A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.
- B. Maintain molds to provide completed architectural precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

2.10 FABRICATION

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
 1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."
- B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.
- C. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.
- D. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses and specified in-place loads.

- E. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.
 - 1. Place backup concrete mixture to ensure bond with face-mixture concrete.
- F. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 117.
- G. Identify pickup points of architectural precast concrete units.
- H. Cure concrete, according to requirements in PCI MNL 117.

2.11 FINISHES

- A. Exposed faces to be free of joint marks, grain, and other obvious defects. Corners, including false joints to be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match submittals.

PART 3 - EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION

- A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.
- B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment of units until permanent connections are completed.
- C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.
- D. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
- E. Grouting or Dry-Packing Connections and Joints: Grout connections where required or indicated. Retain flowable grout in place until hard enough to support itself. Alternatively, pack spaces with stiff dry-pack grout material, tamping until voids are filled. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens. Keep grouted joints damp for not less than 24 hours after initial set.

3.3 REPAIRS

- A. Repair architectural precast concrete units if permitted by Architect. Architect reserves the right to reject repaired units that do not comply with requirements.
- B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.

3.4 CLEANING

- A. Clean surfaces of precast concrete units exposed to view.
- B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.
- C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
 - 1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Protect other work from staining or damage due to cleaning operations.
 - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 034500

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Metal fabrications:
 - 1. View Platform steel deck framing, supporting posts, angles, plates, brackets, clips, anchors and bolts for equipment.
 - 2. View Platform Shade Structure and Kiosk Shade Structure fabrications, as indicated on the Drawings.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 03 30 00 – Cast-in-Place Concrete.
 - 3. Section 05 52 13 – Pipe and Tube Railings

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM A27 – Standard Specification for Steel Castings, Carbon, for General Application.
 - 2. ASTM A36 – Standard Specification for Carbon Structural Steel.
 - 3. ASTM A47 - Standard Specification for Ferritic Malleable Iron Castings.
 - 4. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 5. ASTM A123 - Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
 - 6. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 7. ASTM A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
 - 8. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
 - 9. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

10. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 11. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
 12. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 13. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
 14. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
 15. ASTM F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
- B. American Welding Society (AWS):
1. AWS D1.1 Structural Welding Code - Steel.
 2. AWS D1.3 Structural Welding Code - Sheet Steel.
 3. AWS D-19.0 Welding Zinc Coated Steel.

1.03 COORDINATION

- A. Coordinate installation of metal fabrications that are anchored to concrete or masonry, or that receive work specified by other Sections. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete. Field Measurements: Field verify dimensions prior to fabrication.
- B. . Field Measurements: Field verify dimensions prior to fabrication.

1.04 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating provided materials, dimensions, anchoring detail, and details of termination or connection to adjacent construction. Indicate items that are purchased from a manufacturer and items that are shop fabricated. Indicate component parts requiring Project on-site fabrication, welding, or assembly.
- B. Product Data: Submit Product Data for manufactured items.
- C. Fabricator qualifications per Article "Quality Assurance".
- D. Welding:

1. Welder's Certificates: Field welders shall be Project certified in accordance with AWS D1.1.
 2. Welding Material Certification: Provide certificate that welding material complies with specifications.
- E. Research/Evaluation Reports: ICC-ES for post-installed anchors.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm with a minimum of five years' experience in successfully producing metal fabrications similar to that shown on the drawings.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D-1.1– Structural Welding Code – Steel.
 2. AWS D1.3 - Structural Welding Code - Sheet Steel.
- C. Inspection of Welding: Refer to Section 01 4523: Testing and Inspection.
- D. Preassemble items in shop to the greatest extent possible to minimize field welding. Mark units for reassembly and coordination of installation. Use a marking method that can be easily removed after fabrication.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Store metal items above grade on platforms, skids, in containers, or other required supports. Do not store items directly on the ground.
- B. Protect all items delivered to the site from damage and from corrosion, dirt, grease, and other foreign matter.
- C. Fire suppression equipment shall always be on site and available to employees.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Structural Weathering Steel Shapes: ASTM A588.
- B. Rolled Weathering Steel Plates: ASTM A588. Plates to be bent or cold-formed shall conform to ASTM A283, Grade C.
- C. Round HSS: ASTM A500 Grade B or C.
- D. Square and Rectangular HSS: ASTM A500 Grade B or C.
- E. Black Oxide Steel Pipe: ASTM A53 Type E or S, Grade B, standard weight (Schedule 40), unless otherwise noted. Black oxide finish.

- F. Steel Sheet: ASTM A1008 or ASTM A1011.
- G. Steel Bolts: ASTM A307, Grade A, or F3125 with hex steel nuts per ASTM A563 and washers. Galvanized in accordance with ASTM A153 for exterior locations or stainless steel as indicated on plans.
- H. Weathering Steel Bars: Conforming to ASTM A588
- I. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27. Provide bolts, washers, and shims, hot-dip galvanized per ASTM A153.
- J. Nonshrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- K. Concrete Materials:
 - 1. Concrete per Section 03 30 00, Cast-in-Place Concrete.

2.02 FABRICATION

- A. General:
 - 1. Preassemble items in the shop to the greatest extent possible. Use connections that maintain structural value of joined pieces. Mark units for reassembly and installation. Use a marking method that can be easily removed after fabrication.
 - 2. Cut, drill, and punch metals cleanly and accurately. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated or specified. Remove sharp and rough areas on exposed surfaces. Form exposed work with accurate angles and surfaces and straight edges. Form exposed connections with hairline joints, flush and smooth. Locate joints where least conspicuous.
- B. Welding:
 - 1. Weld connections unless otherwise indicated.
 - 2. Weld corners and seams continuously and in accordance with requirements of AWS D1.1 Structural Welding Code. Welds shall be inspected as required in the General Conditions.
 - 3. Grind exposed welds smoothly and flush to match and blend with adjoining surfaces.
 - 4. Fire suppression equipment shall always be on site and available to employees.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine the areas where metal fabrications are to be installed. Notify the County in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Provide anchorage devices and fasteners as indicated in the drawings and where necessary for securing miscellaneous metal fabrications to in-place construction.
- B. Cut, drill, and fit as required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations.
- D. Alignment: Verify alignment of items with adjacent construction. Coordinate related work.
- E. Grout: Follow manufacturer's recommendations for substrate preparation and application.
- F. Corrosion Protection: Coat concealed surfaces of metals that will come into contact with grout, concrete, masonry, or wood, with a heavy coat of bituminous paint or zinc chromate primer. Protect dissimilar metals from galvanic corrosion by pressure tapes, coating, or isolators.

3.03 FIELD WELDING

- A. Welding: Comply with AWS Code for procedures of manual shielded metal-arch welding, appearance and quality of welds made methods used in correcting welding work.
 - 1. Weld in accordance with AWS D-1.1.
 - 2. Weld galvanized fabrications in accordance with AWS D-19.0.
- B. Remove the welding flux immediately. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surfaces matches those adjacent.
- C. Upon completion of welding plug vent, drainage, and lifting holes of fabrications with appropriate diameter plugs. Push in about halfway by hand, and hammer to a tight fit. With a hand file or an abrasive tool, file off excess material.
 - 1. Plug railing holes.
 - 2. Plug visible holes of HSS members.

3.04 ADJUSTING AND CLEANING

- A. Touch Up Damaged Surfaces. Remove assembly markings.

3.05 CLEAN UP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.06 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 05 52 13
PIPE AND TUBE RAILINGS

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. Steel railings.
- B. Related Requirements:
 - 1. Section 05 5000 "Metal Fabrications" for steel tube railings associated with metal framed stairs and decking.

1.3 COORDINATION

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Fasteners.
 - 3. Post-installed anchors.
 - 4. Handrail brackets.
 - 5. Bituminous paint.
 - 6. Nonshrink, nonmetallic grout.
 - 7. Anchoring cement.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

- C. Samples for Initial Selection: For products involving selection of color, texture, or design.
- D. Samples for Verification: For each type of exposed finish required.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Mill Certificates: Signed by manufacturers of steel products, certifying that products furnished comply with requirements.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft.) applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.

- b. Infill load and other loads need not be assumed to act concurrently.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F ambient; 180 deg F material surfaces.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.3 STEEL RAILINGS

- A. Source Limitations: Obtain each type of railing from a single source from a single manufacturer.
- B. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), with a black oxide finish unless another grade and weight are required by structural loads.
 - 1. Provide black oxide finish for exterior installations and where indicated.
- C. Weathering Steel Plates, Shapes, and Bars: ASTM A588
- D. Cast Iron Fittings: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

2.4 FASTENERS

- A. Fastener Materials:
 - 1. Hot-Dip Galvanized Railing Components: Hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329/F2329M for zinc coating.
 - 2. Stainless Steel Railing Components: Type 304 stainless steel fasteners.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

- A. Handrail Brackets: Black oxide steel set screw shaft collar 2-3/8 inches bore x 3-1/4 inches outside diameter x 15/16-inch width.
- B. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.
- C. Bituminous Paint: Cold-applied asphalt emulsion, complying with ASTM D1187/D1187M.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.
- B. Shop assemble railings to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
 - 1. Clearly mark units for reassembly and coordinated installation with material that can be easily removed after assembly.
 - 2. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately.
 - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
 - 2. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water.
 - 1. Provide weep holes where water may accumulate.
 - 2. Locate weep holes in inconspicuous locations.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fitness, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlapping.

3. Remove flux immediately.
 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards".
- I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - J. Form changes in direction as detailed on the drawings.
 - K. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
 - L. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
 - M. Brackets, Flanges, Fittings, and Anchors: Provide brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.

2.7 STEEL AND IRON FINISHES

- A. For nongalvanized-steel railings, provide weathering steel fittings, brackets, fasteners, and sleeves; however, use hot-dip galvanized anchors to be embedded in exterior concrete.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings.
 1. Fit exposed connections together to form tight, hairline joints.
 2. Install railings level, plumb, square, true to line, without distortion, warp, or rack.
 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
 4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws, using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in the "Fabrication" Article, whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement.

3.3 ANCHORING POSTS

- A. Anchor posts to metal surfaces with flanges, angle type, or floor type, as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For steel railings, weld posts to steel supporting surfaces.
 - 2. Anchor railing ends to posts set in concrete.

3.4 CLEANING

- A. Clean steel by washing thoroughly with clean water and soap and rinsing with clean water. Remove all assembly markings.

3.5 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish the entire unit or provide new units.

END OF SECTION 05 5213

SECTION 06 15 33
EXTERIOR DECKING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Plastic lumber decking.
 - 2. Stairs for elevated decks.
 - 3. Benches for elevated decks.
 - 4. Support framing for elevated decks.
- B. Related Requirements:
 - 1. Section 05 50 00 "Metal Fabrications"
 - 2. Section 05 52 13 "Pipe and Tube Railings"

1.2 DEFINITIONS

- A. Boards: Plastic Lumber of less than 2 inches nominal in thickness and 2 inches nominal or greater in width.

1.3 ACTION SUBMITTALS

- A. Product Data: For plastic decking and metal framing anchors.
 - 1. For plastic decking and metal framing anchors. Include installation instructions.
- B. Samples: For plastic decking, not less than 24 inches long, showing the range of variation to be expected in appearance of decking, including surface texture.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Plastic decking.
 - 2. Decking fasteners.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide air circulation around stacks and under coverings.
- B. Handle and store plastic lumber to comply with manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PLASTIC DECKING

- A. Composite Plastic Lumber: Solid shapes made from a mixture of cellulose fiber and polyethylene or polypropylene.
 - 1. Decking Type: Trex Transcend Composite, 2" Square Edge Board
 - 2. Decking Size: 2 by 6 nominal, 1.3 by 5.5 inches actual and 2 by 4 nominal, 1.3 by 3.4 inches actual
 - 3. Configuration: Square Edge
 - 4. Surface Texture: Woodgrain.
 - 5. Color: As selected by Architect from manufacturer's full range.

2.2 FASTENERS

- A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide screws, of sufficient length, to penetrate not less than 1 inch into substrate.
 - 1. Use stainless steel fasteners unless otherwise indicated.
- B. Power-Driven Fasteners: ICC-ES AC70.
- C. Wood Screws and Lag Screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION, GENERAL

- A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.
- B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.
- C. Install plastic lumber to comply with manufacturer's written instructions.
- D. Secure decking to steel framing with screws from the bottom side.
- E. Do not splice members between support members unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- G. Securely attach exterior work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. ICC-ES AC70 for power-driven fasteners.
 - 2. "Fastening Schedule" in ICC's International Building Code.

3.4 CLEAN UP

- A. Throughout the duration of the project, Contractor shall provide trash receptacles for collecting debris, shall remove debris, trash and unused materials, and excess soil from the job site at regular intervals of not less than weekly and shall dispose of same off site in a legal manner.

END OF SECTION 061533

SECTION 096340

STONE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Dimensional stone exterior paving.
- B. Related Requirements:
 - 1. Section 03 30 00 "Cast In Place Concrete".

1.2 ACTION SUBMITTALS

- A. Product Data: For each variety of native stone, and/or manufacture provided product.
- B. Samples for Verification:
 - 1. For each stone type indicated, include at least three or more Samples of each and show the full range of color and other visual characteristics for completed Work.
 - 2. For each color of grout required.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For stone flooring to include in maintenance manuals. Include product data for stone-care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual experienced in installing stone flooring similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance.
- B. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.
 - 1. Build mockup of typical exterior pavement area.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

1.6 FIELD CONDITIONS

- A. Maintain air and material temperatures to comply with requirements of installation material manufacturers, but not less than 50 deg F during installation and for seven days after completion.
- B. Hot-Weather Requirements for Stone Flooring: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602 and with the following:
 - 1. Maintain the temperature of materials below 100 deg F.
 - 2. Do not apply mortar to substrates with temperatures of 100 deg F and above.
 - 3. When the ambient temperature exceeds 90 deg F. Fog spray installed stone flooring until damp at least three times a day until flooring is three days old.

PART 2 - PRODUCTS

2.1 PAVING STONES

- A. Source Limitations for Stone: Obtain native stone, from within the DVCA site. Stone shall be harvested native material, free of petroglyphs and under the direction of an onsite biologist to make sure any animal species are not harmed. Provide resources to harvest materials of consistent quality in appearance and physical properties.
 - 1. Select stone shapes and sizes that will be needed for both flat stone paving and stone step risers and treads as detailed on plans. Harvested material shall be cleaned of dirt and debris, suitable for installation.
 - 2. Contact John Hernandez, (909) 386-8847, regarding any questions about harvesting of native stone material.
 - 3. Make stone material available for examination by the Architect.
 - a. The Architect will select aesthetically acceptable material for the stone paving and steps from the harvested material.

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or Type II. Provide natural color.
- B. Hydrated Lime: ASTM C207, Type S.

- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C150/C150M, Type I or Type III, and hydrated lime complying with ASTM C207, Type S.
- D. Aggregate: ASTM C144; except for joints narrower than 1/4 inch, use aggregate graded with 100 percent passing No. 16 sieve.
- E. Water: Potable.

2.3 GROUT

- A. Standard Cement Grout: ANSI A118.6, packaged.
 - 1. Sanded grout mixture for joints wider than 1/8 inch.

2.4 ACCESSORIES

2.5 MORTAR AND GROUT MIXES

- A. Mortar: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortar of uniform quality and with optimum performance characteristics.
 - 1. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated. Do not use calcium chloride.
 - 2. Combine mortar materials and thoroughly mix in a mechanical batch mixer unless otherwise indicated. Discard mortar when it has reached initial set.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive stone flooring and conditions under which stone flooring will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone flooring.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone flooring.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Vacuum or sweep concrete substrates to remove dirt, dust, debris, and loose particles.

3.3 INSTALLATION, GENERAL

- A. Do field cutting, if necessary, as stone is set. Cut lines straight and true. As much as possible, only natural edges of stone pieces should be exposed when completed.
 - 1. Use power saws with diamond blades to cut stone where necessary. Stone surfaces that are visible shall have rough-split or natural edges.
 - 2. Install a sample portion of stone steps for review and approval by the architect and county.
- B. Set stone to comply with the requirements indicated.
- C. Produce neat joints of size specified or indicated.

3.4 INSTALLATION TOLERANCES

- A. Variation in Line: For positions shown in plan for edges of flooring and steps, changes in finish, do not exceed 1/4 inch in 5 feet maximum.
- B. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/4 inch.

3.5 ADJUSTING AND CLEANING

- A. Remove and replace stonework with the following description:
 - 1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
 - 2. Defective joints.
 - 3. Stone flooring and joints not matching approved Samples and mockups.
 - 4. Stonework not complying with other requirements indicated.
- B. Replace in a manner that results in stonework matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean stonework as work progresses.
- D. Clean stonework after setting and grouting are complete.

3.6 PROTECTION

- A. Prohibit traffic from installed stone for a minimum of 72 hours.
- B. Protect installed stonework during construction with nonstaining kraft paper. Where adjoining areas require construction work access, cover stonework with a minimum of 3/4-inch untreated plywood over nonstaining kraft paper.

END OF SECTION 096340

SECTION 10 14 00

SIGNAGE

PART 1 - GENERAL

1.01 SCOPE: The Work of this Section shall consist of furnishing all labor, materials, equipment, appliances and services necessary for the execution and completion of all site **Signage Work** as shown on the Plans and as described in the Specifications including, but not necessarily limited to, the following:

- Construction Signs (Temporary);
Construction Worksite Access; and,
Project Signs.
- Site Signs, including but not necessarily limited to the following:
Trail Mile Marker Signs
Directional Signs
Trail Map Directory Sign
Informational Interpretive Signs
Shelter Structure Silhouette Panels
- Coordination with Related Work of other Sections.
- Clean-up; and,
- Replacements, Repairs, Guarantees and Warranty Work.

1.02 RELATED WORK:

Section 03 30 00	Cast in Place Concrete
Section 05 50 00	Metal Fabrications
Section 13 34 23	Fabricated Structures

1.03 GUARANTEE: All signage shall be guaranteed for a minimum period of one (1) year against all peeling, fading, chipping and deterioration of any kind.

1.04 SUBMITTALS: Shall be prepared and shall consist of the following:

- A. Materials Lists/Manufacturer's Product Information: Contractor shall submit a complete list of materials along with the manufacturer's catalog cuts for all materials proposed for use in the Work at the preconstruction conference. Contractor shall also provide the Manufacturer's complete installation drawings including specifications and a replacement parts lists for all equipment proposed for the Project. Submit all Manufacturer's product information for each item specified for use in the Work.
- B. Shop Drawings: Contractor shall prepare and submit Shop Drawings for all signage of this section which shows complete details for all signs being fabricated. Shop Drawings shall show all methods of attachment, materials, letter styles, and height, finishes, colors, dimensions and locations for signs, and shall be prepared in accordance with Standard Specifications and General Conditions, Article 8, Shop Drawings.

1.05 DELIVERY, STORAGE AND HANDLING: Contractor shall assume all responsibility for storage of all signage materials for the Project. County assumes no liability for losses or damages from any cause as a result of Contractor's storage of materials on site.

PART 2 - MATERIALS

2.01 GENERAL: Products used in the Work of this Section shall be produced by manufacturers regularly engaged in

the manufacture of similar items with a history of successful production acceptable to the County.

2.02 CONSTRUCTION SIGNS (TEMPORARY):

- A. Construction Worksite Access: Contractor shall provide signage indicating “Construction Area - No Unauthorized Entry” and “No Trespassing” for mounting on the construction fence gate and fence lines respectively.
- B. Project Identification Sign: Shall be provided to identify the project, the County and Representatives, the Landscape Architect, and the Contractor. It shall be constructed of $\frac{3}{4}$ " thick 4' x 8' exterior plywood with white background and mounted on 4" x 4" posts in location approved by County, Submit sign layout to County for approval.

2.03 SITE SIGNAGE:

- A. Trail Mile Marker Signs: Submit manufacturer's qualifications and shop drawings for review and approval prior to proceeding. Signs shall be fabricated using 6" square weathering steel posts and $\frac{1}{4}$ " thick weathering steel plates with custom graphic cut outs as detailed. Submit shop drawings for review and approval for each sign type.
- B. Directional Signs: Submit manufacturer's qualifications and shop drawings for review and approval prior to proceeding. Sign shall be fabricated using 4" square weathering steel posts and $\frac{1}{4}$ " thick weathering steel plates with custom graphic cut outs as detailed. Submit shop drawings for review and approval for each directional sign type
- C. Informational Interpretive Signs: Submit sign manufacturer's qualifications and submit sign support shop drawings for review and approval prior to proceeding. Sign support shall be fabricated using 4" square weathering steel posts and sign frame as detailed. Sign shall be high pressure laminate, minimum $\frac{1}{2}$ " thick, size as detailed. Sign graphics will be provided to the contractor and sign fabricator.
- D. Trail Map Directory Sign: Submit sign manufacturer's qualifications and shop drawings for review and approval prior to proceeding. Trail map graphic will be provided to the contractor. Sign support shall be fabricated using 2" square weathering steel sign frame as detailed. Sign shall be high pressure laminate, minimum $\frac{1}{2}$ " thick, size as detailed. Sign graphics will be provided to the contractor and sign fabricator.
- E. Geology Stone Veneer Podium Sign: Submit sign manufacturer's qualifications and provide shop drawings for review and approval prior to proceeding. Custom concrete and stone veneer support structure shall be constructed as detailed. Sign shall be high pressure laminate, minimum $\frac{1}{2}$ " thick, size as detailed. Sign graphics will be provided to the contractor and sign fabricator.
- F. Rock Outcrop View Platform Interpretive Sign: Submit sign manufacturer's qualifications and provide shop drawings for review and approval prior to proceeding. Sign support shall be fabricated using weathering steel supports and sign frame as detailed. Sign shall be high pressure laminate, minimum $\frac{1}{2}$ " thick, size as detailed. Sign graphics will be provided to the contractor and sign fabricator.
- G. New Entry Sign Extension: Submit sign manufacturer's qualifications and provide shop drawings for review and approval prior to proceeding. Sign shall be fabricated using minimum 1" thick weathering steel plate with laser or water jet cut outs and attachments as detailed. Sign panel shall match and join the existing entry sign. Provide concrete footing and connections to match existing and as detailed. Sign graphics will be provided to the contractor and sign fabricator
- H. Shelter Structure Silhouette Panels: Submit manufacturer's qualifications and shop drawings for review and approval prior to proceeding. Verify sign dimensions in the field at each structure prior to fabrication. Sign panels shall be fabricated using $\frac{1}{4}$ " thick weathering steel plates with custom graphic cut outs as detailed. Sign graphics will be provided to the contractor and sign fabricator.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Qualifications of Installers: Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.
- B. Coordination: Signs to be installed shall be coordinated with the various parts of the project awarded. All dimensions and conditions shall be field verified prior to any signs being fabricated. Approved detailed shop drawings are required for all signs and support structures prior to fabrication and proceeding. The contractor shall size any required foundations for support as detailed.

3.02 CONSTRUCTION SIGNS (TEMPORARY):

- A. Construction Worksite Access:
 - 1. Construction Area - No Unauthorized Entry: Signs shall be affixed to the construction fence at all entry gates into the construction work area.
 - 2. No Trespassing: Signs shall be affixed to the temporary construction fence at locations approved by the county.
- B. Project Identification Sign: Shall be installed at a location approved by the County and with adequate concrete footings and bracing to support sign in windy conditions.

3.03 SITE SIGNAGE: All site signage to be permanently set into supporting concrete or steel structures as detailed on plans.

- A. Trail Mile Marker Signs: Signs shall be fabricated using 6" square weathering steel posts and 1/4" thick weathering steel plates with custom graphic cut outs as detailed and as per approved shop drawings.
- B. Directional Signs: Signs shall be fabricated using 4" square weathering steel posts and 1/4" thick weathering steel plates with custom graphic cut outs as detailed and as per approved shop drawings.
- C. Informational Interpretive Signs: Sign support shall be fabricated using 4" square weathering steel posts and sign frame as detailed. Protect high pressure laminate sign surface from damage prior to and during installation. After installation as detailed and approved, cover sign with a waterproof sheet membrane until project completion and directed to remove.
- D. Trail Map Directory Sign: Sign support shall be fabricated using 2" square weathering steel sign frame as detailed. Protect high pressure laminate sign surface from damage prior to and during installation. After installation as detailed and approved, cover sign with a waterproof sheet membrane until project completion and directed to remove.
- E. Geology Stone Veneer Podium Sign: Custom concrete and stone veneer support structure shall be constructed as detailed. Protect high pressure laminate sign surface from damage prior to and during installation. After installation as detailed and approved, cover sign with a waterproof sheet membrane until project completion and directed to remove.
- F. Rock Outcrop View Platform Interpretive Sign: Sign support shall be fabricated using weathering steel supports and sign frame as detailed. Protect high pressure laminate sign surface from damage prior to and during installation. After installation as detailed and approved, cover sign with a waterproof sheet membrane until project completion and directed to remove.

G. New Entry Sign Extension: Sign shall be fabricated using minimum 1" thick weathering steel plate with laser or water jet cut outs and attachments as detailed. Verify conditions of existing sign and provide connections to match existing and as detailed and approved. Provide additional park open hour number plates as requested by county.

H. Shelter Structure Silhouette Panels: Sign panels shall be fabricated using 1/4" thick weathering steel plates with custom graphic cut outs as detailed. Attach panels to sides of structures as detailed.

3.04 COMPLETION CLEANING: Upon completion of the Work of this Section, The Contractor shall clean all Signs installed removing all soil, concrete laitance, stains, markings, grease, dirt, etc., and shall clean all signs faces and other such surfaces that require such maintenance. The Contractor shall remove all excess materials, rubbish, debris, etc., and remove construction equipment from the premises.

3.05 CLEAN-UP: Throughout the duration of the Project, Contractor shall provide trash receptacles for collecting debris, shall remove debris, trash and unused materials, and excess soil from the job site at regular intervals of not less than weekly and shall dispose of same off site in a legal manner.

END OF SECTION

SECTION 12 93 00

SITE FURNISHINGS

PART 1 - GENERAL

1.01 SCOPE: The Work of this Section shall consist of furnishing all labor, materials, equipment, appliances and services necessary for the execution and completion of all **Site Furnishing Work** as shown on the Plans and as described in the Specifications including, but not necessarily limited to, the following:

- Providing and Installing all site furnishings.
- Coordination with the Work of other Sections.
- Clean-up; and,
- Replacements, Repairs, Guarantees and Warranty Work.

1.02 RELATED WORK:

Earth Works	Section 31 20 00
Cast in Place Concrete	Section 03 30 00

1.03 SHOP DRAWINGS: Contractor shall prepare and submit copies of Shop Drawings which show complete details for all items requiring shop fabrication. Shop Drawings shall be prepared in accordance General Conditions.

1.04 GUARANTEE & PRODUCT LIABILITY INSURANCE:

- A. Manufacturer: Shall guarantee all materials (and workmanship if installed by manufacturer) for a period of one (1) year exclusive of vandalism. Manufacturer(s) will be required to provide product liability insurance coverage in the minimum amounts of \$3,000,000 per incident. Manufacturer(s) shall inspect all installation Work and provide written certification that equipment has been installed in accordance with manufacturer's specifications.
- B. Contractor: Shall provide a one-year written guarantee on Contractor's letterhead for all materials, labor and workmanship, exclusive of vandalism. The contractor's written guarantee shall be submitted to the County at the final inspection prior to Final Acceptance of the Work.

1.05 SUBMITTALS:

- A. Materials Lists/Manufacturer's Product Information: Contractor shall submit a complete list of materials along with the manufacturer's catalog cuts for all materials proposed for use in the Work at the preconstruction conference. Contractor shall also provide the Manufacturer's complete installation drawings including specifications and a replacement parts lists for all products proposed for the Project. Submit copies of all Manufacturers' product information for each item specified for use in the Work per General Conditions.
- B. Proposed Substitutions: Submittals for Proposed Substitutions shall conform to General Conditions. Products proposed for substitution as "equals" to those specified are subject to the approval of the County Representative. If at the time proposed equals are delivered to the site it is determined by the County Inspector that the products are not equal to those specified, the unacceptable products shall be removed and products as specified shall be provided by Contractor at no additional cost to County.

1.06 INSPECTIONS:

- A. Equipment Locations: No equipment, apparatus, or foundations for same shall be placed, dug or poured until location stakes have been inspected and approved by the County.

- B. Foundations & Assembly: All equipment shall be fully assembled prior to foundations being poured. The assembled and positioned site furnishings shall be inspected and approved by the County prior to the pour of the foundations or permanently anchored.

1.07 DELIVERY, STORAGE AND HANDLING: Contractor shall assume all responsibility for storage of all materials for the Project. The County assumes no liability for losses or damages from any cause as a result of Contractors storage of materials on site.

PART 2 - MATERIALS

- 2.01 PRECAST CONCRETE SEATING KERNAL: Shall be precast concrete, models as specified on plans and manufactured by QCP Corp. or an approved equal that is Architectural Precast Association (APA) Certified.
- 2.02 PRECAST CONCRETE NATIVE AMERICAN BENCH: Shall be precast concrete, custom design, as specified on plans and manufactured by QCP Corp. or an approved equal that is Architectural Precast Association (APA) Certified.
- 2.04 PRECAST CONCRETE NATIVE AMERICAN TABLE: Shall be precast concrete, custom design, as specified on plans and manufactured by QCP Corp. or an approved equal that is Architectural Precast Association (APA) Certified.
- 2.05 PRECAST CONCRETE PICNIC TABLE: Shall be precast concrete, 72" X 96" size, model, finish, and color as specified on plans and manufactured by QCP Corp. or an approved equal that is Architectural Precast Association (APA) Certified.
- 2.06 BOULDERS, STONES, AND ROCK COBBLE: Shall be harvested on site where possible by the contractor, in approved locations. A biologist on-site shall review locations to ensure that no reptiles or animals are harmed in acquiring the material. Material shall not have any petroglyphs. If the contractor believes there may be petroglyphs, contact San Bernardino County Special Districts right away for further direction. In the event there is not enough local rock on site, the contractor shall contact local quarries in the Joshua Tree area and provide samples for the Landscape Architect's approval.
- 2.07 BINOCULAR VIEWER: Shall be a non-coin operated mechanical 12" x 22" size Binocular Viewer as available from SeeCoast Manufacturing company or approved equal (251-928-8882) The color shall be Sepia Hammertone. It shall have 360 degrees horizontal roller bearing movement and 40 degrees vertical movement, 5'-0" eyepiece height and 30" base diameter.
- 2.08 TRASH & RECYCLING RECEPTACLE: Shall be made of heavy gauge steel, animal resistant, Trail Double bin type with both trash and recycle sides, dual top loading doors, dual hinged rear access doors, dual plastic liners, model as specified on plans and manufactured by Tuff Boxx, or an approved equal that is approved by the county for exterior trails.

PART 3 - EXECUTION

- 3.01 SEQUENCE OF WORK: No Work of this Section shall commence prior to the completion and acceptance of all grading work specified in Section **31 20 00 Earth Works**.
- 3.02 LAYOUT:
- A. Site Furnishings: Contractor shall stake or otherwise mark the proposed locations for picnic tables, benches, and other site furnishings, and shall obtain the approval of the locations from the County prior to commencing any excavation for foundations or attachment methods. The proposed locations shall be reviewed by Contractor in the presence of the County Inspector to verify that minimum clear distances required from all edges of slabs, trees, boulders, and other obstructions are provided.

3.03 PROTECTION OF EXISTING IMPROVEMENTS: Contractor shall protect all existing improvements from damage due to Contractor's operations. All damage to existing improvements that result from Contractor's operations shall be repaired by Contractor at Contractor's expense. All areas that are damaged shall be fine graded, filling all depressions, wheel ruts and irregularities. Contractor shall make all repairs and shall restore all damaged areas at Contractor's sole expense. All trees and shrubs in and around the project site shall be protected by Contractor, and if damaged shall be replaced at Contractor's expense.

3.04 SITE FURNISHINGS INSTALLATION:

- A. Boulders and Rock Cobble: Boulders shall be placed under the direction of the County Inspector or his field representative. Rock Cobble for structures and stones for steps and paving shall be installed by the masonry contractor. See section **09 6340 Stone Paving**.
- B. Picnic Table: Shall be fully assembled and located as approved by the County inspector. Set on graded native soil area with maximum slope of 2% in all directions. Adjust as required so table sits firm on the soil and does not rock in any direction.
- C. Seating Kernals: Shall be fully assembled and located as approved by the County inspector. Attach to concrete pads with stainless steel anchors per Manufacturer details.
- D. Round Native American Table: Shall be fully assembled and located per plan as approved by the County inspector. Attach to concrete pads with stainless steel anchors per Manufacturer details.
- E. Native American Bench: Shall be fully assembled and located as approved by the County inspector. Attach to concrete pads with stainless steel anchors per Manufacturer details.
- F. Binocular Viewer: Shall be fully assembled and secured to structural members of the viewing deck with stainless steel vandal proof bolts as recommended by the manufacturer and approved by the County.
- G. Trash & Recycling Receptacle: Shall be fully assembled and located as approved by the County inspector. Attach to a concrete pad with stainless steel anchors.

3.05 CLEAN-UP: Throughout the duration of the project, Contractor shall provide trash receptacles for collecting debris, shall remove debris, trash and unused materials, and excess soil from the job site at regular intervals of not less than weekly and shall dispose of same off site in a legal manner.

END OF SECTION

SECTION 13 34 23
FABRICATED STRUCTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. Prefabricated steel shelters.

1.2 Related sections include the following:

- A. Section 03 30 00- Cast in Place Concrete
- B. Section 05 50 00- Metal Fabrication
- C. Section 10 14 00- Signage

1.3 References

- A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2003a.
- B. ASTM A 325 - Standard Specification for Structural Steel Bolts, Heat Treated, 120,000 PSI Minimum Tensile Strength; 2004.
- C. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength; 2003a.
- D. ASTM A 563 - Standard Specification for Carbon and Alloy Steel Nuts; 2004.
- E. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2003a.
- F. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process; 2003.
- G. ASTM A 792/A 792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy Coated by the Hot-Dip Process; 2003.
- H. American Institute of Steel Construction (AISC).
- I. American Iron and Steel Institute (AISI) Specifications for Cold Formed Members.
- J. American Society of Testing Material (ASTM).
- K. American Welding Society (AWS).

- L. OSHA Steel Erection Standard 29 CFR 1926.750 Part R.
- M. SSPC-SP 2 –Hand Tool Cleaning; Society for Protective Coatings; 2000.
- N. SSPC-SP 10 -Near-White Blast Cleaning; Society for Protective Coatings; 2000.
- O. ICC Evaluation Service, ESR-1006, Structural Insulated Panels.

1.4 SYSTEM DESCRIPTIONS

- A. Standard Design Loads: 2022 California Building Code (CBC latest Edition), 20 P.S.F. (Live Load), 85 M.P.H., Exposure C, Seismic Design Category C.
- B. Column to footing connection shall be in compliance with **OSHA Steel Erection Standard CFR 1926.750 Part R**, which requires a minimum of four (4) anchor bolts per column.
- C. Design Method shall be per applicable local building code requirements. Manufacturer's design shall utilize a three-dimensional structural analysis to determine all member loads and forces. Design and detailing shall be in compliance with AISC 341, Part I or III.
- D. The pre-engineered package shall be shipped as a pre-cut and pre-fabricated package that shall include all structural framing members, roof panels, fasteners, and trim as well as installation instructions. The structure shall be shipped un-assembled for minimum shipping charges.
- E. Field labor shall be utilized only for the assembly of the pre-fabricated parts. No onsite welding shall be required or permitted. Tube frame connection bolts and fasteners shall be concealed, within the tubing or hidden, except at the base plate. All rafter tails shall be factory welded into place as well as all compression ring/tube covers. On multi-tiered buildings the rafter risers shall be welded to the lower rafters for ease of installation. No openings are allowed near the base of the columns but shall have screwed on cover plates. No through bolting shall be allowed for any connections due to the possibility of the deformation of the tube steel parts.

1.5 SUBMITTALS

- A. For each Product, submit a minimum of 4 sets of shop drawings and 2 sets of structural calculations signed and sealed by a Professional Engineer in the state of California, for submittal to the County for review and approval.
- B. Manufacturer shall provide site specific foundation design signed and sealed by a Professional Engineer in the state of California. Generic or "typical" foundation details and design shall not be acceptable.
- C. Structural calculations shall show the conformance to the local building code information:
 - 1. 2022 California Building Code (CBC latest Edition),

- a. 20 P.S.F. (Live Load)
- b. 85 M.P.H., Exposure C
- c. Seismic Design Category C

1.6 QUALITY ASSURANCE

A. Supplier Qualifications:

- 1. The product shall be designed and fabricated at a facility operated and directly supervised by the supplier.
- 2. The supplier shall have at least 5 years of experience in the design and fabrication of pre-engineered steel shelters.
- 3. Membership in American Institute of Steel Construction.
- 4. Membership in American Welding Society.
- 5. Full-time on-staff licensed Professional Engineer.
- 6. Full-time on-staff quality control manager.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Coordinate delivery requirements with Owner and other installers.
- B. Store products in a manner to prevent damage prior to installation. Where products need to be stored outdoors, store off the ground and place so that water will drain
- C. Inspect parts within 48 hours of delivery, compare with manufacturer's bill of materials and report any missing or non-conforming parts to the manufacturer within this time frame.

1.8 WARRANTY

- A. Provide manufacturer's standard ten-year warranty.

PART 2 - PRODUCTS

2.1 SHADE STRUCTURES

- A. Acceptable Manufacturer: ICON Shelter Systems or approved equal.
- B. Octagon Model: OC28TY4-P5-20-90-150-REVC~51565 as manufactured by ICON Shelter Systems.
 - 1. The structure shall be octagon in plan view.
 - 2. Custom angled columns per ICON shop drawings.
 - 3. Roofing shall be 2" x 6" T&G Douglas fir Boards and covered by corrugated metal roofing with weathering steel finish.
 - 4. Steel frame shall have a weathering steel finish.

5. Custom weathering steel panels with cutout designs on each side of the structure for both the Native American and Creosote Discovery Shelters.

C. Manufacturer Representative:

ICON Shelter Systems, Inc., 1455 Lincoln Ave, Holland, MI 49423.
Contact the regional representative regarding pricing:

Unique Recreation Consultants, Inc.
1804 Garnet Avenue #478
San Diego, CA 92109
Phone (951) 541-8380

- D. Substitutions must be approved a minimum of seven (7) days prior to the bid date, the supplier must provide engineered drawings and calculations for approval as per Section 1.5A, sealed by a California Professional Engineer. Any approval of alternate manufacturers shall be through an addendum prior to the bid date and shall not be allowed without written notification.
- E. Alternate suppliers shall meet the requirements shown in Section 1.6. Alternate suppliers must provide proof of: equivalency of the shot blast, e-coat and powder-coat process and finish. Structural design shall include all loads to the foundation and shall not exceed the loads specified in the chart on the installation drawings. Designs using wood, light gauge metal framing or sheet metal other than roof/wall panels and related trim and flashing shall not be approved.

2.2 APPLICATIONS

- A. Shelters: Pre-engineered, prefabricated all-steel framed shelters; column, rafter, and purlin structure, with steel roof panels, all flashing, trim, accessories, and fasteners required for a complete installation.
- B. Structural framing (Columns, rafters, tie-beams, purlins, etc.) shall be Hollow Structural Sections (HSS) meeting ASTM A500 grade B. "I" beams, tapered columns, open "C" channels, cold-formed box sections or wood products shall not be accepted.
- C. Compression rings shall be made of structural channel sections or welded plate sections that meet ASTM A36 grade steel.
- D. Structural connections shall be made with A325 high-strength bolts and A563 structural nuts, ASTM A307 grade anchor bolts, self-drilling screws and pop-rivets.
- E. Metal Roof Panel: 24-gauge corrugated steel roof panel. The ribs shall run with the slope of the building for proper drainage.

2.3 FABRICATION

All columns, rafters, tie-beams, purlins, compression rings shall be factory welded assemblies with bolted connections in the field. There will be no field welding required for any connections. All base plates, stiffener plates, rafter clips and end plates shall be factory welded in place.

Factory welded connections shall be made by certified welders in accordance with the latest edition of AWS D1.1 and D1.3 Specifications. All welders shall be AWS certified.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. When unloading, pad the forks and use other precautions to protect the powder-coated finish. Do not use chains to move materials. Handle all materials carefully in the field to avoid scratching the powder-coat finish. Before installing the roof, clean the steel and touch up any scratches and chips in the powder-coat finish using touch up paint from the manufacturer.
- B. The shelter shall be set on prepared footings or concrete slab (provided by others). Footing details shall be designed by an engineer (retained by other than the manufacturer), based on load information as provided on the manufacturer's supplied drawings. Foundation shall be constructed to all local building code requirements and per good construction practices for the specific site conditions.
- C. In accordance with **OSHA Steel Erection Standard 29 CFR 1926.750 Part R**, anchor bolts shall be installed for proper column stability and shall have a minimum of four (4) anchor bolts per column.
- D. Install all parts and pieces per the manufacturer's supplied installation instructions and these specifications. The underside of the tongue and groove decking or sandwich panel roof deck shall be sealed before installation as specified and approved by the landscape architect or owner.

END OF SECTION 02875

SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Removing existing vegetation per plan and as required.
 - 2. Pruning and cutting back vegetation.
 - 3. Clearing and grubbing.
 - 4. Temporary erosion and sedimentation control measures.
- B. Related Sections include the following:
 - 1. Section 01 56 39 - Tree and Plant Protection
 - 2. Section 31 22 00 – Earth Works

1.2 MATERIAL OWNERSHIP

- A. Except for stripped topsoil or other materials indicated to remain on Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.3 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, driveways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic paths if required by authorities having jurisdiction.
- B. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- C. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.
- D. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones. Fire suppression equipment shall be on site and available to employees at all times.

1.4 SOIL MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Section "Earthwork."

PART 2 - EXECUTION

2.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly identify trees and vegetation to remain with approval from Landscape Architect.
- C. Protect existing site improvements that are to remain, from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to the County.

2.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties, streets and walkways, according to a sediment and erosion control plan, specific to the site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- B. Inspect, repair, and maintain erosion and sedimentation control measures during construction.
- C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

2.3 CLEARING AND GRUBBING

- A. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.
- B. Remove from the area of work all plants indicated on plans and verified with Landscape Architect for removal, concrete debris and trash. Vegetation and roots shall be removed down to two (2) feet below grade within clearing areas and legally dispose of them off Owner's property.
- C. Cut back foliage as indicated on plans and where necessary to allow for construction of trails and other improvements.

- D. Prune existing trees where approved by the arborist and where indicated.
- E. Boulders 12" in size and larger encountered during operations shall be retained on site for reuse in approved locations.
- F. No less frequently than daily, treat exposed ground areas and removal operations for dust control with water truck or equal. Provide dust control in windy conditions as required by the County inspector.

2.4 DISPOSAL

- A. Disposal: Removed obstructions, cleared materials, and waste materials including trash and debris shall be legally disposed of off Owner's property.

END OF SECTION

SECTION 31 20 00

EARTHWORKS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Preparing subgrades for slabs-on-grade, walks, pavements.
 - 2. Subbase course for concrete walks and pavements.
 - 3. Excavating and backfilling for footings.
- B. Related Requirements:
 - 1. Section 01 56 39 - Tree and Plant Protection
 - 2. Section 31 10 00 - Site Clearing
 - 3. Section 03 30 00 – Cast-in-Place Concrete

1.2 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed in a trench.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and paving course.
- C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices, changes in the Work.
 - 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, will be without additional compensation.
- E. Fill: Soil materials used to raise existing grades.
- F. Subbase Course: Aggregate layer placed between the subgrade and base course for concrete pavement or walk.
- G. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct pre-excavation conference at Project Site.
 - 1. Review methods and procedures related to earthmoving, including, but not limited to, the following:
 - a. Personnel and equipment needed to make progress and avoid delays.
 - b. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
 - c. Field quality control.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: Provide for each on-site and borrow soil material proposed for fill and backfill deeper than 6" as follows:
 - 1. Classification according to ASTM D2487.
 - 2. Laboratory compaction curve according to ASTM D698, ASTM D1557.
- C. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth-moving operations begin.

1.5 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated.

1.6 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Utility Locator Service: Notify utility locator service, "811" for area where Project is located before beginning earth-moving operations.

- D. Do not commence earth-moving operations until plant-protection measures specified in Section 01 56 39 "Tree and Plant Protection" are in place.
- E. The following practices are prohibited within plant protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Erection of sheds or structures.
 - 4. Excavation or other digging unless otherwise indicated.
 - 5. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- F. Do not direct vehicle or equipment exhaust towards protection zones.
- G. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones. Fire suppression equipment shall always be on site and available to employees.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D2487, Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487, Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction..
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 20 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Sand: ASTM C33/C33M; fine aggregate.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and excavated materials intended for filling and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
- B. Remove rock to lines and grades indicated to permit installation of permanent construction. Salvage rock and boulders 12" and larger in size for reuse on site.

3.3 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.4 SUBGRADE INSPECTION

- A. Notify owner's representative when excavations have reached the required subgrade.
- B. If owner's representative determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by owner's representative, without additional compensation.

3.5 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation.
 - 1. Fill unauthorized excavations under other construction as directed by Landscape Architect.

3.6 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from the edge of excavations. Do not store within drip line of remaining trees.

3.7 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, subdrainage, damp proofing, waterproofing, and perimeter insulation.
 - 2. Removing concrete formwork.
 - 3. Removing trash and debris.
 - 4. Removing temporary shoring, bracing, and sheeting.
- B. Place backfill on subgrades free of mud.

3.8 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under walks and pavements, use satisfactory soil material.
 - 2. Under steps and ramps, use engineered fill.
 - 3. Under footings and foundations, use engineered fill.
- C. Place soil fill on subgrades free of mud.

3.9 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy.
 - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.10 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D698, ASTM D1557:
 - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.

3.11 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from structures and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
 - 1. Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus or minus 1 inch.
 - 3. Pavements: Plus or minus 1/2 inch.

3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- B. Allow the testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- D. Testing agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2937, and ASTM D6938, as applicable.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.13 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.14 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.
- B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Landscape Architect.
 - 1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 32 31 13

CABLE FENCING

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. Two wire cable barrier fencing per drawings.
- B. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for cast-in-place concrete post footings.
 - 2. Section 05 50 00 "Metal Fabrications"

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 the following:
 - a. Fence posts and fittings and decorative steel plate attachments
 - b. Cable rope and attachments.
- B. Shop Drawings: For each type of fence assembly.
 - 1. Include plans, elevations, sections, details, and attachments to other work.

1.4 FIELD CONDITIONS

- A. Field Measurements: Verify layout information for cable fences as shown on Drawings in relation to property survey and existing gates and structures. Verify dimensions by field measurements.

1.5 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace components of cable fences that fail in materials or workmanship within specified warranty period. Vandalism of fence components is excluded.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to comply with performance requirements.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Cable fence frameworks shall withstand the design wind loads and stresses for fence height(s) and under exposure conditions indicated according to **ASCE/SEI 7**
 - 1. Design Wind Load: 85 mph
 - a. Post Size: For post spacing not to exceed 8 feet, use 6-inch square and 3" x 6" 'C' channel weathering steel, 1/4" wall thickness, as detailed. Post square tops shall be capped.

2.2 CABLE WIRE

- A. General: Provide 1/2" diameter, 6 x 19 galvanized steel wire rope with swage terminal fittings at cable ends. Apply Natina Steel Color Solution to the galvanized steel cable per the manufacturer's instructions.

2.3 FENCE FRAMEWORK

- A. Posts: Provide members with minimum dimensions and wall thickness according to the drawings:
 - 1. Post Height: 54 inches above grade as indicated on Drawings.
 - a. Line Post: 3" x 6" 'C' channel x 1/4" weathering steel
 - b. Decorative and Corner Post: 6" square x 1/4" weathering steel.
 - c. Attachment plates: 1/4" thick weathering steel with laser or water jet cut out image of Joshua tree. Graphic of tree will be provided.
 - d. Background paint: Reflective white suitable for steel application.

2.4 FITTINGS

- A. Post Caps: Weld weathering steel caps onto each 6" square post top.
- B. Cable Terminals: Stainless steel 316 machine swage threaded stud tensioner for ½" steel cable at terminal end posts.
- C. Post holes: 5/8" in diameter holes, as needed for cable to pass through posts

2.5 ANCHORING CONCRETE

- A. Concrete Footings: Concrete for post footings shall be as required per section 03 30 00 Cast-in-place Concrete. Minimum Compressive Strength: 2500 psi in 28 days.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
 - 1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of any utilities, underground structures, and property monuments. Obtain approval of layout by County.

3.3 CABLE FENCE INSTALLATION

- A. Install cable fencing according to ASTM F567 and more stringent requirements specified.
 - 1. Layout fencing on lines shown on plan inside property line per approved staking.
 - 2. Mark layout and post locations for approval by the County prior to excavating post holes for footings. Indicate where 4-foot-wide wildlife gaps will occur.
- B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil. Provide 3" deep crushed gravel layer at bottom of holes for drainage.

- C. Prepare Decorative posts: Post tops shall be capped. Submit shop drawings of decorative steel plate cut outs based on graphics provided. Prepare and paint 6" square post side with approved white reflective paint. Weld decorative panel cut outs to posts.
- D. Post Setting: Set posts plumb in concrete at indicated spacing and in line into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and brace in position during setting with mechanical devices.
 - 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect above ground portion of posts from concrete splatter.
 - a. Exposed Concrete: Extend 2 inches above grade; shape and smooth top to shed water away.
- E. Terminal Posts: Install terminal end, corner, and decorative posts according to ASTM F567 and terminal posts at changes in horizontal or vertical alignment of 15 degrees or more. For runs exceeding 500 feet space terminal posts an equal distance between corner or end posts.
- F. Line and Decorative Posts: Space line posts uniformly at 96 inches O.C. Space decorative posts every 32 feet. Provide 4'-0" wide wildlife gaps between decorative posts and fencing at locations shown on plan.
- G. Cable and Fasteners: Install galvanized steel cable between and through posts. Use stainless steel 316 machine swage threaded stud tensioners at terminal posts and at wildlife gaps. Secure cable to hardware with machine swage equipment. Tension the cable with tensioner stud extending through terminal posts with washer and nuts. Cable tension shall be sufficient to prevent cable from sagging more than 1" between support posts. Remove excess stud extension.

3.4 ADJUSTING

- A. Tensioning: Adjust cable tension after 10 days to maintain straight lines without sagging.

END OF SECTION 323113



RGSE Inc. Structural Engineers
 2720 Cochran St. Suite 8B, Simi Valley, CA 93065
 (805) 522-3379 www.rgseinc.com

CALCULATIONS

PROJECT: Structural engineering services for the proposed new Rock Vista viewing platform with overhead shade structure as part of the Phase II Desert View Conservation Area Recreational Trails Project near Joshua Tree, CA per the RFP received 3/20/2024. Also to optionally be included is the trail kiosk per the RFP update received 4/18/2024.

JOB No: 24120

CLIENT: Omar Arellano or Gregg Denson
 Architerria Design Group
 10221-A Trademark Street
 Rancho Cucamonga, CA 91730

**PROJECT
MANAGER:** Jeff Lubberts (jeffl@rgseinc.com)

TASK: Structural Engineering

**RESULTING
DOCUMENTS:** Calculations & Drawings

**BUILDING
CODE USED:** CBC 2022



DATE	REMARK
11/20/2024	1 st Plan Check Submittal



RGSE inc. Structural Engineers

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www.rgseinc.com

DESIGN CRITERIA

Project: DECK1**Weight Take Off****Roof Weights:**

Roofing		psf
Sheathing		
Joists		
Insulation		
Beam		
Gyp. Brd.		
Ceiling		
Mechanical		
Misc.		

Dead load		psf
Live load		psf

Floor Weights:

DECKING	6	psf
2X4 TUBE	4.58	
2X6 TUBE	4.26	
4X6 TUBE	4.75	
MISC	4	
Dead Load	23.59	psf
Live load	100	psf

Seismic weights of roof

Level	Assembly	Unit Wt. (psf)	Area (ft²)	Weight (kips)	Story Wt. (kip)
Roof	Roof*				
	Ext Wall				
	Heavy Ext Wall				
	Int. Wall				

* Weight included 3 psf of solar panel

Seismic weights of floor

Level	Assembly	Unit Wt. (psf)	Area (ft²)	Weight (kips)	Story Wt. (kip)
2nd Floor	Floor	23.59	409	9.65	9.65

Project: DECK2**Weight Take Off****Roof Weights:**

Roofing		psf
Sheathing		
Joists		
Insulation		
Beam		
Gyp. Brd.		
Ceiling		
Mechanical		
Misc.		

Dead load		psf
Live load		psf

Floor Weights:

DECKING	6	psf
2X4 TUBE	4.58	
2X6 TUBE	4.26	
4X6 TUBE	4.75	
MISC	4	

Dead Load	23.59	psf
Live load	100	psf

Seismic weights of roof

Level	Assembly	Unit Wt. (psf)	Area (ft²)	Weight (kips)	Story Wt. (kip)
Roof	Roof*				
	Ext Wall				
	Heavy Ext Wall				
	Int. Wall				

* Weight included 3 psf of solar panel

Seismic weights of floor

Level	Assembly	Unit Wt. (psf)	Area (ft²)	Weight (kips)	Story Wt. (kip)
2nd Floor	Floor	23.59	467	11.02	11.02

Project: SHADE STRUCTURE AT DECK 2**Weight Take Off****Roof Weights:**

Metal deck Roofing	3	psf
2x T&G	4.5	
tube Joists	7.5	
Beam	3.5	
Misc.	1.5	
Dead load	20.0	psf
Live load	20.0	psf

Seismic weights of roof

Level	Assembly	Unit Wt. (psf)	Area (ft²)	Weight (kips)	Story Wt. (kip)
Roof	Roof*	20.0	173.25	3.47	3.47
	Ext Wall				
	Heavy Ext Wall				
	Int. Wall				

Floor Weights:

DECKING		psf
2X4 TUBE		
2X6 TUBE		
4X6 TUBE		
MISC		
Dead Load		psf
Live load		psf

Seismic weights of floor

Level	Assembly	Unit Wt. (psf)	Area (ft²)	Weight (kips)	Story Wt. (kip)
2nd Floor	Floor	0	467	0.00	0.00

ASCE 7-16 Snow Loads

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: Snow load

Flat Roof Snow Loads

Description :		per ASCE 7-16, Chapter 7	
Ground Snow Load, per Fig 7.2	19.00 psf	Roof Slope, Sec .7.3.4	0.00
Terrain Category	B (see ASCE 7-16 Section 26.7)	Roof Configuration	Monoslope
Exposure of Roof	Fully Exposed		
Ce : Exposure Factor, Table 7.3-	0.90		
Ct : Thermal Factor	Unheated and open air structures	pm, Minimum required	19.00 psf
Risk Category, per Table 1.5-	II	pf, Calculated Snow Load per Equation	14.36 psf
Importance Factor, Is, Table 1.5-2	1.00	pf, Design Snow Load Max(pm min, pf calc	19.00 psf



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DECK PLATFORM DESIGN

Steel Beam

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

(c) ENERCALC, LLC 1982-2024

DESCRIPTION: 2X4 STL TUBE**CODE REFERENCES**

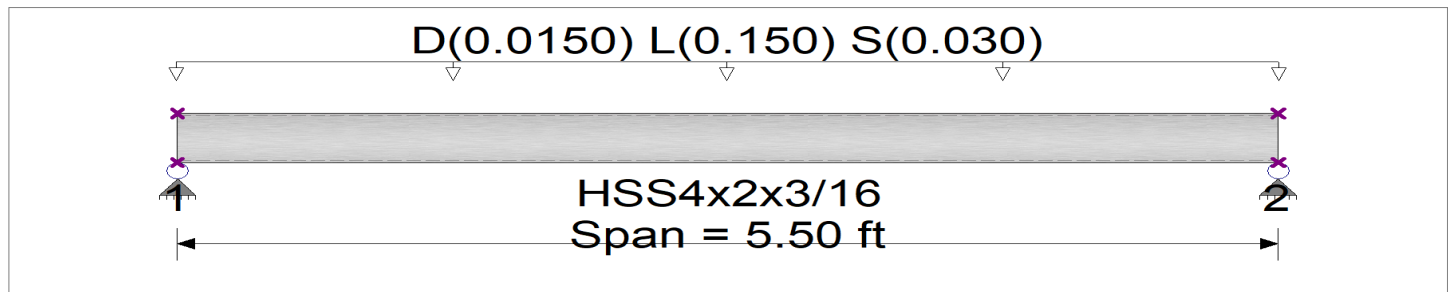
Calculations per AISC 360-16, IBC 2021, SDPWS 2021

Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method : Allowable Strength Design
 Beam Bracing : Completely Unbraced
 Bending Axis : Major Axis Bending

Fy : Steel Yield : 46.0 ksi
 E: Modulus : 29,000.0 ksi

**Applied Loads**

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.010, L = 0.10, S = 0.020 ksf, Tributary Width = 1.50 ft

DESIGN SUMMARY**Design OK**

Maximum Bending Stress Ratio =		0.116 : 1		Maximum Shear Stress Ratio =		0.023 : 1	
Section used for this span		HSS4x2x3/16		Section used for this span		HSS4x2x3/16	
Ma : Applied		0.624 k-ft		Va : Applied		0.4538 k	
Mn / Omega : Allowable		5.371 k-ft		Vn/Omega : Allowable		20.003 k	
Load Combination		+D+L		Load Combination		+D+L	
Span # where maximum occurs		Span # 1		Location of maximum on span		0.000 ft	
Span # where maximum occurs		Span # 1		Span # where maximum occurs		Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.029 in Ratio = 2,257		>=360		Span: 1 : L Only	
Max Upward Transient Deflection		0 in Ratio = 0		<360		n/a	
Max Downward Total Deflection		0.032 in Ratio = 2053		>=240.		Span: 1 : +D+L	
Max Upward Total Deflection		0 in Ratio = 0		<240.0		n/a	

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
D Only													
Dsgn. L = 5.50 ft	1	0.011	0.002	0.06		0.06	8.97	5.37	1.14	1.00	0.04	33.41	20.00
+D+L													
Dsgn. L = 5.50 ft	1	0.116	0.023	0.62		0.62	8.97	5.37	1.14	1.00	0.45	33.41	20.00
+D+0.70S													
Dsgn. L = 5.50 ft	1	0.025	0.005	0.14		0.14	8.97	5.37	1.14	1.00	0.10	33.41	20.00
+D+0.750L													
Dsgn. L = 5.50 ft	1	0.090	0.018	0.48		0.48	8.97	5.37	1.14	1.00	0.35	33.41	20.00
+D+0.750L+0.5250S													
Dsgn. L = 5.50 ft	1	0.101	0.020	0.54		0.54	8.97	5.37	1.14	1.00	0.39	33.41	20.00
+0.60D													
Dsgn. L = 5.50 ft	1	0.006	0.001	0.03		0.03	8.97	5.37	1.14	1.00	0.02	33.41	20.00
+D+0.750L+0.10S													
Dsgn. L = 5.50 ft	1	0.092	0.018	0.49		0.49	8.97	5.37	1.14	1.00	0.36	33.41	20.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.0322	2.766		0.0000	0.000

Vertical Reactions

Support notation : Far left is #:

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.454	0.454
Max Upward from Load Combinations	0.454	0.454
Max Upward from Load Cases	0.413	0.413

Steel Beam

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: 2X4 STL TUBE**Vertical Reactions**

Support notation : Far left is #:

Values in KIPS

Load Combination	Support 1	Support 2	
Max Downward from all Load Conditions (Resis			2.090
Max Downward from Load Combinations (Resi:			2.090
Max Downward from Load Cases (Resisting Up			2.090
D Only	0.041	0.041	2.090
+D+L	0.454	0.454	2.090
+D+0.70S	0.099	0.099	2.090
+D+0.750L	0.351	0.351	2.090
+D+0.750L+0.5250S	0.394	0.394	2.090
+0.60D	0.025	0.025	2.090
+D+0.750L+0.10S	0.359	0.359	2.090
L Only	0.413	0.413	2.090
S Only	0.083	0.083	2.090

Steel Beam

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

(c) ENERCALC, LLC 1982-2024

DESCRIPTION: 2X6 STL TUBE INTERIOR**CODE REFERENCES**

Calculations per AISC 360-16, IBC 2021, SDPWS 2021

Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

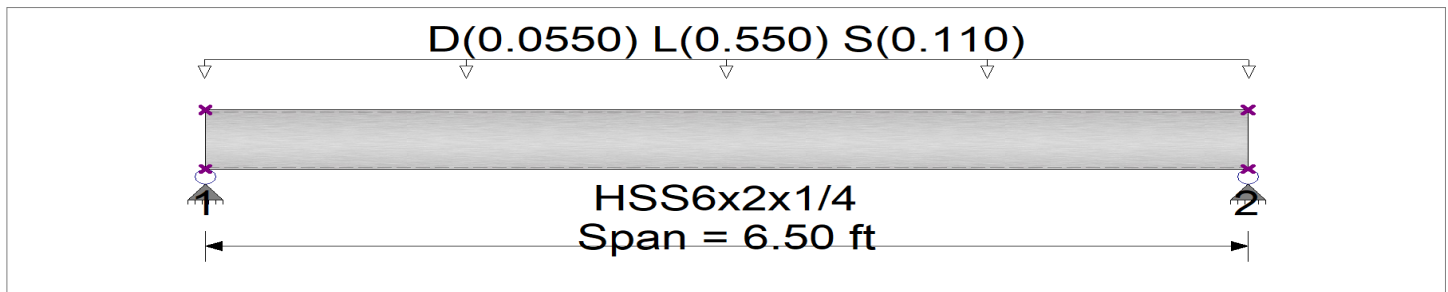
Analysis Method : Allowable Strength Design

Fy : Steel Yield : 46.0 ksi

Beam Bracing : Completely Unbraced

E: Modulus : 29,000.0 ksi

Bending Axis : Major Axis Bending

**Applied Loads**

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading

Uniform Load : D = 0.010, L = 0.10, S = 0.020 ksf, Tributary Width = 5.50 ft

DESIGN SUMMARY**Design OK**

Maximum Bending Stress Ratio =		0.243 : 1		Maximum Shear Stress Ratio =		0.049 : 1	
Section used for this span		HSS6x2x1/4		Section used for this span		HSS6x2x1/4	
Ma : Applied		3.260 k-ft		Va : Applied		2.006 k	
Mn / Omega : Allowable		13.405 k-ft		Vn/Omega : Allowable		40.826 k	
Load Combination		+D+L		Load Combination		+D+L	
Span # where maximum occurs		Span # 1		Location of maximum on span		0.000 ft	
Span # where maximum occurs		Span # 1		Span # where maximum occurs		Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.058 in Ratio = 1,335		>=360		Span: 1 : L Only	
Max Upward Transient Deflection		0 in Ratio = 0		<360		n/a	
Max Downward Total Deflection		0.066 in Ratio = 1190		>=240.		Span: 1 : +D+L	
Max Upward Total Deflection		0 in Ratio = 0		<240.0		n/a	

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
D Only													
Dsgn. L = 6.50 ft	1	0.026	0.005	0.35		0.35	22.39	13.41	1.14	1.00	0.22	68.18	40.83
+D+L													
Dsgn. L = 6.50 ft	1	0.243	0.049	3.26		3.26	22.39	13.41	1.14	1.00	2.01	68.18	40.83
+D+0.70S													
Dsgn. L = 6.50 ft	1	0.057	0.011	0.76		0.76	22.39	13.41	1.14	1.00	0.47	68.18	40.83
+D+0.750L													
Dsgn. L = 6.50 ft	1	0.189	0.038	2.53		2.53	22.39	13.41	1.14	1.00	1.56	68.18	40.83
+D+0.750L+0.5250S													
Dsgn. L = 6.50 ft	1	0.212	0.043	2.84		2.84	22.39	13.41	1.14	1.00	1.75	68.18	40.83
+0.60D													
Dsgn. L = 6.50 ft	1	0.016	0.003	0.21		0.21	22.39	13.41	1.14	1.00	0.13	68.18	40.83
+D+0.750L+0.10S													
Dsgn. L = 6.50 ft	1	0.193	0.039	2.59		2.59	22.39	13.41	1.14	1.00	1.59	68.18	40.83

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.0656	3.269		0.0000	0.000

Vertical Reactions

Support notation : Far left is #:

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	2.006	2.006
Max Upward from Load Combinations	2.006	2.006
Max Upward from Load Cases	1.788	1.788

Steel Beam

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: 2X6 STL TUBE INTERIOR**Vertical Reactions**

Support notation : Far left is #:

Values in KIPS

Load Combination	Support 1	Support 2	
Max Downward from all Load Conditions (Resis			2.090
Max Downward from Load Combinations (Resi:			2.090
Max Downward from Load Cases (Resisting Up			2.090
D Only	0.218	0.218	2.090
+D+L	2.006	2.006	2.090
+D+0.70S	0.469	0.469	2.090
+D+0.750L	1.559	1.559	2.090
+D+0.750L+0.5250S	1.747	1.747	2.090
+0.60D	0.131	0.131	2.090
+D+0.750L+0.10S	1.595	1.595	2.090
L Only	1.788	1.788	2.090
S Only	0.358	0.358	2.090

Steel Beam

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

(c) ENERCALC, LLC 1982-2024

DESCRIPTION: 2X6 STL TUBE EXTERIOR**CODE REFERENCES**

Calculations per AISC 360-16, IBC 2021, SDPWS 2021

Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method : Allowable Strength Design

Beam Bracing : Completely Unbraced

Bending Axis : Major Axis Bending

Fy : Steel Yield : 46.0 ksi

E: Modulus : 29,000.0 ksi

D(0.02750) L(0.2750) S(0.0550) D(0.02750) L(0.2750)

1 HSS6x2x1/4 2
 Span = 2.0 ft

HSS6x2x1/4
 Span = 4.0 ft

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading

Load for Span Number 1

Uniform Load : D = 0.010, L = 0.10, S = 0.020 ksf, Tributary Width = 2.750 ft

Load for Span Number 2

Uniform Load : D = 0.010, L = 0.10 ksf, Tributary Width = 2.750 ft

DESIGN SUMMARY**Design OK**

Maximum Bending Stress Ratio =

0.047 : 1

Maximum Shear Stress Ratio =

0.019 : 1

Section used for this span

HSS6x2x1/4

Section used for this span

HSS6x2x1/4

Ma : Applied

0.629 k-ft

Va : Applied

0.7868 k

Mn / Omega : Allowable

13.405 k-ft

Vn/Omega : Allowable

40.826 k

Load Combination

+D+L

Load Combination

+D+L

Span # where maximum occurs

Span # 1

Location of maximum on span

2.000 ft

Span # where maximum occurs

Span # 1

Maximum Deflection

Max Downward Transient Deflection

0.003 in

Ratio = 19,136

>=360

Span: 2 : L Only

Max Upward Transient Deflection

0 in

Ratio = 0

<360

n/a

Max Downward Total Deflection

0.003 in

Ratio = 14966

>=240.

Span: 2 : +D+0.750L+0.5250S

Max Upward Total Deflection

-0.000 in

Ratio = 243200

>=240.

Span: 2 : +D+0.70S

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
D Only													
Dsgn. L = 2.00 ft	1	0.006	0.002		-0.08	0.08	22.39	13.41	1.00	1.00	0.10	68.18	40.83
Dsgn. L = 4.00 ft	2	0.006	0.002	0.04	-0.08	0.08	22.39	13.41	2.08	1.00	0.10	68.18	40.83
+D+L													
Dsgn. L = 2.00 ft	1	0.047	0.019		-0.63	0.63	22.39	13.41	1.00	1.00	0.79	68.18	40.83
Dsgn. L = 4.00 ft	2	0.047	0.019	0.35	-0.63	0.63	22.39	13.41	2.08	1.00	0.79	68.18	40.83
+D+0.70S													
Dsgn. L = 2.00 ft	1	0.012	0.004		-0.16	0.16	22.39	13.41	1.00	1.00	0.16	68.18	40.83
Dsgn. L = 4.00 ft	2	0.012	0.003	0.02	-0.16	0.16	22.39	13.41	3.00	1.00	0.12	68.18	40.83
+D+0.750L													
Dsgn. L = 2.00 ft	1	0.037	0.015		-0.49	0.49	22.39	13.41	1.00	1.00	0.61	68.18	40.83
Dsgn. L = 4.00 ft	2	0.037	0.015	0.28	-0.49	0.49	22.39	13.41	2.08	1.00	0.61	68.18	40.83
+D+0.750L+0.5250S													
Dsgn. L = 2.00 ft	1	0.041	0.015		-0.55	0.55	22.39	13.41	1.00	1.00	0.63	68.18	40.83
Dsgn. L = 4.00 ft	2	0.041	0.015	0.26	-0.55	0.55	22.39	13.41	2.23	1.00	0.63	68.18	40.83
+0.60D													
Dsgn. L = 2.00 ft	1	0.004	0.001		-0.05	0.05	22.39	13.41	1.00	1.00	0.06	68.18	40.83
Dsgn. L = 4.00 ft	2	0.004	0.001	0.03	-0.05	0.05	22.39	13.41	2.08	1.00	0.06	68.18	40.83
+D+0.750L+0.10S													
Dsgn. L = 2.00 ft	1	0.038	0.015		-0.50	0.50	22.39	13.41	1.00	1.00	0.62	68.18	40.83
Dsgn. L = 4.00 ft	2	0.038	0.015	0.27	-0.50	0.50	22.39	13.41	2.11	1.00	0.62	68.18	40.83

Steel Beam

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: 2X6 STL TUBE EXTERIOR**Overall Maximum Deflections**

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.5250S	1	0.0032	0.000		0.0000	0.000
+D+L	2	0.0020	2.320	S Only	-0.0003	0.480

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions		1.416	0.472
Max Upward from Load Combinations		1.416	0.472
Max Upward from Load Cases		1.238	0.413
Max Downward from all Load Conditions (Resis			-0.028
Max Downward from Load Cases (Resisting Up			-0.028
D Only		0.179	0.060
+D+L		1.416	0.472
+D+0.70S		0.275	0.040
+D+0.750L		1.107	0.369
+D+0.750L+0.5250S		1.179	0.355
+0.60D		0.107	0.036
+D+0.750L+0.10S		1.121	0.366
L Only		1.238	0.413
S Only		0.138	-0.028

Steel Beam

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

(c) ENERCALC, LLC 1982-2024

DESCRIPTION: 4X6 STL TUBE BLW**CODE REFERENCES**

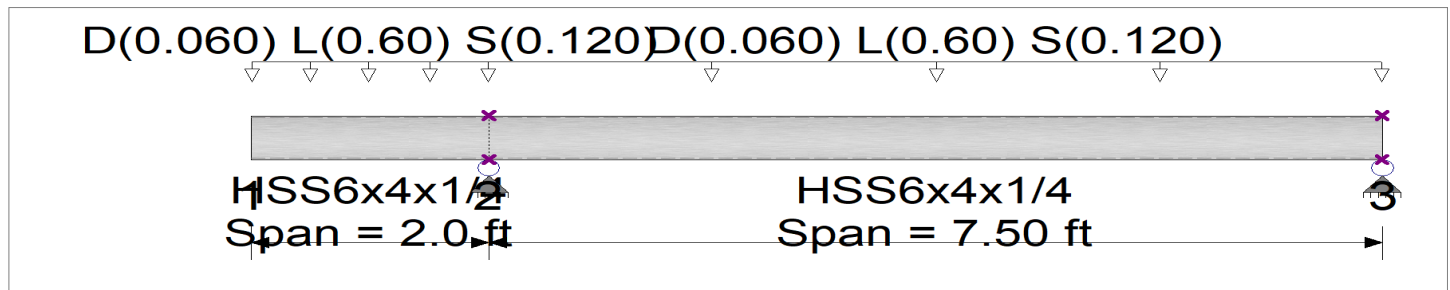
Calculations per AISC 360-16, IBC 2021, SDPWS 2021

Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method : Allowable Strength Design
 Beam Bracing : Completely Unbraced
 Bending Axis : Major Axis Bending

Fy : Steel Yield : 46.0 ksi
 E: Modulus : 29,000.0 ksi

**Applied Loads**

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading

Load for Span Number 1

Uniform Load : D = 0.010, L = 0.10, S = 0.020 ksf, Tributary Width = 6.0 ft

Load for Span Number 2

Uniform Load : D = 0.010, L = 0.10, S = 0.020 ksf, Tributary Width = 6.0 ft

DESIGN SUMMARY**Design OK**

Maximum Bending Stress Ratio =		0.209 : 1	Maximum Shear Stress Ratio =		0.066 : 1
Section used for this span		HSS6x4x1/4	Section used for this span		HSS6x4x1/4
Ma : Applied		4.099 k-ft	Va : Applied		2.714 k
Mn / Omega : Allowable		19.580 k-ft	Vn/Omega : Allowable		40.826 k
Load Combination		+D+L	Load Combination		+D+L
Span # where maximum occurs		Span # 2	Location of maximum on span		2.000 ft
Span # where maximum occurs		Span # 2	Span # where maximum occurs		Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.059 in Ratio = 1,529	>=360	Span: 2 : L Only	
Max Upward Transient Deflection		-0.040 in Ratio = 1,212	>=360	Span: 2 : L Only	
Max Downward Total Deflection		0.066 in Ratio = 1359	>=240.	Span: 2 : +D+L	
Max Upward Total Deflection		-0.045 in Ratio = 1076	>=240.	Span: 2 : +D+L	

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
D Only													
Dsgn. L = 2.00 ft	1	0.008	0.007		-0.15	0.15	32.70	19.58	1.00	1.00	0.30	68.18	40.83
Dsgn. L = 7.50 ft	2	0.023	0.007	0.46	-0.15	0.46	32.70	19.58	1.17	1.00	0.30	68.18	40.83
+D+L													
Dsgn. L = 2.00 ft	1	0.069	0.066		-1.35	1.35	32.70	19.58	1.00	1.00	2.71	68.18	40.83
Dsgn. L = 7.50 ft	2	0.209	0.066	4.10	-1.35	4.10	32.70	19.58	1.17	1.00	2.71	68.18	40.83
+D+0.70S													
Dsgn. L = 2.00 ft	1	0.016	0.016		-0.32	0.32	32.70	19.58	1.00	1.00	0.64	68.18	40.83
Dsgn. L = 7.50 ft	2	0.049	0.016	0.97	-0.32	0.97	32.70	19.58	1.17	1.00	0.64	68.18	40.83
+D+0.750L													
Dsgn. L = 2.00 ft	1	0.054	0.052		-1.05	1.05	32.70	19.58	1.00	1.00	2.11	68.18	40.83
Dsgn. L = 7.50 ft	2	0.163	0.052	3.19	-1.05	3.19	32.70	19.58	1.17	1.00	2.11	68.18	40.83
+D+0.750L+0.5250S													
Dsgn. L = 2.00 ft	1	0.060	0.058		-1.18	1.18	32.70	19.58	1.00	1.00	2.36	68.18	40.83
Dsgn. L = 7.50 ft	2	0.182	0.058	3.57	-1.18	3.57	32.70	19.58	1.17	1.00	2.36	68.18	40.83
+0.60D													
Dsgn. L = 2.00 ft	1	0.005	0.004		-0.09	0.09	32.70	19.58	1.00	1.00	0.18	68.18	40.83
Dsgn. L = 7.50 ft	2	0.014	0.004	0.28	-0.09	0.28	32.70	19.58	1.17	1.00	0.18	68.18	40.83
+D+0.750L+0.10S													
Dsgn. L = 2.00 ft	1	0.055	0.053		-1.08	1.08	32.70	19.58	1.00	1.00	2.16	68.18	40.83
Dsgn. L = 7.50 ft	2	0.167	0.053	3.26	-1.08	3.26	32.70	19.58	1.17	1.00	2.16	68.18	40.83

Steel Beam

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: 4X6 STL TUBE BLW**Overall Maximum Deflections**

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+L	-0.0446	0.000
+D+L	2	0.0662	3.870		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions		4.065	2.353
Max Upward from Load Combinations		4.065	2.353
Max Upward from Load Cases		3.610	2.090
D Only		0.455	0.263
+D+L		4.065	2.353
+D+0.70S		0.960	0.556
+D+0.750L		3.162	1.831
+D+0.750L+0.5250S		3.542	2.050
+0.60D		0.273	0.158
+D+0.750L+0.10S		3.235	1.873
L Only		3.610	2.090
S Only		0.722	0.418

ASCE 7-16 Seismic Base Shear

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: Seismic Base Shear Analysis

Specific Description: PLATFORM BASE SHEAR ANALYSIS

Risk Category

Calculations per ASCE 7-16

Risk Category of Building or Other Structure : "II" : All Buildings and other structures except those listed as Category I, III, and IV [SCE 7-16, Page 4, Table 1.5-1](#)

Seismic Importance Factor = 1 [ASCE 7-16, Page 5, Table 1.5-2](#)

USER DEFINED Ground Motion

[ASCE 7-16 11.4.2](#)

Max. Ground Motions, 5% Damping

$$S_S = 1.931 \text{ g, 0.2 sec response}$$

$$S_1 = 0.6930 \text{ g, 1.0 sec response}$$

For the closest datapoint grid location . . .

Latitude = 0.000 deg North

Longitude = 0.000 deg West

Conforms to ASCE 7 Section 12.8.1.3: Regular structure with period of 0.5 s or less, SDS limited to max of 0.7*SDS or 1.0 for calculation

Site Class, Site Coeff. and Design Category

Classification: "D" : Shear Wave Velocity 600 to 1,200 ft/sec = **D** (By Default per 11.4.3) [ASCE 7-16 Table 20.3-1](#)

Site Coefficients F_a & F_v $F_a = 1.20$ [ASCE 7-16 Table 11.4-1 & 11.4-2](#)
 (using straight-line interpolation from table val) $F_v = 1.70$

Maximum Considered Earthquake Accelerat $S_{MS} = F_a * S_s = 2.317$ [ASCE 7-16 Eq. 11.4-1](#)

$S_{M1} = F_v * S_1 = 1.178$ [ASCE 7-16 Eq. 11.4-2](#)

Design Spectral Acceleration $S_{DS} = S_{MS} * 2/3 = 1.545$ [ASCE 7-16 Eq. 11.4-3](#)

$S_{D1} = S_{M1} * 2/3 = 0.785$ [ASCE 7-16 Eq. 11.4-4](#)

Seismic Design Category = **D** [ASCE 7-16 Table 11.6-1 & -2](#)

Resisting System

[ASCE 7-16 Table 12.2-1](#)

Basic Seismic Force Resisting System . . . **Cantilevered column systems detailed to conform to specific classification**
4.Intermediate reinforced concrete moment frames

Response Modification Coefficient "R" = 1.50

System Overstrength Factor "Wo" = 1.25

Deflection Amplification Factor "Cd" = 1.50

Building height Limits :

Category "A & B" Limit: Limit = 35

Category "C" Limit: Limit = 35

Category "D" Limit: Not Permitted

Category "E" Limit: Not Permitted

Category "F" Limit: Not Permitted

NOTE! See ASCE 7-16 for all applicable footnc

Lateral Force Procedure

[ASCE 7-16 Section 12.8.2](#)

Equivalent Lateral Force Procedure

[The "Equivalent Lateral Force Procedure" is being used according to the provisions of ASCE 7-16 12.8](#)

Determine Building Period

[Use ASCE 12.8-7](#)

Structure Type for Building Period CalculatCONCRETE 100% Moment Resisting Frame

"Ct" value = 0.016 "hn" : Height from base to highest leve 4.0 ft

"x" value = 0.90

"Ta" Approximate fundamental period using Eq. 12.8-7 : $T_a = C_t * (h_n^x) = 0.056 \text{ sec}$

"TL" : Long-period transition period per ASCE 7-16 Maps 22-14 -> 22-17 8.000 sec

Building Period "Ta" Calculated from Approximate Method sel= 0.056

ASCE 7-16 Seismic Base Shear

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: Seismic Base Shear Analysis

" Cs " Response Coefficient

ASCE 7-16 Section 12.8.1.1

S_{DS} : Short Period Design Spectral Response	=	1.545	From Eq. 12.8-2, Preliminary C_s	=	0.721
" R " : Response Modification Factor	=	1.50	From Eq. 12.8-3 & 12.8-4 , C_s need not exceed	=	9.398
" I " : Seismic Importance Factor	=	1	From Eq. 12.8-5 & 12.8-6, C_s not be less than	=	0.231

User has selected ASCE 12.8.1.3 : Regular structure, **Cs : Seismic Response Coefficient = 0.7209**
 Less than 5 Stories and with $T \leq 0.5$ sec, SO $S_s \leq 1.5$ for C_s calcul

Seismic Base Shear

ASCE 7-16 Section 12.8.1

Cs = 0.7209 from 12.8.1.1	W (see Sum W_i below) =	4.00 k
Seismic Base Shear $V = C_s * W =$		2.88 k

Vertical Distribution of Seismic Forces

ASCE 7-16 Section 12.8.3

" k " : hx exponent based on $T_a = 1.00$

Table of building Weights by Floor Level...

Level #	W_i : Weight	H_i : Height	$(W_i * H_i^k)$	C_{vx}	$F_x = C_{vx} * V$	Sum Story Shear	Sum Story Moment
1	4.00	11.02	44.08	1.0000	2.88	2.88	0.00
Sum $W_i =$	4.00 k	Sum $W_i * H_i =$	44.08 k-ft	Total Base Shear =	2.88 k	Base Moment =	31.8 k-ft

Diaphragm Forces : Seismic Design Category "B" to "F"

ASCE 7-16 12.10.1.1

Level #	W_i	F_i	Sum F_i	Sum W_i	F_{px} : Calcd	F_{px} : Min	F_{px} : Max	F_{px}	Dsgn. Force
1	4.00	2.88	2.88	4.00	2.88	1.24	2.47	2.47	2.88

W_{px} : Weight at level of diaphragm and other structure elements attached to it.

F_i : Design Lateral Force applied at the level.

Sum F_i : Sum of "Lat. Force" of current level plus all levels above

MIN Req'd Force @ Level ... $0.20 * S_{DS} * I * W_{px}$

MAX Req'd Force @ Level ... $0.40 * S_{DS} * I * W_{px}$

F_{px} : Design Force @ Level . $W_{px} * \text{SUM}(x \rightarrow n) F_i / \text{SUM}(x \rightarrow n) w_i$, x = Current level, n = Top Level

Pole Footing Embedded in Soil

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: P1

Code References

Calculations per IBC 2021 1807.3, SDPWS 2021
 Load Combinations Used : ASCE 7-22 / IBC 2024 (L<=100psf)

General Information

Pole Footing Shape Circular
 Pole Footing Diameter 18.0 in
 Calculate Min. Depth for Allowable Pressures
 No Lateral Restraint at Ground Surface
 Allow Passive 400.0 pcf
 Max Passive 6,000.0 psf

Controlling Values

Governing Load Combination D+0.70E
 Lateral Load 0.2520 k
 Moment 1.008 k-ft

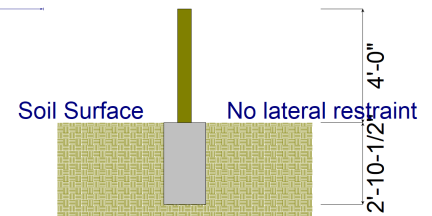
NO Ground Surface Restraint

Pressures at 1/3 Depth
 Actual 367.665 psf
 Allowable 367.860 psf

Minimum Required Depth	2.875 ft
-------------------------------	-----------------

Footing Base Area 1.767 ft²
 Maximum Soil Pressure 3.243 ksf

Point Load



Applied Loads

Lateral Concentrated Load (k)		Lateral Distributed Loads (k/ft)		Vertical Load (k)
D : Dead Load	k		k/ft	1.380 k
Lr : Roof Live	k		k/ft	k
L : Live	k		k/ft	4.350 k
S : Snow	k		k/ft	0.870 k
W : Wind	k		k/ft	k
E : Earthquake	0.360 k		k/ft	k
H : Lateral Earth	k		k/ft	k
Load distance above ground surface	4.0 ft	TOP of Load above ground surface	ft	
		BOTTOM of Load above ground surface	ft	

Load Combination Results

Load Combination	Forces @ Ground Surface		Required Depth - (ft)	Pressure at 1/3 Depth		Soil Increase Factor
	Loads - (k)	Moments - (ft-k)		Actual - (psf)	Allow - (psf)	
D Only	0.000	0.000	0.13	0.0	0.0	1.000
+D+L	0.000	0.000	0.13	0.0	0.0	1.000
+D+0.70S	0.000	0.000	0.13	0.0	0.0	1.000
+D+0.750L	0.000	0.000	0.13	0.0	0.0	1.000
+D+0.750L+0.5250S	0.000	0.000	0.13	0.0	0.0	1.000
+0.60D	0.000	0.000	0.13	0.0	0.0	1.000
+D+0.70E	0.252	1.008	2.88	367.7	367.9	1.000
+D+0.750L+0.10S+0.5250E	0.189	0.756	2.50	328.9	330.0	1.000
+0.60D+0.70E	0.252	1.008	2.88	367.7	367.9	1.000



Anchor Designer™
Software
 Version 3.2.2311.2

Company:		Date:	2/22/2023
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Project:			
Address:			
Phone:			
E-mail:			

1. Project information

Project description: PLATFORM ANCHORAGE AT TOP OF POLE FOOTING

Location: PLATFORM ANCHORAGE AT TOP OF POLE FOOTING

Fastening description: PLATFORM ANCHORAGE AT TOP OF POLE FOOTING

2. Input Data & Anchor Parameters

General

Design method: ACI 318-19

Units: Imperial units

Anchor Information:

Anchor type: Cast-in-place

Material: F1554 Grade 36

Diameter (inch): 0.875

Effective Embedment depth, h_{ef} (inch): 6.000

Anchor category: -

Anchor ductility: Yes

h_{min} (inch): 7.63

C_{min} (inch): 5.25

S_{min} (inch): 5.25

Base Material

Concrete: Normal-weight

Concrete thickness, h (inch): 12.00

State: Cracked

Compressive strength, f'_c (psi): 2500

$\Psi_{c,v}$: 1.0

Reinforcement condition: Supplementary reinforcement not present

Supplemental edge reinforcement: Not applicable

Reinforcement provided at corners: No

Ignore concrete breakout in tension: No

Ignore concrete breakout in shear: No

Ignore 6do requirement: No

Build-up grout pad: No

Base Plate

Length x Width x Thickness (inch): 6.00 x 6.00 x 0.25

Recommended Anchor

Anchor Name: Heavy Hex Bolt - 7/8"Ø Heavy Hex Bolt, F1554 Gr. 36





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Load and Geometry

Load factor source: ACI 318 Section 5.3

Load combination: $U = 0.9D + 1.0E$

Seismic design: Yes

Anchors subjected to sustained tension: Not applicable

Ductility section for tension: 17.10.5.3 (d) is satisfied

Ductility section for shear: 17.10.6.3 (c) is satisfied

Ω_0 factor: 2.5

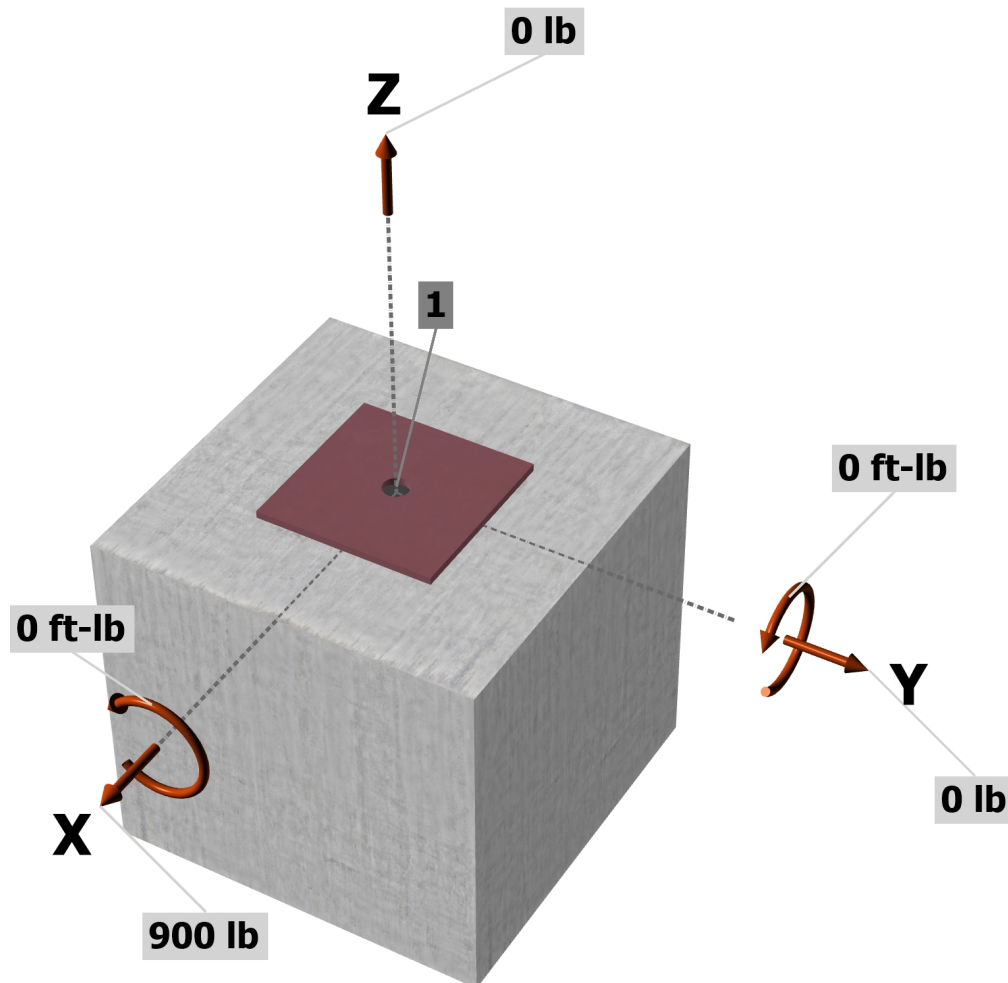
Apply entire shear load at front row: No

Anchors only resisting wind and/or seismic loads: Yes

Service level loads:

	D	E	Strength level loads
N_a [lb]:	0	0	0
V_{ax} [lb]:	0	360	900
V_{ay} [lb]:	0	0	0
M_x [ft-lb]:	0	0	0
M_y [ft-lb]:	0	0	0

<Figure 1>



Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.

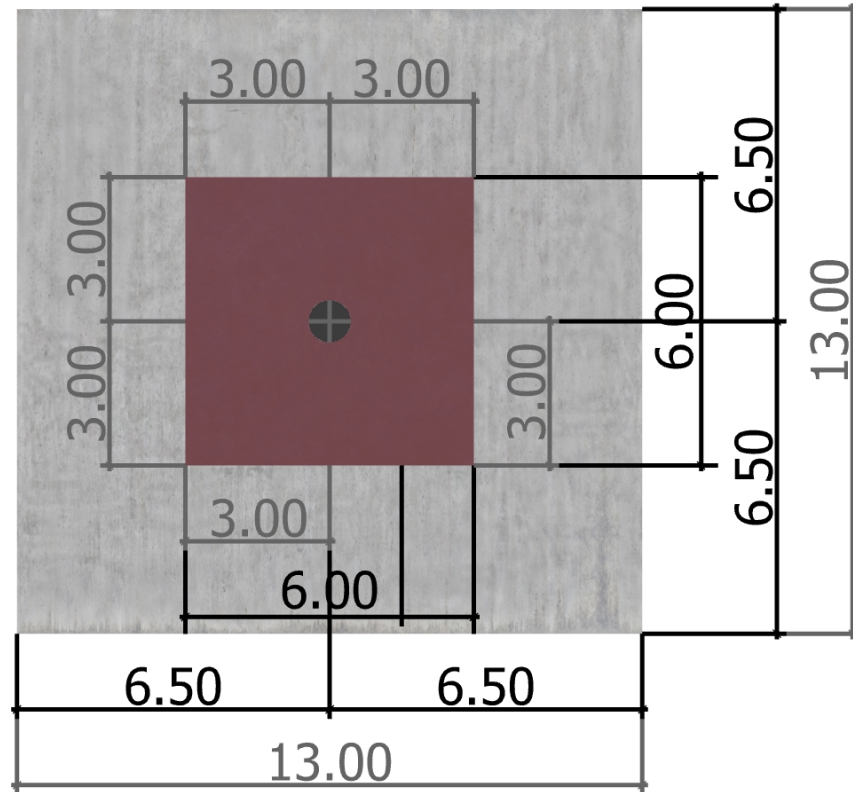
Simpson Strong-Tie Company Inc. 5956 W. Las Positas Boulevard Pleasanton, CA 94588 Phone: 925.560.9000 Fax: 925.847.3871 www.strongtie.com



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<Figure 2>



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3. Resulting Anchor Forces

Anchor	Tension load, N _{ua} (lb)	Shear load x, V _{uax} (lb)	Shear load y, V _{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2 + (V_{uay})^2}$ (lb)
1	0.0	900.0	0.0	900.0
Sum	0.0	900.0	0.0	900.0

Maximum concrete compression strain (%): 0.00

Maximum concrete compression stress (psi): 0

Resultant tension force (lb): 0

Resultant compression force (lb): 0

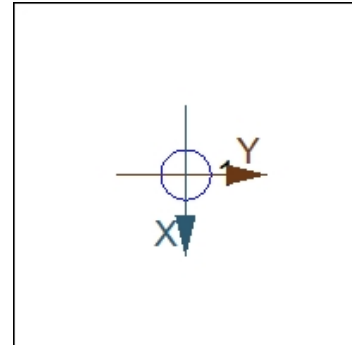
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00

Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00

Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00

Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



8. Steel Strength of Anchor in Shear (Sec. 17.7.1)

V _{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (lb)
16080	1.0	0.65	10452

9. Concrete Breakout Strength of Anchor in Shear (Sec. 17.7.2)

Shear perpendicular to edge in x-direction:

$V_{bx} = \min[7(l_e/d_a)^{0.2}\sqrt{d_a\lambda_a}f'_c c_{a1}^{1.5}; 9\lambda_a\sqrt{f'_c c_{a1}^{1.5}}]$ (Eq. 17.7.2.2.1a & Eq. 17.7.2.2.1b)

l _e (in)	d _a (in)	λ_a	f' _c (psi)	c _{a1} (in)	V _{bx} (lb)
6.00	0.875	1.00	2500	6.50	7457

$\phi V_{cbx} = \phi (A_{Vc}/A_{Vco}) \Psi_{ed,V} \Psi_{c,V} \Psi_{h,V} V_{bx}$ (Sec. 17.5.1.2 & Eq. 17.7.2.1a)

A _{Vc} (in ²)	A _{Vco} (in ²)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V _{bx} (lb)	ϕ	ϕV_{cbx} (lb)
126.75	190.13	0.900	1.000	1.000	7457	0.70	3132

Shear parallel to edge in y-direction:

$V_{by} = \min[7(l_e/d_a)^{0.2}\sqrt{d_a\lambda_a}f'_c c_{a1}^{1.5}; 9\lambda_a\sqrt{f'_c c_{a1}^{1.5}}]$ (Eq. 17.7.2.2.1a & Eq. 17.7.2.2.1b)

l _e (in)	d _a (in)	λ_a	f' _c (psi)	c _{a1} (in)	V _{by} (lb)
6.00	0.875	1.00	2500	6.50	7457

$\phi V_{cby} = \phi (2)(A_{Vc}/A_{Vco}) \Psi_{ed,V} \Psi_{c,V} \Psi_{h,V} V_{by}$ (Sec. 17.5.1.2, 17.7.2.1(c) & Eq. 17.7.2.1a)

A _{Vc} (in ²)	A _{Vco} (in ²)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V _{by} (lb)	ϕ	ϕV_{cby} (lb)
126.75	190.13	1.000	1.000	1.000	7457	0.70	6960

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.7.3)

$\phi V_{cp} = \phi K_{cp} N_{cb} = \phi K_{cp} (A_{Nc}/A_{Nco}) \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,NNb}$ (Sec. 17.5.1.2 & Eq. 17.7.3.1a)

Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.

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k_{cp}	A_{Nc} (in ²)	A_{Nco} (in ²)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕV_{cp} (lb)
2.0	169.00	169.00	1.000	1.000	1.000	10825	0.70	15155

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.8)

Shear	Factored Load, V_{ua} (lb)	Design Strength, ϕV_n (lb)	Ratio	Status
Steel	900	10452	0.09	Pass
T Concrete breakout x+	900	3132	0.29	Pass (Governs)
 Concrete breakout y+	900	6960	0.13	Pass (Governs)
Pryout	900	15155	0.06	Pass

7/8"Ø Heavy Hex Bolt, F1554 Gr. 36 with hef = 6.000 inch meets the selected design criteria.

12. Warnings

- Per designer input, ductility requirements for tension have been determined to be satisfied – designer to verify.
- Per designer input, ductility requirements for shear have been determined to be satisfied – designer to verify.
- Designer must exercise own judgement to determine if this design is suitable.



RGSE inc. Structural Engineers

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SHADE STRUCTURE AT DECK DESIGN



PROJECT :
CLIENT :
JOB NO. :

DATE :

PAGE :
DESIGN BY :
REVIEW BY :

Wind Analysis for Open Structure (Solar Panels) Based on ASCE 7-22

shade structure

INPUT DATA

Exposure category (B, C or D) = **C**

Basic wind speed (ASCE 7 26.5.1) $V = 95$ mph, (152.89 kph)

Topographic factor (26.8 & Table 26.8-1) $K_{zt} = 1$ Flat

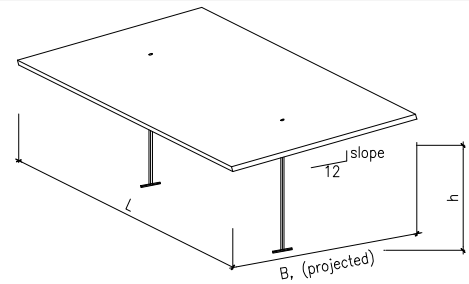
Height of mean roof $h = 8$ ft, (2.44 m)

Roof slope **4** : **12**

Roof length $L = 16.5$ ft, (5.03 m)

Roof horizontal projected width $B = 10.83$ ft, (3.30 m)

Effective area of component / cladding $A = 10$ ft² (0.93 m²)



DESIGN SUMMARY

1. Main Wind-Force Resisting System

Max horizontal force / base shear from roof

= 1.34 kips

+ 0.13 kips (eave & columns increasing)

Σ 1.48 kips, (6.6 kN)

Max vertical download force = 4.02 kips

Max vertical uplift force = 3.71 kips

Max moment at centroid of base from roof

= 15.45 ft-kips

+ 1.54 ft-kips (eave & columns increasing)

Σ 16.99 ft-kips, (23 kN-m)

2. Component and Cladding Elements

Max inward pressure = 56 psf, (2670 N/m²)

Max net outward pressure = 60 psf, (2890 N/m²)

ANALYSIS

Velocity pressure

$q_h K_d = (0.00256 K_z K_{zt} K_e V^2) K_d = 16.69$ psf

where: q_h = velocity pressure at mean roof height, h . (Eq. 26.10-1 page 277),

K_h = velocity pressure exposure coefficient evaluated at height, h . (Tab. 26.10-1, pg 277)

K_d = wind directionality factor. (Tab. 26.6-1, page 274)

h = height of mean roof

$K_e = 1.00$, (Tab. 26.9-1 page 275)

= 0.85

= 0.85

= 8.00 ft

Main Wind-Force Resisting System (Sec. 27.3.2)

$p = q_h K_d G C_N$

$F = p A_f$

where: G = gust effect factor. (Sec. 26.11)

θ = roof angle

A_f = roof actual area.

C_N = net force coefficients. (Fig. 27.3-4, page 287)

Check Fig. 27.3-4 limitation

$h / B = 0.74$ within [0.25 , 1.0] [Satisfactory]

= 0.85

= 18.43 degree

< 45 deg. [Satisfactory]

= 94.2 ft², windward

= 94.2 ft², leeward

θ	CASE	WIND TO BOTTOM, $\gamma = 0^\circ$				WIND TO TOP, $\gamma = 180^\circ$			
		CLEAR FLOW		OBSTRUCTED		CLEAR FLOW		OBSTRUCTED	
		C_{NW}	C_{NL}	C_{NW}	C_{NL}	C_{NW}	C_{NL}	C_{NW}	C_{NL}
18.43	A	-1.17	-1.44	-1.28	-1.59	1.48	1.69	0.45	-1.05
	p (psf)	-16.67	-20.39	-18.21	-22.58	21.04	24.00	6.33	-14.96
	F (kips)	-1.57	-1.92	-1.71	-2.13	1.98	2.26	0.60	-1.41
	B	-2.13	-0.14	-2.19	-0.74	1.98	0.65	1.25	-0.16
	p (psf)	-30.21	-1.95	-31.10	-10.46	28.14	9.16	17.68	-2.31
	F (kips)	-2.84	-0.18	-2.93	-0.99	2.65	0.86	1.66	-0.22

(cont'd)

		WIND TO BOTTOM, $\gamma = 0^\circ$				WIND TO TOP, $\gamma = 180^\circ$			
		CLEAR FLOW		OBSTRUCTED		CLEAR FLOW		OBSTRUCTED	
		CASE A	CASE B	CASE A	CASE B	CASE A	CASE B	CASE A	CASE B
Horizontal force / base shear	H (kips)	-1.10	-0.96	-1.21	-1.24	1.34	1.11	-0.26	0.46
Vertical download force	V (kips)	0.00	0.00	0.00	0.00	4.02	3.33	0.00	1.37
Vertical uplift force	V (kips)	3.31	2.87	3.64	3.71	0.00	0.00	0.77	0.00
Bending moment at centroid of base	M (ft-kips)	7.82931	15.2573	8.542398	15.44775	11.5275	3.78711	-7.7774	-1.70942

Component and Cladding Elements (Sec. 30.5.2)

$$p = q_h K_d G C_N$$

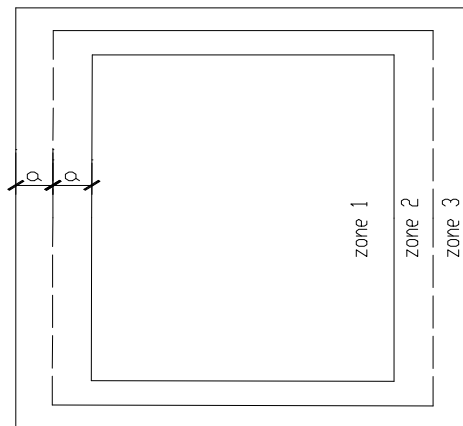
where: C_N = net force coefficients. (Fig. 30.5-1, page 336)

$$a = \text{Max}[\text{Min}(0.1L, 0.1B, 0.4h), \text{Min}(0.04L, 0.04B), 3\text{ft}], \text{ (Fig. 30.5-1)}$$

$$= 3.0 \text{ ft}$$

For effective area, 10 sq.ft. as given

	CLEAR WIND FLOW						OBSTRUCTED WIND FLOW					
	ZONE 3		ZONE 2		ZONE 1		ZONE 3		ZONE 2		ZONE 1	
C_N	3.93	-4.04	2.97	-3.11	1.98	-2.04	2.56	-4.25	1.94	-3.27	1.29	-2.15
p (psf)	55.76	-57.31	42.21	-44.07	28.14	-28.91	36.31	-60.35	27.49	-46.38	18.33	-30.45



ASCE 7-16 Seismic Base Shear

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: Seismic Base Shear Analysis

Specific Description: SHADE STRUCTURE BASESHEAR

Risk Category

Calculations per ASCE 7-16

Risk Category of Building or Other Structure : "II" : All Buildings and other structures except those listed as Category I, III, and IV [SCE 7-16, Page 4, Table 1.5-1](#)

Seismic Importance Factor = 1 [ASCE 7-16, Page 5, Table 1.5-2](#)

USER DEFINED Ground Motion

[ASCE 7-16 11.4.2](#)

Max. Ground Motions, 5% Damping

 $S_S = 1.931 \text{ g, 0.2 sec response}$
 $S_1 = 0.6930 \text{ g, 1.0 sec response}$

For the closest datapoint grid location . . .

Latitude = 0.000 deg North

Longitude = 0.000 deg West

Conforms to ASCE 7 Section 12.8.1.3: Regular structure with period of 0.5 s or less, SDS limited to max of 0.7*SDS or 1.0 for calculation

Site Class, Site Coeff. and Design Category

Classification: "D" : Shear Wave Velocity 600 to 1,200 ft/sec = **D** (By Default per 11.4.3) [ASCE 7-16 Table 20.3-1](#)

Site Coefficients F_a & F_v $F_a = 1.20$ [ASCE 7-16 Table 11.4-1 & 11.4-2](#)
 (using straight-line interpolation from table val) $F_v = 1.70$

Maximum Considered Earthquake Accelerat $S_{MS} = F_a * S_s = 2.317$ [ASCE 7-16 Eq. 11.4-1](#)

$S_{M1} = F_v * S_1 = 1.178$ [ASCE 7-16 Eq. 11.4-2](#)

Design Spectral Acceleration $S_{DS} = S_{MS} * 2/3 = 1.545$ [ASCE 7-16 Eq. 11.4-3](#)

$S_{D1} = S_{M1} * 2/3 = 0.785$ [ASCE 7-16 Eq. 11.4-4](#)

Seismic Design Category = **D** [ASCE 7-16 Table 11.6-1 & -2](#)

Resisting System

[ASCE 7-16 Table 12.2-1](#)Basic Seismic Force Resisting System . . . **Cantilevered column systems detailed to conform to specific classification**

2.Steel ordinary cantilever column systems

Response Modification Coefficient " R " = 1.25

System Overstrength Factor " Wo " = 1.25

Deflection Amplification Factor " Cd " = 1.25

Building height Limits :

Category "A & B" Limit: Limit = 35

Category "C" Limit: Limit = 35

Category "D" Limit: Not Permitted ,i

Category "E" Limit: Not Permitted ,i

Category "F" Limit: Not Permitted ,i

NOTE! See ASCE 7-16 for all applicable footnc

Lateral Force Procedure

[ASCE 7-16 Section 12.8.2](#)

Equivalent Lateral Force Procedure

[The "Equivalent Lateral Force Procedure" is being used according to the provisions of ASCE 7-16 12.8](#)

Determine Building Period

[Use ASCE 12.8-7](#)

Structure Type for Building Period CalculaCONCRETE 100% Moment Resisting Frame

" Ct " value = 0.016 " hn " : Height from base to highest level 11.0 ft

" x " value = 0.90

" Ta " Approximate fundamental period using Eq. 12.8-7 : $T_a = C_t * (h_n \wedge x) = 0.138 \text{ sec}$

"TL" : Long-period transition period per ASCE 7-16 Maps 22-14 -> 22-17 8.000 sec

Building Period " Ta " Calculated from Approximate Method sel= 0.138

ASCE 7-16 Seismic Base Shear

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: Seismic Base Shear Analysis

" Cs " Response Coefficient

ASCE 7-16 Section 12.8.1.1

S_{DS} : Short Period Design Spectral Response	=	1.545	From Eq. 12.8-2, Preliminary C_s	=	0.865
" R " : Response Modification Factor	=	1.25	From Eq. 12.8-3 & 12.8-4 , C_s need not exceed	=	4.537
" I " : Seismic Importance Factor	=	1	From Eq. 12.8-5 & 12.8-6, C_s not be less than	=	0.277

User has selected ASCE 12.8.1.3 : Regular structure, **Cs : Seismic Response Coefficient = 0.8651**
 Less than 5 Stories and with $T \leq 0.5$ sec, SO $S_s \leq 1.5$ for C_s calcul

Seismic Base Shear

ASCE 7-16 Section 12.8.1

C_s =	0.8651 from 12.8.1.1	W (see Sum W_i below) =	3.47 k
Seismic Base Shear V =	$C_s * W$ =		3.00 k

Vertical Distribution of Seismic Forces

ASCE 7-16 Section 12.8.3

" k " : hx exponent based on T_a = 1.00

Table of building Weights by Floor Level...

Level #	W_i : Weight	H_i : Height	$(W_i * H_i^k)$	C_{vx}	$F_x = C_{vx} * V$	Sum Story Shear	Sum Story Moment
1	3.47	11.00	38.17	1.0000	3.00	3.00	0.00
Sum W_i =	3.47 k	Sum $W_i * H_i$ =	38.17 k-ft	Total Base Shear =	3.00 k	Base Moment =	33.0 k-ft

Diaphragm Forces : Seismic Design Category "B" to "F"

ASCE 7-16 12.10.1.1

Level #	W_i	F_i	Sum F_i	Sum W_i	F_{px} : Calcd	F_{px} : Min	F_{px} : Max	F_{px}	Dsgn. Force
1	3.47	3.00	3.00	3.47	3.00	1.07	2.14	2.14	3.00

W_{px} : Weight at level of diaphragm and other structure elements attached to it.

F_i : Design Lateral Force applied at the level.

Sum F_i : Sum of "Lat. Force" of current level plus all levels above

MIN Req'd Force @ Level ... $0.20 * S_{DS} * I * W_{px}$

MAX Req'd Force @ Level ... $0.40 * S_{DS} * I * W_{px}$

F_{px} : Design Force @ Level . $W_{px} * \text{SUM}(x \rightarrow n) F_i / \text{SUM}(x \rightarrow n) w_i$, x = Current level, n = Top Level

Steel Beam

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: 2X4 STL TUBE**CODE REFERENCES**

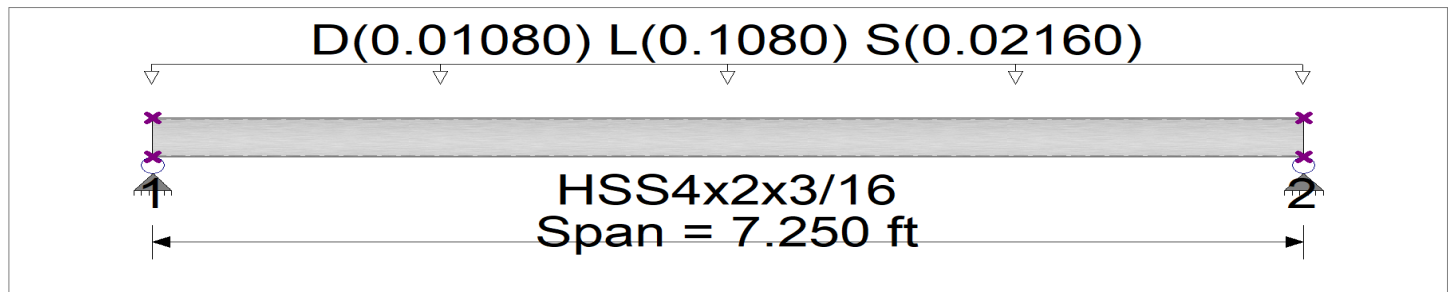
Calculations per AISC 360-16, IBC 2021, SDPWS 2021

Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method : Allowable Strength Design
 Beam Bracing : Completely Unbraced
 Bending Axis : Minor Axis Bending

Fy : Steel Yield : 46.0 ksi
 E: Modulus : 29,000.0 ksi

**Applied Loads**

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.010, L = 0.10, S = 0.020 ksf, Tributary Width = 1.080 ft

DESIGN SUMMARY**Design OK**

Maximum Bending Stress Ratio =		0.238 : 1	Maximum Shear Stress Ratio =		0.051 : 1
Section used for this span		HSS4x2x3/16	Section used for this span		HSS4x2x3/16
Ma : Applied		0.781 k-ft	Va : Applied		0.4307 k
Mn / Omega : Allowable		3.282 k-ft	Vn/Omega : Allowable		8.501 k
Load Combination		+D+L	Load Combination		+D+L
Span # where maximum occurs		Span # 1	Location of maximum on span		0.000 ft
Span # where maximum occurs		Span # 1	Span # where maximum occurs		Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.190 in	Ratio =	456	>=360
Max Upward Transient Deflection		0 in	Ratio =	0	<360
Max Downward Total Deflection		0.210 in	Ratio =	415	>=240.
Max Upward Total Deflection		0 in	Ratio =	0	<240.0
					Span: 1 : L Only
					n/a
					Span: 1 : +D+L
					n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mny	Mny/Omega	Cb	Rm	Va Max	Vny	Vny/Omega
D Only													
Dsgn. L = 7.25 ft	1	0.022	0.005	0.07		0.07	5.48	3.28	1.14	1.00	0.04	14.20	8.50
+D+L													
Dsgn. L = 7.25 ft	1	0.238	0.051	0.78		0.78	5.48	3.28	1.14	1.00	0.43	14.20	8.50
+D+0.70S													
Dsgn. L = 7.25 ft	1	0.052	0.011	0.17		0.17	5.48	3.28	1.14	1.00	0.09	14.20	8.50
+D+0.750L													
Dsgn. L = 7.25 ft	1	0.184	0.039	0.60		0.60	5.48	3.28	1.14	1.00	0.33	14.20	8.50
+D+0.750L+0.5250S													
Dsgn. L = 7.25 ft	1	0.206	0.044	0.68		0.68	5.48	3.28	1.14	1.00	0.37	14.20	8.50
+0.60D													
Dsgn. L = 7.25 ft	1	0.013	0.003	0.04		0.04	5.48	3.28	1.14	1.00	0.02	14.20	8.50
+D+0.750L+0.10S													
Dsgn. L = 7.25 ft	1	0.188	0.040	0.62		0.62	5.48	3.28	1.14	1.00	0.34	14.20	8.50

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.2097	3.646		0.0000	0.000

Vertical Reactions

Support notation : Far left is #:

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.431	0.431
Max Upward from Load Combinations	0.431	0.431
Max Upward from Load Cases	0.392	0.392

Steel Beam

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: 2X4 STL TUBE**Vertical Reactions**

Support notation : Far left is #:

Values in KIPS

Load Combination	Support 1	Support 2
D Only	0.039	0.039
+D+L	0.431	0.431
+D+0.70S	0.094	0.094
+D+0.750L	0.333	0.333
+D+0.750L+0.5250S	0.374	0.374
+0.60D	0.023	0.023
+D+0.750L+0.10S	0.341	0.341
L Only	0.392	0.392
S Only	0.078	0.078

2D Frame

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: SHADE STRUCTURE**Joints...**

Joint Label	Joint Coordinates		X Translational Restraint	Y Translational Restraint	Z Rotational Restraint	Joint Temp deg F
	X ft	Y ft				
1	0.0	0.0				0
2	0.0	8.250	Unrestrained	Unrestrained	Unrestrained	0
3	0.0	10.160	Unrestrained	Unrestrained	Unrestrained	0
4	-2.830	11.080	Unrestrained	Unrestrained	Unrestrained	0
5	-7.250	12.50	Unrestrained	Unrestrained	Unrestrained	0
6	1.420	9.670	Unrestrained	Unrestrained	Unrestrained	0
7	2.670	9.250	Unrestrained	Unrestrained	Unrestrained	0

Members...

Member Label	Property Label	Endpoint Joints		Member Length ft	Releases Specify Connectivity of Member Ends to Joints					
		I Joint	J Joint		I End			J End		
					x	y	z (rotation)	x	y	z (rotation)
A	COL	1	2	8.250	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased
B	COL	2	3	1.910	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased
C	BM	4	5	4.642	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased
D	BM	4	3	2.976	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased
E	BM	3	6	1.502	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased
F	BM	6	7	1.319	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased
G	KICKER	2	4	4.002	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased
H	KICKER	2	6	2.008	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased

Member Stress Check Data...

Member Label	Unbraced Lengths		Slenderness Factors		AISC Bending & Stability Factors	
	Lu : z ft	Lu : y	K : z	K : y	Cm	Cb
A	8.250	8.250	1.00	1.00	1.000	1.000
B	1.910	1.910	1.00	1.00	1.000	1.000
C	4.642	4.642	1.00	1.00	1.000	1.000
D	2.976	2.976	1.00	1.00	1.000	1.000
E	1.502	1.502	1.00	1.00	1.000	1.000
F	1.319	1.319	1.00	1.00	1.000	1.000
G	4.002	4.002	1.00	1.00	1.000	1.000
H	2.008	2.008	1.00	1.00	1.000	1.000

Materials...

Member Label	Youngs ksi	Density kcf	Thermal in/deg	Yield ksi
Default	1.00	0.000	0.000000	1.00
Steel	29,000.00	0.490	0.000007	46.00
Wood	1,800.00	0.035	0.000000	0.00

Wood Material Data...

Wood, Not Defined, Density= 35.0pcf, FbT= 1000psi, FbC= 1000psi, Fv= 1000psi, Ft= 1000, Fc= 400psi, E Bend XX= 1800ksi, E BendMin XX= 1800ksi, E Beny YY= 1800ksi, E BendMin YY= 1800ksi, E Axial= 1800ksi, Species= , Grade= Any, Class=

Member Sections...

Prop Label	Group Tag	Material	Area	Depth	Width	Ixx	Iyy
Default	Group	Default	1.0 in^2	0.0 in	0.0 in	1.0 in^4	1.0 in^4
HSS6x4x3/16	KICKER	Steel	3.280 in^2	6.0 in	4.0 in	16.40 in^4	8.760 in^4
HSS6x6x1/2	COL	Steel	9.740 in^2	6.0 in	6.0 in	48.30 in^4	48.30 in^4
HSS6x6x1/4	BM	Steel	5.240 in^2	6.0 in	6.0 in	28.60 in^4	28.60 in^4

Joint Loads....

Note: Loads labeled "Global Y" act downward (in "-Y" direction)

Joint Label	Load Direction	Load Magnitude						
		Dead	Roof Live	Live	Snow	Seismic	Wind	Earth
3	Global X					1.50	0.670	k

2D Frame

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: SHADE STRUCTURE**Member Distributed Loads....**

Note: Loads labeled "Global Y" act downward (in "-Y" direction)

Member Label	Load Direction	Load Extents		Load Magnitude					
		Start	ft	Dead	Roof Live	Live	Snow	Seismic	Wind
C	Global Y	0.0	Start Mag :	0.1450	0.1450		0.1380		
		4.643	End Mag :	0.1450	0.1450		0.1380		k/ft
D	Global Y	0.0	Start Mag :	0.1450	0.1450		0.1380		k/ft
		2.976	End Mag :	0.1450	0.1450		0.1380		k/ft
E	Global Y	0.0	Start Mag :	0.1450	0.1450		0.1380		k/ft
		1.502	End Mag :	0.1450	0.1450		0.1380		k/ft
F	Global Y	0.0	Start Mag :	0.1450	0.1450		0.1380		k/ft
		1.319	End Mag :	0.1450	0.1450		0.1380		k/ft

Stress/Strength Load Combinations

ASCE 7-16

Load Combination Description	Cd	Load Combination Factors								
		Dead	0.2*Sds* Seismic	Roof Live	Live	Snow	Wind	Seismic	Rho	Earth
+D+H	0.9	1.0								1.0
+D+L+H	1	1.0			1.0					1.0
+D+Lr+H	1.25	1.0		1.0						1.0
+D+S+H	1.15	1.0				1.0				1.0
+D+0.750Lr+0.750L+H	1.25	1.0		0.750	0.750					1.0
+D+0.750L+0.750S+H	1.15	1.0			0.750	0.750				1.0
+D+0.60W+H	1.6	1.0					0.60			1.0
+D+0.750Lr+0.750L+0.450W+H	1.6	1.0		0.750	0.750		0.450			1.0
+D+0.750L+0.750S+0.450W+H	1.6	1.0			0.750	0.750	0.450			1.0
+0.60D+0.60W+0.60H	1.6	0.60					0.60			0.60
+D+0.8750E+0.60H	0.9	1.0						0.8750	1.250	0.60
+D+0.750L+0.750S+0.6563E+H	1.15	1.0			0.750	0.750		0.6563	1.250	1.0
+0.60D+0.8750E+H	0.9	0.60						0.8750	1.250	1.0

Reaction Load Combinations

ASCE 7-16

Load Combination Description	Load Combination Factors						
	Dead	Roof Live	Live	Snow	Wind	Seismic	Earth
+D+H	1.0						1.0
+D+L+H	1.0		1.0				1.0
+D+Lr+H	1.0	1.0					1.0
+D+S+H	1.0			1.0			1.0
+D+0.750Lr+0.750L+H	1.0	0.750	0.750				1.0
+D+0.750L+0.750S+H	1.0		0.750	0.750			1.0
+D+0.60W+H	1.0				0.60		1.0
+D+0.750Lr+0.750L+0.450W+H	1.0	0.750	0.750		0.450		1.0
+D+0.750L+0.750S+0.450W+H	1.0		0.750	0.750	0.450		1.0
+0.60D+0.60W+0.60H	0.60				0.60		0.60
+D+0.70E+0.60H	1.0					0.70	0.60
+D+0.750L+0.750S+0.5250E+H	1.0		0.750	0.750		0.5250	1.0
+0.60D+0.70E+H	0.60					0.70	1.0
D Only	1.0						
Lr Only		1.0					
L Only			1.0				
S Only				1.0			
W Only					1.0		
E Only						1.0	
H Only							1.0

Deflection Load Combinations

ASCE 7-16

Load Combination Description	Load Combination Factors						
	Dead	Roof Live	Live	Snow	Wind	Seismic	Earth
+D+H	1.0						1.0
+D+L+H	1.0		1.0				1.0
+D+Lr+H	1.0	1.0					1.0
+D+S+H	1.0			1.0			1.0
+D+0.750Lr+0.750L+H	1.0	0.750	0.750				1.0
+D+0.750L+0.750S+H	1.0		0.750	0.750			1.0

2D Frame

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: SHADE STRUCTURE**Deflection Load Combinations****ASCE 7-16**

Load Combination Description	Load Combination Factors						
	Dead	Roof Live	Live	Snow	Wind	Seismic	Earth
+D+0.60W+H	1.0				0.60		1.0
+D+0.750Lr+0.750L+0.450W+H	1.0	0.750	0.750		0.450		1.0
+D+0.750L+0.750S+0.450W+H	1.0		0.750	0.750	0.450		1.0
+0.60D+0.60W+0.60H	0.60				0.60		0.60
+D+0.70E+0.60H	1.0					0.70	0.60
+D+0.750L+0.750S+0.5250E+H	1.0		0.750	0.750		0.5250	1.0
+0.60D+0.70E+H	0.60					0.70	1.0
D Only	1.0						
Lr Only		1.0					
L Only			1.0				
S Only				1.0			
W Only					1.0		
E Only						1.0	
H Only							1.0

Extreme Joint Displacements

Only Load Combinations giving maximum values are listed

Joint Label	Joint Displacements		
	X in	Y in	Z Radians
1 Max	0.0 E Only	0.0 +0.60D+0.60W	0.0 +D+Lr
1 Min	0.0 +D+0.750Lr+0.450W	0.0 +D+Lr	0.0 E Only
2 Max	0.4666 E Only	-0.000318 +0.60D+0.60W	0.005865 +D+Lr
2 Min	-0.2903 +D+Lr	-0.001061 +D+Lr	-0.007678 E Only
3 Max	0.6455 E Only	.0000250 E Only	0.006259 +D+Lr
3 Min	-0.4318 +D+Lr	-0.001036 +D+Lr	-0.007834 E Only
4 Max	0.7316 E Only	0.2651 E Only	0.006794 +D+Lr
4 Min	-0.5036 +D+Lr	-0.2184 +D+Lr	-0.007804 E Only
5 Max	0.8646 E Only	0.6790 E Only	0.007593 +D+Lr
5 Min	-0.6295 +D+Lr	-0.6106 +D+Lr	-0.007804 E Only
6 Max	0.5995 E Only	0.1041 +D+Lr	0.006153 +D+Lr
6 Min	-0.3954 +D+Lr	-0.1330 E Only	-0.007807 E Only
7 Max	0.5602 E Only	0.1962 +D+Lr	0.006135 +D+Lr
7 Min	-0.3645 +D+Lr	-0.2501 E Only	-0.007807 E Only

Extreme Joint Reactions

Only Load Combinations giving maximum values are listed

Joint Label	Joint Reactions		
	X k	Y k	Z k-ft
1 Max	0.0 S Only	3.027 +D+Lr	15.240 E Only
1 Min	-1.50 E Only	0.0 W Only	-6.915 +D+Lr
2 Max			

2D Frame

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: SHADE STRUCTURE**Extreme Joint Reactions**

Only Load Combinations giving maximum values are listed

Joint Label	Joint Reactions		
	X k	Y k	Z k-ft
3 Min			
3 Max			
4 Min			
4 Max			
5 Min			
5 Max			
6 Min			
6 Max			
7 Min			
7 Max			
Min			

Extreme Member End Forces

Only Load Combinations giving maximum values are listed

Member Label	Member " I " End Forces			Member " J " End Forces		
	Axial k	Shear k	Moment k-ft	Axial k	Shear k	Moment k-ft
A	3.027	1.313	11.260	-0.9082	0.0	6.915
Max	+D+Lr	+D+0.8750E	+0.60D+0.8750E	+0.60D+0.60W	D Only	+D+Lr
A	0.9082	0.0	-6.915	-3.027	-1.313	-0.4323
Min	+0.60D+0.60W	D Only	+D+Lr	+D+Lr	+D+0.8750E	+0.60D+0.8750E
B	-0.1566	0.2397	0.3213	0.4720	3.539	0.1365
Max	D Only	+0.60D+0.8750E	+0.60D+0.8750E	+D+0.750S+0.6563E	+D+Lr	+0.60D+0.8750E
B	-0.4720	-3.539	-5.385	0.1566	-0.2397	-1.375
Min	+D+0.750S+0.6563E	+D+Lr	+D+Lr	D Only	+0.60D+0.8750E	+D+Lr
C	0.4118	-0.3845	-0.8926	0.0	0.0	0.0
Max	+D+Lr	+0.60D+0.60W	+0.60D+0.8750E	+D+0.750S+0.450W	+D+0.750S+0.450W	+D+Lr
C	0.1235	-1.282	-2.975	0.0	0.0	0.0
Min	+0.60D+0.60W	+D+Lr	+D+Lr	+D+0.8750E	+D+S	+0.60D+0.8750E
D	-1.364	1.320	2.592	4.393	-0.05061	0.1138
Max	+0.60D+0.8750E	+D+Lr	+D+Lr	+D+Lr	+0.60D+0.8750E	+D+Lr
D	-4.660	0.2968	0.6803	1.284	-0.4990	-0.1634
Min	+D+Lr	+0.60D+0.8750E	+0.60D+0.8750E	+0.60D+0.8750E	+D+Lr	+0.60D+0.8750E
E	-0.1514	1.278	1.261	0.8112	0.09143	0.3495
Max	+0.60D+0.8750E	+D+Lr	+D+Lr	+D+Lr	+0.60D+0.8750E	+D+Lr
E	-0.9533	0.03211	0.02690	0.1088	-0.8665	-0.07145
Min	+D+Lr	+0.60D+0.8750E	+0.60D+0.8750E	+0.60D+0.8750E	+D+Lr	+0.60D+0.8750E
F	-0.03654	0.3625	0.2390	0.0	0.0	0.0
Max	+0.60D+0.8750E	+D+Lr	+D+Lr	+D+0.750Lr	+D+S	+D+S
F	-0.1218	0.1088	0.07170	0.0	0.0	0.0
Min	+D+Lr	+0.60D+0.60W	+0.60D+0.60W	+D+0.750S+0.450W	+0.60D+0.8750E	+D+0.8750E
G	5.703	0.06903	0.06397	-1.636	0.01313	0.4013
Max	+D+Lr	+0.60D+0.8750E	+0.60D+0.8750E	+0.60D+0.8750E	+D+Lr	+D+0.750S+0.6563E
G	1.636	-0.01313	-0.4357	-5.703	-0.06903	0.1448
Min	+0.60D+0.8750E	+D+Lr	+D+Lr	+D+Lr	+0.60D+0.8750E	+0.60D+0.60W
H	0.2110	0.02331	0.04707	0.1536	0.8383	-0.000255
Max	+0.60D+0.8750E	+0.60D+0.8750E	+0.60D+0.8750E	+D+Lr	+D+Lr	+0.60D+0.8750E

2D Frame

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: SHADE STRUCTURE**Extreme Member End Forces**

Only Load Combinations giving maximum values are listed

Member Label	Member " I " End Forces			Member " J " End Forces		
	Axial k	Shear k	Moment k-ft	Axial k	Shear k	Moment k-ft
H	-0.1536	-0.8383	-1.095	-0.2110	-0.02331	-0.5885
Min	+D+Lr	+D+Lr	+D+Lr	+0.60D+0.8750E	+0.60D+0.8750E	+D+Lr

Extreme Member Forces

Only Load Combinations giving maximum values are listed

Mmbr Label	Member " I " End Forces		Member " J " End Forces		Member " K " End Forces	
	Axial	Dist from "I" Joint	Axial	Dist from "I" Joint	Axial	Dist from "I" Joint
A	-0.9082k	0.0 ft	11.260 k-ft	0.0 ft	1.313 k	0.0 ft
Max	+0.60D+0.60W		+0.60D+0.8750E		+D+0.8750E	
A	-3.027k	0.0 ft	-6.915 k-ft	8.250 ft	0.3015 k	0.0 ft
Min	+D+Lr		+D+Lr		+D+0.750Lr+0.450W	
B	0.4720k	0.0 ft	1.375 k-ft	1.910 ft	0.2397 k	0.0 ft
Max	+D+0.750S+0.6563E		+D+Lr		+0.60D+0.8750E	
B	0.1566k	0.0 ft	-5.385 k-ft	0.0 ft	-3.539 k	0.0 ft
Min	D Only		+D+Lr		+D+Lr	
C	-0.002521k	4.548 ft	-0.000372 k-ft	4.548 ft	-0.007848 k	4.548 ft
Max	+0.60D+0.60W		+0.60D+0.8750E		+0.60D+0.60W	
C	-0.4118k	0.0 ft	-2.975 k-ft	0.0 ft	-1.282 k	0.0 ft
Min	+D+Lr		+D+Lr		+D+Lr	
D	4.660k	0.0 ft	2.592 k-ft	0.0 ft	1.320 k	0.0 ft
Max	+D+Lr		+D+Lr		+D+Lr	
D	1.284k	2.976 ft	-0.1138 k-ft	2.976 ft	0.05061 k	2.976 ft
Min	+0.60D+0.8750E		+D+Lr		+0.60D+0.8750E	
E	0.9533k	0.0 ft	1.261 k-ft	0.0 ft	1.278 k	0.0 ft
Max	+D+Lr		+D+Lr		+D+Lr	
E	0.1088k	1.502 ft	-0.3495 k-ft	1.502 ft	-0.09143 k	1.502 ft
Min	+0.60D+0.8750E		+D+Lr		+0.60D+0.8750E	
F	0.1218k	0.0 ft	0.2390 k-ft	0.0 ft	0.3625 k	0.0 ft
Max	+D+Lr		+D+Lr		+D+Lr	
F	0.000746k	1.292 ft	0.000119 k-ft	1.265 ft	0.002219 k	1.292 ft
Min	+0.60D+0.8750E		+0.60D+0.8750E		+0.60D+0.60W	
G	-1.636k	0.0 ft	0.06397 k-ft	0.0 ft	0.06903 k	0.0 ft
Max	+0.60D+0.8750E		+0.60D+0.8750E		+0.60D+0.8750E	
G	-5.703k	0.0 ft	-0.4357 k-ft	0.0 ft	-0.01313 k	0.0 ft
Min	+D+Lr		+D+Lr		+D+Lr	
H	0.1536k	0.0 ft	0.5885 k-ft	2.008 ft	0.02331 k	0.0 ft
Max	+D+Lr		+D+Lr		+0.60D+0.8750E	
H	-0.2110k	0.0 ft	-1.095 k-ft	0.0 ft	-0.8383 k	0.0 ft
Min	+0.60D+0.8750E		+D+Lr		+D+Lr	

Member Stress Checks...

Stress Checks per AISC 360-16 & NDS 2018

Member Label	Section Label	Material	Max. Axial + Bending Stress Ratios				Max. Shear Stress Ratios			
			Load Combination	Ratio	Status	Dist (ft)	Load Combination	Ratio	Status	Dist (ft)
A	COL	Steel	+0.60D+0.8750E	0.250	PASS	0.00	+D+0.8750E	0.019	PASS	0.00
B	COL	Steel	+D+Lr	0.119	PASS	0.00	+D+Lr	0.050	PASS	0.00
C	BM	Steel	+D+Lr	0.117	PASS	0.00	+D+Lr	0.031	PASS	0.00
D	BM	Steel	+D+Lr	0.117	PASS	0.00	+D+Lr	0.032	PASS	0.00
E	BM	Steel	+D+Lr	0.052	PASS	0.00	+D+Lr	0.031	PASS	0.00
F	BM	Steel	+D+Lr	0.010	PASS	0.00	+D+Lr	0.009	PASS	0.00
G	KICKER	Steel	+D+Lr	0.074	PASS	0.00	+0.60D+0.8750E	0.003	PASS	0.00
H	KICKER	Steel	+D+Lr	0.102	PASS	0.00	+D+Lr	0.042	PASS	0.00

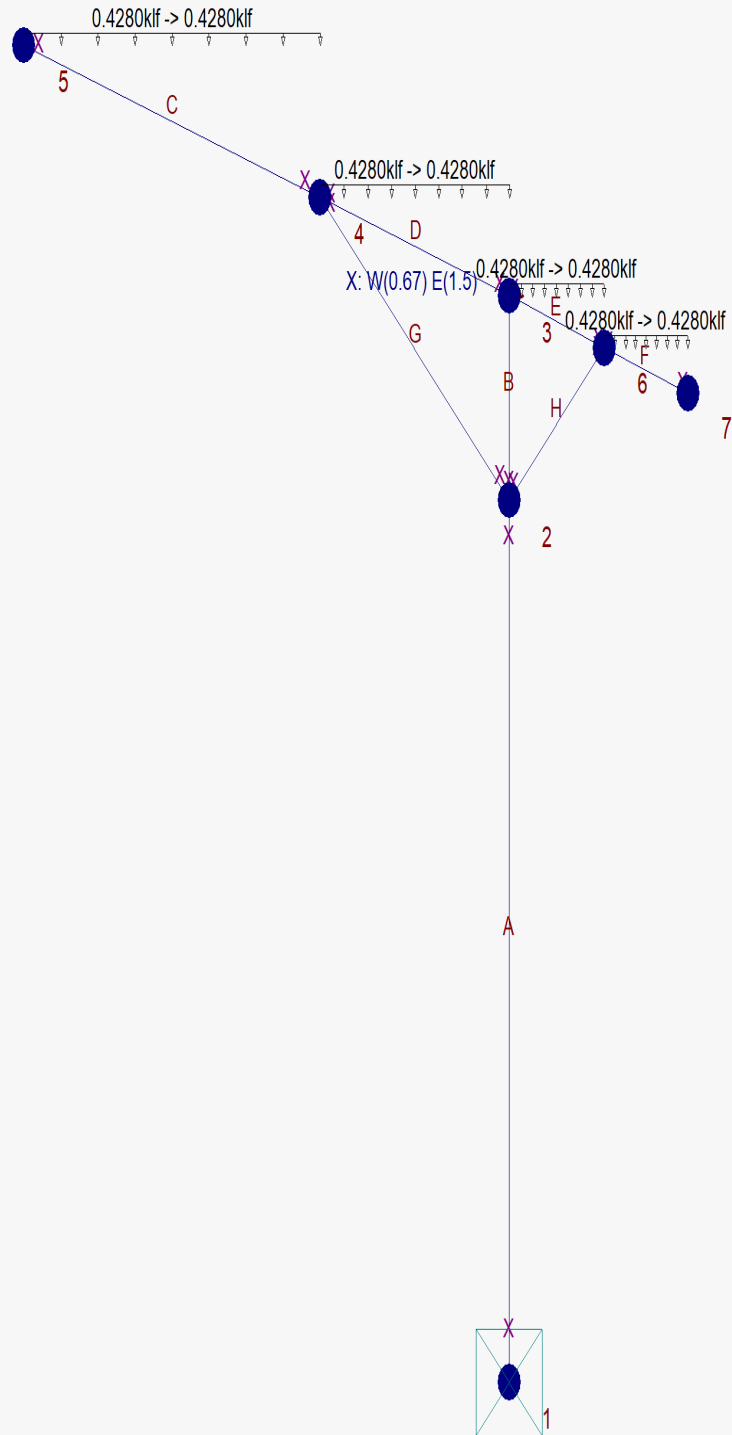
2D Frame

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

(c) ENERCALC, LLC 1982-2024

DESCRIPTION: SHADE STRUCTURE



Anchor Designer™
Software
 Version 3.2.2311.2

Company:		Date:	2/22/2023
Engineer:		Page:	1/7
Project:			
Address:			
Phone:			
E-mail:			

1. Project information

Project description: SHADE ANCHORAGE
 Location: SHADE ANCHORAGE
 Fastening description: SHADE ANCHORAGE

2. Input Data & Anchor Parameters

General

Design method: ACI 318-19
 Units: Imperial units

Anchor Information:

Anchor type: Cast-in-place
 Material: F1554 Grade 36
 Diameter (inch): 1.000
 Effective Embedment depth, h_{ef} (inch): 24.000
 Anchor category: -
 Anchor ductility: Yes
 h_{min} (inch): 25.75
 C_{min} (inch): 6.00
 S_{min} (inch): 6.00

Base Material

Concrete: Normal-weight
 Concrete thickness, h (inch): 48.00
 State: Cracked
 Compressive strength, f'_c (psi): 2500
 $\Psi_{c,v}$: 1.0
 Reinforcement condition: Supplementary reinforcement not present
 Supplemental edge reinforcement: Not applicable
 Reinforcement provided at corners: No
 Ignore concrete breakout in tension: No
 Ignore concrete breakout in shear: No
 Ignore 6do requirement: No
 Build-up grout pad: Yes

Base Plate

Length x Width x Thickness (inch): 12.00 x 12.00 x 0.25
 Yield stress: 36000 psi

Profile type/size: HSS6X6X1/4

Recommended Anchor

Anchor Name: Heavy Hex Bolt - 1"Ø Heavy Hex Bolt, F1554 Gr. 36



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Phone:			
E-mail:			

Load and Geometry

Load factor source: ACI 318 Section 5.3

Load combination: $U = 0.9D + 1.0E$

Seismic design: Yes

Anchors subjected to sustained tension: Not applicable

Ductility section for tension: 17.10.5.3 (d) is satisfied

Ductility section for shear: 17.10.6.3 (c) is satisfied

Ω_0 factor: 1.3

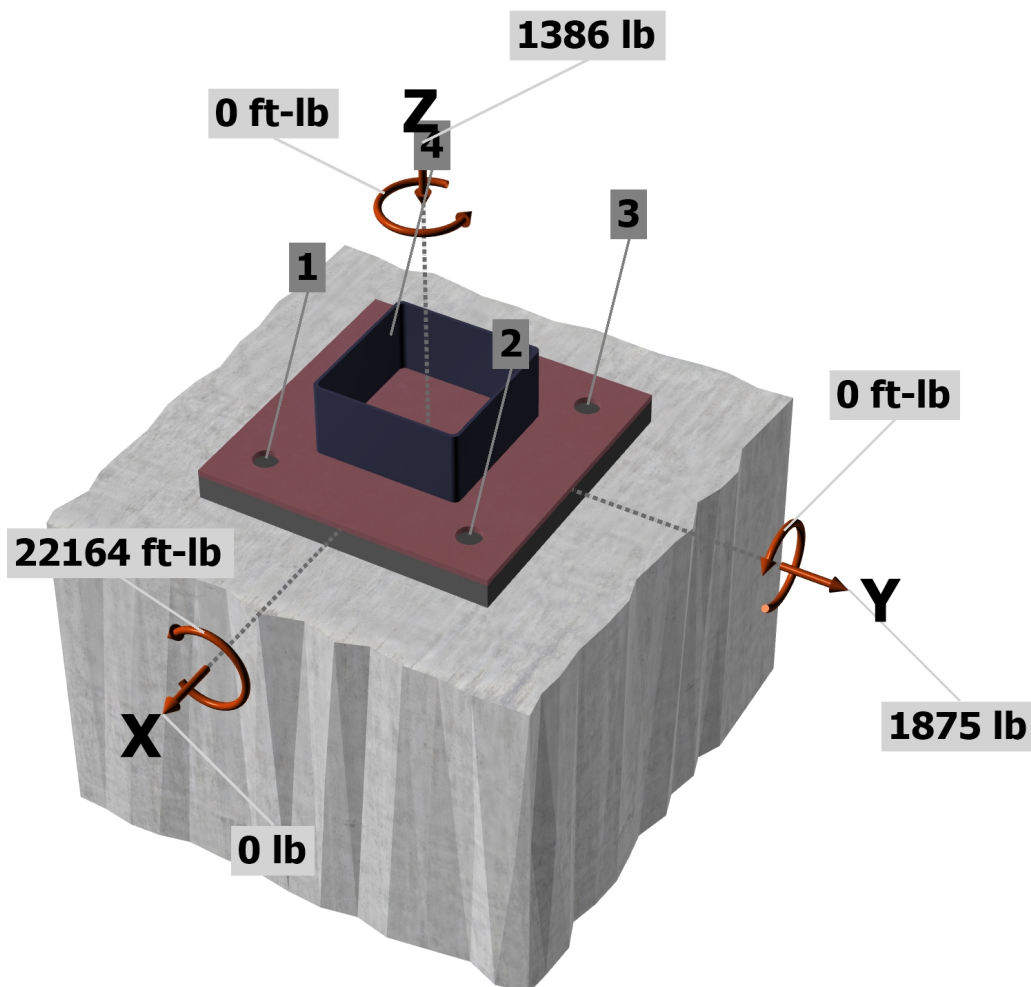
Apply entire shear load at front row: No

Anchors only resisting wind and/or seismic loads: No

Service level loads:

	D	E	Strength level loads
N_a [lb]:	-1540	0	-1386
V_{ax} [lb]:	0	0	0
V_{ay} [lb]:	0	1500	1875
M_x [ft-lb]:	3460	15240	22164
M_y [ft-lb]:	0	0	0
M_z [ft-lb]:	0	0	0

<Figure 1>

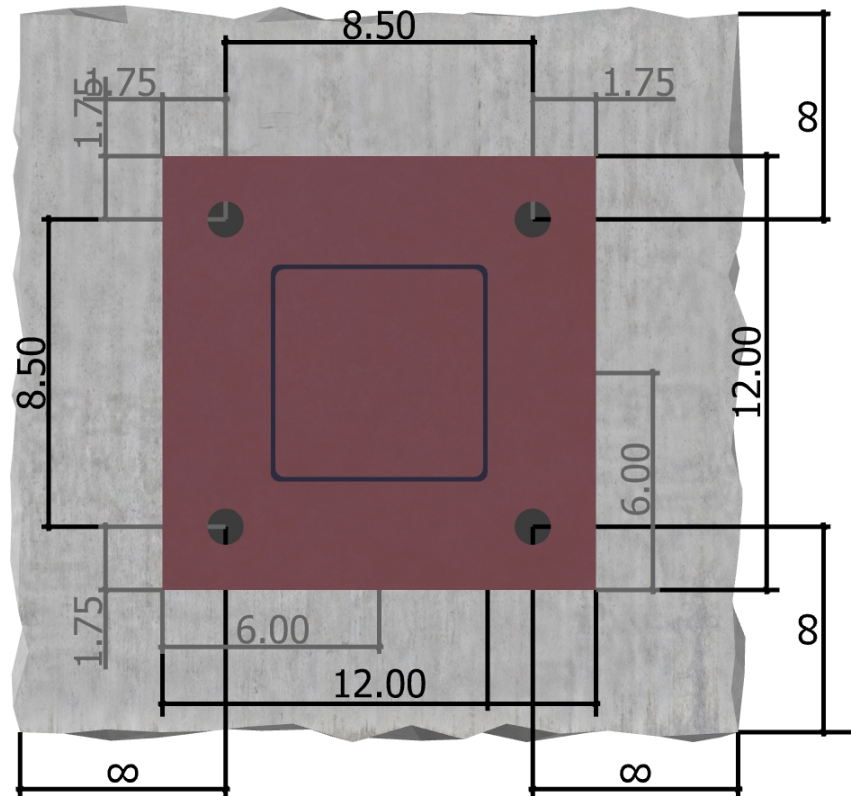




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<Figure 2>



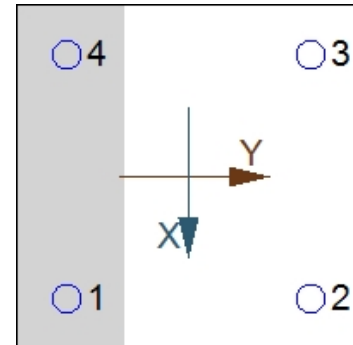
Company:		Date:	2/22/2023
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3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2 + (V_{uay})^2}$ (lb)
1	0.0	0.0	468.8	468.8
2	14406.2	0.0	468.8	468.8
3	14406.2	0.0	468.8	468.8
4	0.0	0.0	468.8	468.8
Sum	28812.4	0.0	1875.0	1875.0

Maximum concrete compression strain (%): 0.31
 Maximum concrete compression stress (psi): 1344
 Resultant tension force (lb): 28812
 Resultant compression force (lb): 30198
 Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
 Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
 Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
 Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



4. Steel Strength of Anchor in Tension (Sec. 17.6.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
35150	0.75	26363

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.6.2)

$$N_b = 16\lambda_a \sqrt{f_c} h_{ef}^{5/3} \text{ (Eq. 17.6.2.2.1)}$$

λ_a	f_c (psi)	h_{ef} (in)	N_b (lb)
1.00	2500	24.000	159750

$$0.75\phi N_{cbg} = 0.75\phi (A_{Nc} / A_{Nco}) \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b \text{ (Sec. 17.5.1.2 & Eq. 17.6.2.1a)}$$

A_{Nc} (in ²)	A_{Nco} (in ²)	$c_{a,min}$ (in)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	$0.75\phi N_{cbg}$ (lb)
5796.00	5184.00	-	1.000	1.000	1.00	1.000	159750	0.70	93770

6. Pullout Strength of Anchor in Tension (Sec. 17.6.3)

$$0.75\phi N_{pn} = 0.75\phi \Psi_{c,P} N_p = 0.75\phi \Psi_{c,P} 8A_{brg} f_c \text{ (Sec. 17.5.1.2, Eq. 17.6.3.1 & 17.6.3.2.2a)}$$

$\Psi_{c,P}$	A_{brg} (in ²)	f_c (psi)	ϕ	$0.75\phi N_{pn}$ (lb)
1.0	1.50	2500	0.70	15761



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8. Steel Strength of Anchor in Shear (Sec. 17.7.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (lb)
21090	0.8	0.65	10967

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.7.3)

$\phi V_{cp} = \phi k_{cp} N_{cbg} = \phi k_{cp} (A_{Nc} / A_{Nco}) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b$ (Sec. 17.5.1.2 & Eq. 17.7.3.1b)

k_{cp}	A_{Nc} (in ²)	A_{Nco} (in ²)	$\psi_{ec,N}$	$\psi_{ed,N}$	$\psi_{c,N}$	$\psi_{cp,N}$	N_b (lb)	ϕ	ϕV_{cp} (lb)
2.0	6480.25	5184.00	1.000	1.000	1.000	1.000	159750	0.70	279574

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.8)

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status	
Steel	14406	26363	0.55	Pass	
Concrete breakout	28812	93770	0.31	Pass	
Pullout	14406	15761	0.91	Pass (Governs)	
Shear	Factored Load, V_{ua} (lb)	Design Strength, ϕV_n (lb)	Ratio	Status	
Steel	469	10967	0.04	Pass (Governs)	
Pryout	1875	279574	0.01	Pass	
Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. 17.8.1	0.91	0.00	91.4%	1.0	Pass

1"Ø Heavy Hex Bolt, F1554 Gr. 36 with hef = 24.000 inch meets the selected design criteria.

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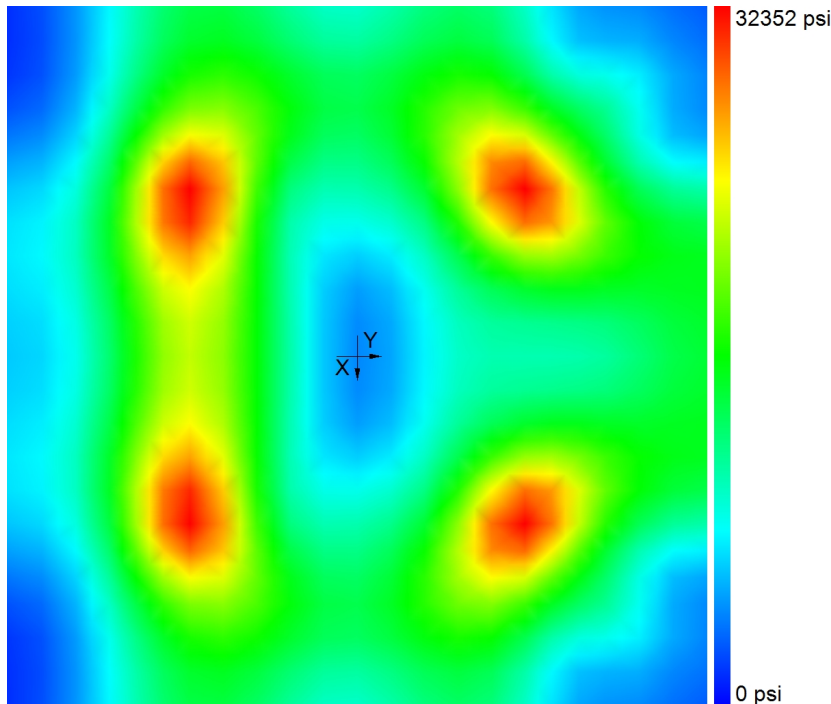
Base Plate Thickness

Required base plate thickness: 0.969 inch

Warning: input base plate thickness does not meet required base plate thickness.

Steel **36000 psi**
 Maximum stress **32352 psi**
 Calculated plate thickness **0.969 inch**

Stress distribution



For ACI and CSA design methods, maximum base plate stress is limited to 0.9 times yield stress.

For ETAG design method, maximum base plate stress is limited to yield stress divide by 1.5.

Plate stress is derived using Von Mises theory.

$$\sigma_{xx} = \frac{F_{xx}}{t} + \frac{6M_{xx}}{t^2} (@ \text{bottom}) \text{ or } \sigma_{xx} = \frac{F_{xx}}{t} - \frac{6M_{xx}}{t^2} (@ \text{top})$$

$$\sigma_{yy} = \frac{F_{yy}}{t} + \frac{6M_{yy}}{t^2} (@ \text{bottom}) \text{ or } \sigma_{yy} = \frac{F_{yy}}{t} - \frac{6M_{yy}}{t^2} (@ \text{top})$$

$$\sigma_{xy} = \frac{F_{xy}}{t} + \frac{6M_{xy}}{t^2} (@ \text{bottom}) \text{ or } \sigma_{xy} = \frac{F_{xy}}{t} - \frac{6M_{xy}}{t^2} (@ \text{top})$$

$$\sigma_{xz} = \frac{V_x}{t}$$

$$\sigma_{yz} = \frac{V_y}{t}$$

$\sigma_{xx}, \sigma_{yy}, \sigma_{xy}$ as follows:

$$S_1 = \frac{\sigma_{xx} + \sigma_{yy}}{2} + \sqrt{\left(\frac{\sigma_{xx} - \sigma_{yy}}{2}\right)^2 + \sigma_{xy}^2}$$

$$S_2 = \frac{\sigma_{xx} + \sigma_{yy}}{2} - \sqrt{\left(\frac{\sigma_{xx} - \sigma_{yy}}{2}\right)^2 + \sigma_{xy}^2}$$

$$S_3 = 0$$

$$\sigma_{\text{Von Mises}} = \sqrt{\frac{(S_1 - S_2)^2 + (S_1 - S_3)^2 + (S_2 - S_3)^2}{2}}$$



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12. Warnings

- Per designer input, ductility requirements for tension have been determined to be satisfied – designer to verify.
- Per designer input, ductility requirements for shear have been determined to be satisfied – designer to verify.
- Designer must exercise own judgement to determine if this design is suitable.

Pole Footing Embedded in Soil

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: P3

Code References

Calculations per IBC 2021 1807.3, SDPWS 2021
 Load Combinations Used : ASCE 7-22 / IBC 2024 (L<=100psf)

General Information

Pole Footing Shape Circular
 Pole Footing Diameter 24.0 in
 Calculate Min. Depth for Allowable Pressures
 No Lateral Restraint at Ground Surface
 Allow Passive 400.0 pcf
 Max Passive 6,000.0 psf

Controlling Values

Governing Load Combination D+0.8750E
 Lateral Load 2.541 k
 Moment 10.165 k-ft

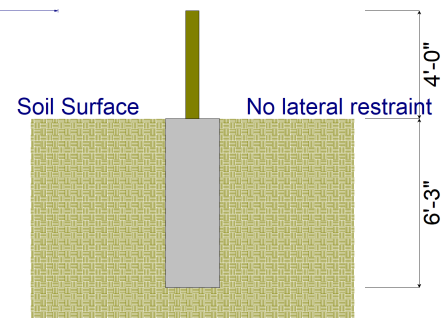
NO Ground Surface Restraint

Pressures at 1/3 Depth
 Actual 821.89 psf
 Allowable 823.04 psf

Minimum Required Depth 6.250 ft

Footing Base Area 3.142 ft²
 Maximum Soil Pressure 2.655 ksf

Point Load



Applied Loads

Lateral Concentrated Load (k)		Lateral Distributed Loads (k/ft)		Vertical Load (k)
D : Dead Load	0.870 k		k/ft	2.920 k
Lr : Roof Live	0.870 k		k/ft	1.540 k
L : Live	k		k/ft	4.350 k
S : Snow	0.820 k		k/ft	2.310 k
W : Wind	2.130 k		k/ft	2.10 k
E : Earthquake	1.910 k		k/ft	k
H : Lateral Earth	k		k/ft	k
Load distance above ground surface	4.0 ft	TOP of Load above ground surface	ft	
		BOTTOM of Load above ground surface	ft	

Load Combination Results

Load Combination	Forces @ Ground Surface		Required Depth - (ft)	Pressure at 1/3 Depth		Soil Increase Factor
	Loads - (k)	Moments - (ft-k)		Actual - (psf)	Allow - (psf)	
D Only	0.870	3.480	4.13	531.3	533.7	1.000
+D+L	0.870	3.480	4.13	531.3	533.7	1.000
+D+Lr	1.740	6.960	5.38	703.2	704.5	1.000
+D+0.70S	1.444	5.776	5.00	650.7	653.9	1.000
+D+0.750Lr+0.750L	1.523	6.090	5.13	665.4	667.7	1.000
+D+0.750L+0.5250S	1.301	5.202	4.75	625.3	625.8	1.000
+D+0.60W	2.148	8.592	5.88	766.4	768.2	1.000
+D+0.750Lr+0.750L+0.450W	2.481	9.924	6.13	814.1	814.7	1.000
+D+0.750L+0.5250S+0.450W	2.259	9.036	6.00	782.6	784.2	1.000

Pole Footing Embedded in Soil

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

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DESCRIPTION: P3

+0.60D+0.60W	1.800	7.200	5.38	713.5	714.0	1.000
+D+0.8750E	2.541	10.165	6.25	821.9	823.0	1.000
+D+0.750L+0.10S+0.6563E	2.205	8.822	5.88	774.6	776.6	1.000
+0.60D+0.8750E	2.193	8.773	5.88	772.6	775.1	1.000



RGSE inc. Structural Engineers

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KIOSK DESIGN

ASCE 7-16 Seismic Base Shear

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

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DESCRIPTION: Seismic Base Shear Analysis

Specific Description: KIOSK BASESHEAR

Risk Category

Calculations per ASCE 7-16

Risk Category of Building or Other Structure : "II" : All Buildings and other structures except those listed as Category I, III, and IV [SCE 7-16, Page 4, Table 1.5-1](#)

Seismic Importance Factor = 1 [ASCE 7-16, Page 5, Table 1.5-2](#)

USER DEFINED Ground Motion

[ASCE 7-16 11.4.2](#)

Max. Ground Motions, 5% Damping

 $S_S = 1.931 \text{ g, 0.2 sec response}$
 $S_1 = 0.6930 \text{ g, 1.0 sec response}$

For the closest datapoint grid location . . .

Latitude = 0.000 deg North

Longitude = 0.000 deg West

Conforms to ASCE 7 Section 12.8.1.3: Regular structure with period of 0.5 s or less, SDS limited to max of 0.7*SDS or 1.0 for calculation

Site Class, Site Coeff. and Design Category

Classification: "D" : Shear Wave Velocity 600 to 1,200 ft/sec = **D** (By Default per 11.4.3) [ASCE 7-16 Table 20.3-1](#)

Site Coefficients F_a & F_v $F_a = 1.20$ [ASCE 7-16 Table 11.4-1 & 11.4-2](#)
 (using straight-line interpolation from table val) $F_v = 1.70$

Maximum Considered Earthquake Accelerat $S_{MS} = F_a * S_s = 2.317$ [ASCE 7-16 Eq. 11.4-1](#)

$S_{M1} = F_v * S_1 = 1.178$ [ASCE 7-16 Eq. 11.4-2](#)

Design Spectral Acceleration $S_{DS} = S_{MS} * 2/3 = 1.545$ [ASCE 7-16 Eq. 11.4-3](#)

$S_{D1} = S_{M1} * 2/3 = 0.785$ [ASCE 7-16 Eq. 11.4-4](#)

Seismic Design Category = **D** [ASCE 7-16 Table 11.6-1 & -2](#)

Resisting System

[ASCE 7-16 Table 12.2-1](#)Basic Seismic Force Resisting System . . . **Cantilevered column systems detailed to conform to specific classification**

2.Steel ordinary cantilever column systems

Response Modification Coefficient " R " = 1.25

System Overstrength Factor " Wo " = 1.25

Deflection Amplification Factor " Cd " = 1.25

Building height Limits :

Category "A & B" Limit: Limit = 35

Category "C" Limit: Limit = 35

Category "D" Limit: Not Permitted ,i

Category "E" Limit: Not Permitted ,i

Category "F" Limit: Not Permitted ,i

NOTE! See ASCE 7-16 for all applicable footnc

Lateral Force Procedure

[ASCE 7-16 Section 12.8.2](#)

Equivalent Lateral Force Procedure

[The "Equivalent Lateral Force Procedure" is being used according to the provisions of ASCE 7-16 12.8](#)

Determine Building Period

[Use ASCE 12.8-7](#)

Structure Type for Building Period CalculaCONCRETE 100% Moment Resisting Frame

" Ct " value = 0.016 " hn " : Height from base to highest level 7.50 ft

" x " value = 0.90

" Ta " Approximate fundamental period using Eq. 12.8-7 : $T_a = C_t * (h_n \wedge x) = 0.098 \text{ sec}$

"TL" : Long-period transition period per ASCE 7-16 Maps 22-14 -> 22-17 8.000 sec

Building Period " Ta " Calculated from Approximate Method sel= 0.098

ASCE 7-16 Seismic Base Shear

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

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DESCRIPTION: Seismic Base Shear Analysis

" Cs " Response Coefficient

ASCE 7-16 Section 12.8.1.1

S_{DS} : Short Period Design Spectral Response	=	1.545	From Eq. 12.8-2, Preliminary C_s	=	0.865
" R " : Response Modification Factor	=	1.25	From Eq. 12.8-3 & 12.8-4 , C_s need not exceed	=	6.405
" I " : Seismic Importance Factor	=	1	From Eq. 12.8-5 & 12.8-6, C_s not be less than	=	0.277

User has selected ASCE 12.8.1.3 : Regular structure, **Cs : Seismic Response Coefficient = 0.8651**
 Less than 5 Stories and with $T \leq 0.5$ sec, SO $S_s \leq 1.5$ for C_s calcul

Seismic Base Shear

ASCE 7-16 Section 12.8.1

$C_s = 0.8651$ from 12.8.1.1	W (see Sum W_i below) =	0.96 k
Seismic Base Shear $V = C_s * W =$		0.83 k

Vertical Distribution of Seismic Forces

ASCE 7-16 Section 12.8.3

" k " : hx exponent based on $T_a = 1.00$

Table of building Weights by Floor Level...

Level #	W_i : Weight	H_i : Height	$(W_i * H_i^k)$	C_{vx}	$F_x = C_{vx} * V$	Sum Story Shear	Sum Story Moment
1	0.96	7.50	7.20	1.0000	0.83	0.83	0.00
Sum $W_i =$	0.96 k	Sum $W_i * H_i =$	7.20 k-ft	Total Base Shear =	0.83 k	Base Moment =	6.2 k-ft

Diaphragm Forces : Seismic Design Category "B" to "F"

ASCE 7-16 12.10.1.1

Level #	W_i	F_i	Sum F_i	Sum W_i	F_{px} : Calcd	F_{px} : Min	F_{px} : Max	F_{px}	Dsgn. Force
1	0.96	0.83	0.83	0.96	0.83	0.30	0.59	0.59	0.83

W_{px} : Weight at level of diaphragm and other structure elements attached to it.

F_i : Design Lateral Force applied at the level.

Sum F_i : Sum of "Lat. Force" of current level plus all levels above

MIN Req'd Force @ Level ... $0.20 * S_{DS} * I * W_{px}$

MAX Req'd Force @ Level ... $0.40 * S_{DS} * I * W_{px}$

F_{px} : Design Force @ Level . $W_{px} * \text{SUM}(x \rightarrow n) F_i / \text{SUM}(x \rightarrow n) w_i$, x = Current level, n = Top Level

Steel Beam

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

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DESCRIPTION: 2x4 stl tube**CODE REFERENCES**

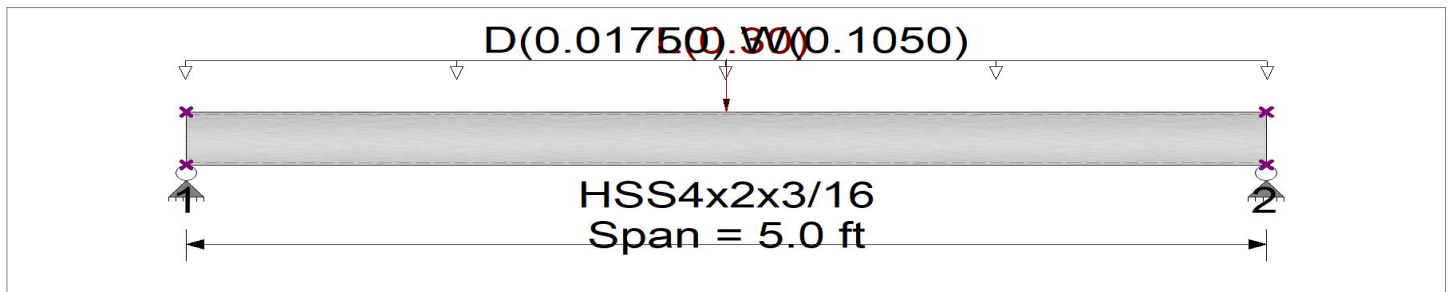
Calculations per AISC 360-16, IBC 2021, SDPWS 2021

Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method : Allowable Strength Design
 Beam Bracing : Completely Unbraced
 Bending Axis : Minor Axis Bending

Fy : Steel Yield : 46.0 ksi
 E: Modulus : 29,000.0 ksi

**Applied Loads**

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.010, W = 0.060 ksf, Tributary Width = 1.750 ft

Point Load : L = 0.30 k @ 2.50 ft

DESIGN SUMMARY**Design OK**

Maximum Bending Stress Ratio =		0.147 : 1		Maximum Shear Stress Ratio =		0.032 : 1	
Section used for this span		HSS4x2x3/16		Section used for this span		HSS4x2x3/16	
Ma : Applied		0.484 k-ft		Va : Applied		0.2744 k	
Mn / Omega : Allowable		3.282 k-ft		Vn/Omega : Allowable		8.501 k	
Load Combination		+D+0.750L+0.450W		Load Combination		+D+0.750L+0.450W	
Span # where maximum occurs		Span # 1		Location of maximum on span		0.000 ft	
Span # where maximum occurs		Span # 1		Span # where maximum occurs		Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.042 in Ratio = 1,431 >=360		Span: 1 : W Only			
Max Upward Transient Deflection		-0.042 in Ratio = 1,431 >=360		Span: 1 : -W			
Max Downward Total Deflection		0.055 in Ratio = 1099 >=240.		Span: 1 : +D+0.750L+0.450W			
Max Upward Total Deflection		-0.021 in Ratio = 2862 >=240.		Span: 1 : +0.60D-0.60W			

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mny	Mny/Omega	Cb	Rm	Va Max	Vny	Vny/Omega
D Only													
Dsgn. L = 5.00 ft	1	0.017	0.005	0.05		0.05	5.48	3.28	1.14	1.00	0.04	14.20	8.50
+D+L													
Dsgn. L = 5.00 ft	1	0.131	0.023	0.43		0.43	5.48	3.28	1.29	1.00	0.19	14.20	8.50
+D+0.750L													
Dsgn. L = 5.00 ft	1	0.102	0.018	0.34		0.34	5.48	3.28	1.28	1.00	0.16	14.20	8.50
+D+0.60W													
Dsgn. L = 5.00 ft	1	0.077	0.024	0.25		0.25	5.48	3.28	1.14	1.00	0.20	14.20	8.50
+D-0.60W													
Dsgn. L = 5.00 ft	1	0.043	0.013		-0.14	0.14	5.48	3.28	1.14	1.00	0.11	14.20	8.50
+D+0.750L+0.450W													
Dsgn. L = 5.00 ft	1	0.147	0.032	0.48		0.48	5.48	3.28	1.23	1.00	0.27	14.20	8.50
+D+0.750L-0.450W													
Dsgn. L = 5.00 ft	1	0.057	0.013	0.19		0.19	5.48	3.28	1.43	1.00	0.11	14.20	8.50
+0.60D+0.60W													
Dsgn. L = 5.00 ft	1	0.070	0.022	0.23		0.23	5.48	3.28	1.14	1.00	0.18	14.20	8.50
+0.60D-0.60W													
Dsgn. L = 5.00 ft	1	0.050	0.015		-0.16	0.16	5.48	3.28	1.14	1.00	0.13	14.20	8.50
+0.60D													
Dsgn. L = 5.00 ft	1	0.010	0.003	0.03		0.03	5.48	3.28	1.14	1.00	0.03	14.20	8.50

Steel Beam

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

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DESCRIPTION: 2x4 stl tube**Overall Maximum Deflections**

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.450W	1	0.0546	2.514		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.274	0.274
Max Upward from Load Combinations	0.274	0.274
Max Upward from Load Cases	0.263	0.263
Max Downward from all Load Conditions (Resis	-0.263	-0.263
Max Downward from Load Combinations (Resis	-0.263	-0.263
D Only	0.044	0.044
+D+L	0.194	0.194
+D+0.750L	0.156	0.156
+D+0.60W	0.201	0.201
+D-0.60W	-0.114	-0.114
+D+0.750L+0.450W	0.274	0.274
+D+0.750L-0.450W	0.038	0.038
+0.60D+0.60W	0.184	0.184
+0.60D-0.60W	-0.131	-0.131
+0.60D	0.026	0.026
L Only	0.150	0.150
W Only	0.263	0.263
-W	-0.263	-0.263

Pole Footing Embedded in Soil

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

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DESCRIPTION: P2

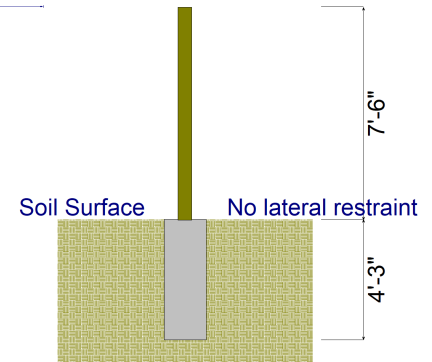
Code References

Calculations per IBC 2021 1807.3, SDPWS 2021
 Load Combinations Used : ASCE 7-22 / IBC 2024 (L<=100psf)

General Information

Pole Footing Shape Circular
 Pole Footing Diameter 18.0 in
 Calculate Min. Depth for Allowable Pressures
 No Lateral Restraint at Ground Surface
 Allow Passive 400.0 pcf
 Max Passive 6,000.0 psf

Point Load



Controlling Values

Governing Load Combination $D+0.750Lr+0.450W$
 Lateral Load 0.5065 k
 Moment 3.799 k-ft

NO Ground Surface Restraint

Pressures at 1/3 Depth
 Actual 557.69 psf
 Allowable 557.95 psf

Minimum Required Depth	4.250 ft
-------------------------------	-----------------

Footing Base Area 1.767 ft²
 Maximum Soil Pressure 1.231 ksf

Applied Loads

Lateral Concentrated Load (k)		Lateral Distributed Loads (k/ft)		Vertical Load (k)
D : Dead Load	0.0970 k		k/ft	0.4180 k
Lr : Roof Live	0.1950 k		k/ft	0.8360 k
L : Live	k		k/ft	k
S : Snow	0.1850 k		k/ft	0.790 k
W : Wind	0.5850 k		k/ft	2.510 k
E : Earthquake	0.270 k		k/ft	k
H : Lateral Earth	k		k/ft	k
Load distance above ground surface	7.50 ft	TOP of Load above ground surface	ft	
		BOTTOM of Load above ground surface	ft	

Load Combination Results

Load Combination	Forces @ Ground Surface		Required Depth - (ft)	Pressure at 1/3 Depth		Soil Increase Factor
	Loads - (k)	Moments - (ft-k)		Actual - (psf)	Allow - (psf)	
D Only	0.097	0.728	2.38	302.7	304.9	1.000
+D+Lr	0.292	2.190	3.50	452.8	455.3	1.000
+D+0.70S	0.227	1.699	3.13	411.9	414.9	1.000
+D+0.750Lr	0.243	1.824	3.25	424.0	425.2	1.000
+D+0.5250S	0.194	1.456	3.00	390.6	391.3	1.000
+D+0.60W	0.448	3.360	4.13	531.1	533.8	1.000
+D+0.750Lr+0.450W	0.507	3.799	4.25	557.7	558.0	1.000
+D+0.5250S+0.450W	0.457	3.430	4.13	536.4	537.2	1.000
+0.60D+0.60W	0.409	3.069	3.88	514.9	515.1	1.000

Pole Footing Embedded in Soil

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

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DESCRIPTION: P2

+D+0.70E	0.286	2.145	3.50	450.3	451.2	1.000
+D+0.10S+0.5250E	0.257	1.929	3.38	432.7	434.1	1.000
+0.60D+0.70E	0.247	1.854	3.25	426.4	427.8	1.000



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1. Project information

Project description: KIOSK ANCHORAGE
 Location: KIOSK ANCHORAGE
 Fastening description: KIOSK ANCHORAGE

2. Input Data & Anchor Parameters

General

Design method: ACI 318-19
 Units: Imperial units

Anchor Information:

Anchor type: Cast-in-place
 Material: F1554 Grade 36
 Diameter (inch): 0.875
 Effective Embedment depth, h_{ef} (inch): 16.000
 Anchor category: -
 Anchor ductility: Yes
 h_{min} (inch): 17.63
 C_{min} (inch): 5.25
 S_{min} (inch): 5.25

Base Material

Concrete: Normal-weight
 Concrete thickness, h (inch): 36.00
 State: Cracked
 Compressive strength, f'_c (psi): 2500
 $\Psi_{c,v}$: 1.0
 Reinforcement condition: Supplementary reinforcement not present
 Supplemental edge reinforcement: Not applicable
 Reinforcement provided at corners: No
 Ignore concrete breakout in tension: No
 Ignore concrete breakout in shear: No
 Ignore 6do requirement: No
 Build-up grout pad: Yes

Base Plate

Length x Width x Thickness (inch): 12.00 x 12.00 x 0.25
 Yield stress: 36000 psi

Profile type/size: HSS6X6X1/4

Recommended Anchor

Anchor Name: Heavy Hex Bolt - 7/8"Ø Heavy Hex Bolt, F1554 Gr. 36



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Load and Geometry

Load factor source: ACI 318 Section 5.3

Load combination: $U = 1.2D + 1.0W + 1.0L + 0.5(L_r \text{ or } S \text{ or } R)$

Seismic design: Yes

Anchors subjected to sustained tension: Not applicable

Ductility section for tension: 17.10.5.2 not applicable

Ductility section for shear: 17.10.6.2 not applicable

Ω_0 factor: not set

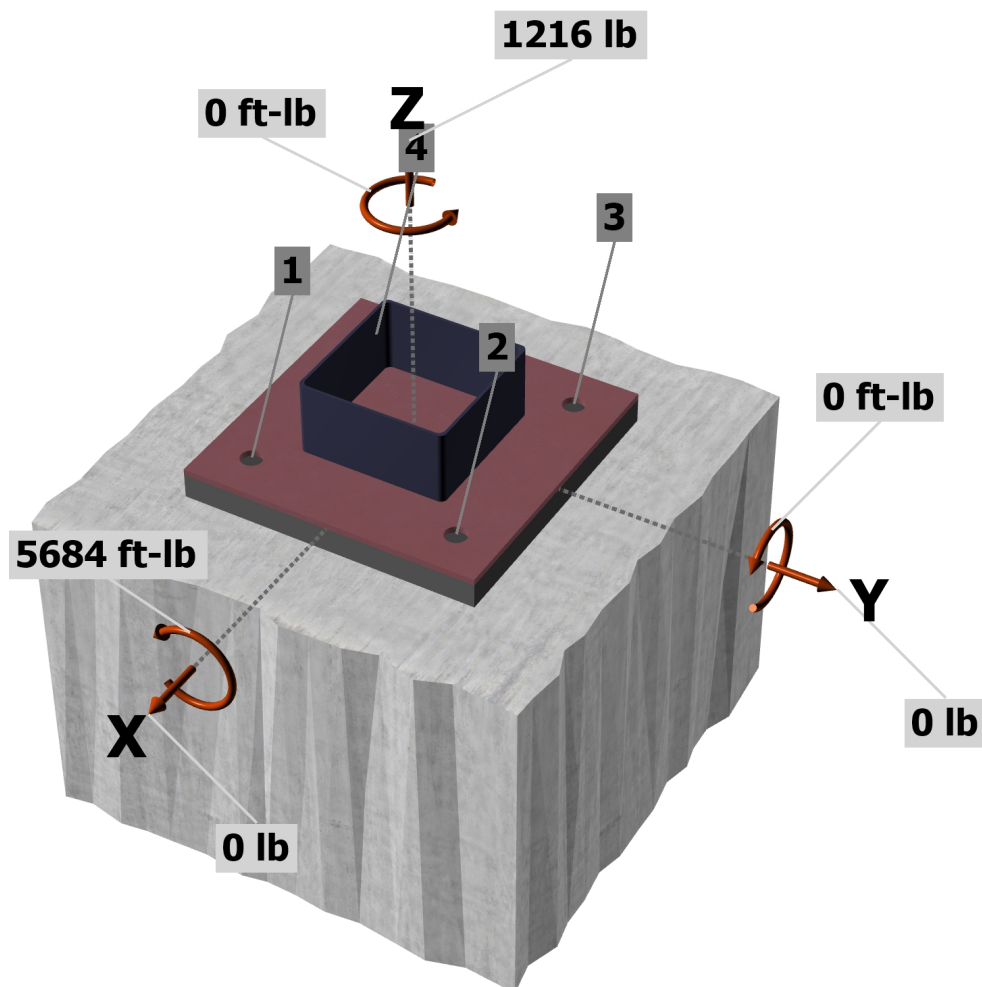
Apply entire shear load at front row: No

Anchors only resisting wind and/or seismic loads: Yes

Service level loads:

	D	W	L	Lr/S/R	Strength level loads
N_a [lb]:	-730	2510	0	-836	1216
V_{ax} [lb]:	0	0	0	0	0
V_{ay} [lb]:	0	0	0	0	0
M_x [ft-lb]:	730	4390	0	836	5684
M_y [ft-lb]:	0	0	0	0	0
M_z [ft-lb]:	0	0	0	0	0

<Figure 1>



Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.

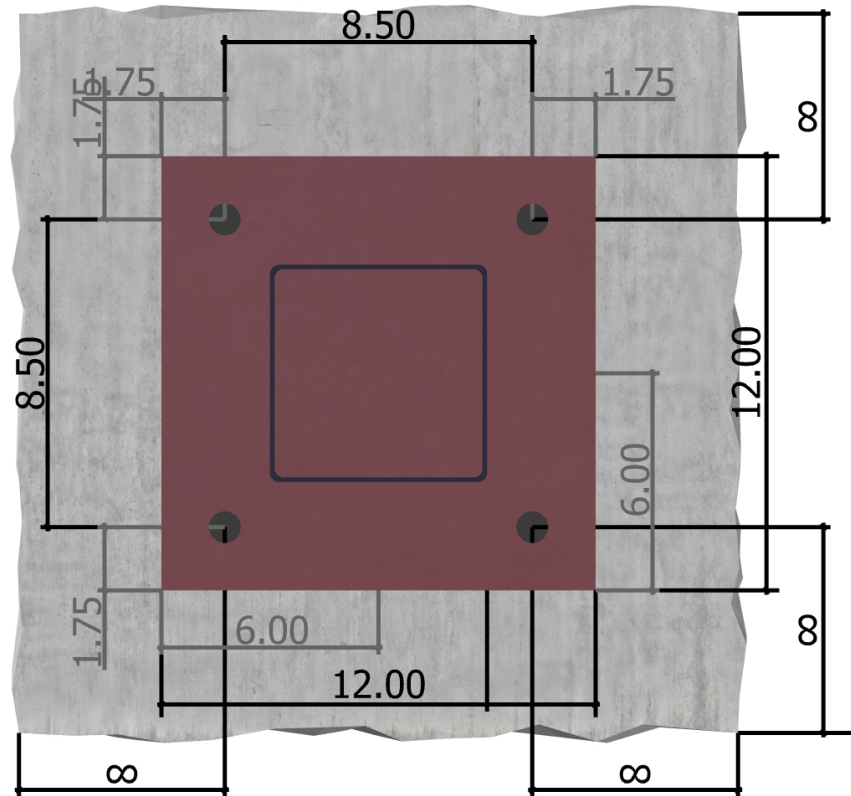
Simpson Strong-Tie Company Inc. 5956 W. Las Positas Boulevard Pleasanton, CA 94588 Phone: 925.560.9000 Fax: 925.847.3871 www.strongtie.com



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<Figure 2>



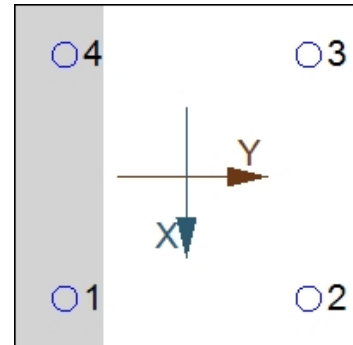
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3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2 + (V_{uay})^2}$ (lb)
1	0.0	0.0	0.0	0.0
2	4026.1	0.0	0.0	0.0
3	4026.1	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
Sum	8052.2	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.08
 Maximum concrete compression stress (psi): 369
 Resultant tension force (lb): 8052
 Resultant compression force (lb): 6836
 Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
 Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00

<Figure 3>



4. Steel Strength of Anchor in Tension (Sec. 17.6.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
26795	0.75	20096

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.6.2)

$$N_b = 16\lambda_a \sqrt{f'_c} h_{ef}^{5/3} \text{ (Eq. 17.6.2.2.1)}$$

λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
1.00	2500	16.000	81275

$$0.75\phi N_{cbg} = 0.75\phi (A_{Nc} / A_{Nco}) \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b \text{ (Sec. 17.5.1.2 & Eq. 17.6.2.1a)}$$

A_{Nc} (in ²)	A_{Nco} (in ²)	$C_{a,min}$ (in)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	$0.75\phi N_{cbg}$ (lb)
2712.00	2304.00	-	1.000	1.000	1.00	1.000	81275	0.70	50225

6. Pullout Strength of Anchor in Tension (Sec. 17.6.3)

$$0.75\phi N_{pn} = 0.75\phi \Psi_{c,P} N_p = 0.75\phi \Psi_{c,P} 8A_{brg} f'_c \text{ (Sec. 17.5.1.2, Eq. 17.6.3.1 & 17.6.3.2.2a)}$$

$\Psi_{c,P}$	A_{brg} (in ²)	f'_c (psi)	ϕ	$0.75\phi N_{pn}$ (lb)
1.0	1.19	2500	0.70	12474



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11. Results

Interaction of Tensile and Shear Forces (Sec. 17.8)

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	4026	20096	0.20	Pass
Concrete breakout	8052	50225	0.16	Pass
Pullout	4026	12474	0.32	Pass (Governs)

7/8"Ø Heavy Hex Bolt, F1554 Gr. 36 with hef = 16.000 inch meets the selected design criteria.

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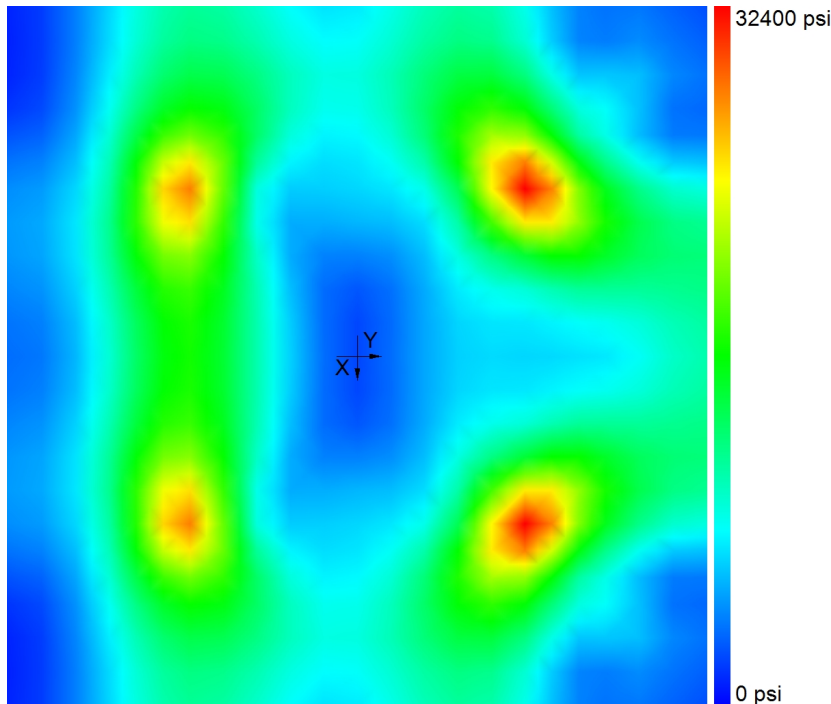
Base Plate Thickness

Required base plate thickness: 0.540 inch

Warning: input base plate thickness does not meet required base plate thickness.

Steel **36000 psi**
 Maximum stress **32400 psi**
 Calculated plate thickness **0.540 inch**

Stress distribution



For ACI and CSA design methods, maximum base plate stress is limited to 0.9 times yield stress.

For ETAG design method, maximum base plate stress is limited to yield stress divide by 1.5.

Plate stress is derived using Von Mises theory.

$$\sigma_{xx} = \frac{F_{xx}}{t} + \frac{6M_{xx}}{t^2} (@ \text{bottom}) \text{ or } \sigma_{xx} = \frac{F_{xx}}{t} - \frac{6M_{xx}}{t^2} (@ \text{top})$$

$$\sigma_{yy} = \frac{F_{yy}}{t} + \frac{6M_{yy}}{t^2} (@ \text{bottom}) \text{ or } \sigma_{yy} = \frac{F_{yy}}{t} - \frac{6M_{yy}}{t^2} (@ \text{top})$$

$$\sigma_{xy} = \frac{F_{xy}}{t} + \frac{6M_{xy}}{t^2} (@ \text{bottom}) \text{ or } \sigma_{xy} = \frac{F_{xy}}{t} - \frac{6M_{xy}}{t^2} (@ \text{top})$$

$$\sigma_x = \frac{V_x}{t}$$

$$\sigma_y = \frac{V_y}{t}$$

$\sigma_{xx}, \sigma_{yy}, \sigma_{xy}$ as follows:

$$S_1 = \frac{\sigma_{xx} + \sigma_{yy}}{2} + \sqrt{\left(\frac{\sigma_{xx} - \sigma_{yy}}{2}\right)^2 + \sigma_{xy}^2}$$

$$S_2 = \frac{\sigma_{xx} + \sigma_{yy}}{2} - \sqrt{\left(\frac{\sigma_{xx} - \sigma_{yy}}{2}\right)^2 + \sigma_{xy}^2}$$

$$S_3 = 0$$

$$\sigma_{\text{Von Mises}} = \sqrt{\frac{(S_1 - S_2)^2 + (S_1 - S_3)^2 + (S_2 - S_3)^2}{2}}$$



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12. Warnings

- Per designer input, the tensile component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor tensile force associated with the same load combination. Therefore the ductility requirements of ACI 318 17.10.5.2 for tension need not be satisfied – designer to verify.

- Per designer input, the shear component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor shear force associated with the same load combination. Therefore the ductility requirements of ACI 318 17.10.6.2 for shear need not be satisfied – designer to verify.

- Designer must exercise own judgement to determine if this design is suitable.



RGSE inc. Structural Engineers

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MISCELLANEOUS

Steel Column

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

RGSE INC.

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DESCRIPTION: BENCH COLUMN DECK PLATFORM

Code References

Calculations per AISC 360-16, IBC 2021, SDPWS 2021

Load Combinations Used : ASCE 7-22 / IBC 2024 (L<=100psf)

General Information

Steel Section Name : **HSS4x4x3/16**
 Analysis Method : Allowable Strength
 Steel Stress Grade
 Fy : Steel Yield 46.0 ksi
 E : Elastic Bending Modulus 29,000.0 ksi

Overall Column Height 1.50 ft
 Top & Bottom Fixity Top Free, Bottom Fixed
 Brace condition :
 Unbraced Length for buckling ABOUT X-X Axis = 1.50 ft, K = 2.1
 Unbraced Length for buckling ABOUT Y-Y Axis = 1.50 ft, K = 2.1

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 14.130 lbs * Dead Load Factor

AXIAL LOADS . . .

Axial Load at 1.50 ft, D = 0.1250, L = 1.0 k

BENDING LOADS . . .

Moment acting about X-X axis at 1.50 ft, L = 1.0 k-ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio =
 Load Combination
 Location of max.above base
 At maximum location values are . . .

Pa : Axial 1.139 k
 Pn / Omega : Allowable 68.279 k
 Ma-x : Applied 1.0 k-ft
 Mn-x / Omega : Allowable 8.424 k-ft
 Ma-y : Applied 0.0 k-ft
 Mn-y / Omega : Allowable 8.424 k-ft

Maximum Load Reactions . .

Top along X-X 0.0 k
 Bottom along X-X 0.0 k
 Top along Y-Y 0.0 k
 Bottom along Y-Y 0.0 k

Maximum Load Deflections . . .

Along Y-Y -0.01072 in at 1.50ft above base
 for load combination : +D+L
 Along X-X 0.0 in at 0.0ft above base
 for load combination :

PASS Maximum Shear Stress Ratio
 Load Combination
 Location of max.above base
 At maximum location values are . . .
 Va : Applied 0.0 k
 Vn / Omega : Allowable 0.0 k

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios				Cb _x	Cb _y	K _x L _x /R _x	K _y L _y /R _y	Maximum Shear Ratios			
	Stress Ratio	Status	Location						Stress Ratio	Status	Location	
D Only	0.002	PASS	0.00 ft		1.00	1.00	24.39	24.39	0.000	PASS	0.00 ft	
+D+L	0.127	PASS	1.17 ft		1.00	1.00	24.39	24.39	0.000	PASS	0.00 ft	
+D+0.750L	0.096	PASS	0.00 ft		1.00	1.00	24.39	24.39	0.000	PASS	0.00 ft	
+0.60D	0.001	PASS	0.00 ft		1.00	1.00	24.39	24.39	0.000	PASS	0.00 ft	

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		My - End Moments	
	@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top	@ Base	@ Top
D Only	0.139										
+D+L	1.139							1.000			
+D+0.750L	0.889							0.750			
+0.60D	0.083										
L Only	1.000							1.000			

Extreme Reactions

Item	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		My - End Moments	
	Extreme Value	@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top	@ Base	@ Top
Axial @ Base	Maximum	1.139						1.000			

Steel Column

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

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DESCRIPTION: BENCH COLUMN DECK PLATFORM**Extreme Reactions**

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base @ Top	k	Y-Y Axis Reaction @ Base @ Top	Mx - End Moments @ Base @ Top	k-ft	My - End Moments @ Base @ Top
"	Minimum	0.083						
Reaction, X-X Axis Base	Maximum	0.139						
"	Minimum	0.139						
Reaction, Y-Y Axis Base	Maximum	0.139						
"	Minimum	0.139						
Reaction, X-X Axis Top	Maximum	0.139						
"	Minimum	0.139						
Reaction, Y-Y Axis Top	Maximum	0.139						
"	Minimum	0.139						
Moment, X-X Axis Base	Maximum	1.139	1.000			1.000		
"	Minimum	0.139						
Moment, Y-Y Axis Base	Maximum	0.139						
"	Minimum	0.139						
Moment, X-X Axis Top	Maximum	0.139						
"	Minimum	0.139						
Moment, Y-Y Axis Top	Maximum	0.139						
"	Minimum	0.139						

Maximum Deflections for Load Combinations

Load Combination	Max. Deflection in X dir	Distance	Max. Deflection in Y dir	Distance
D Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+L	0.0000 in	0.000 ft	-0.011 in	1.500 ft
+D+0.750L	0.0000 in	0.000 ft	-0.008 in	1.500 ft
+0.60D	0.0000 in	0.000 ft	0.000 in	0.000 ft
L Only	0.0000 in	0.000 ft	-0.011 in	1.490 ft

Steel Section Properties : HSS4x4x3/16

Depth	=	4.000 in	I xx	=	6.21 in^4	J	=	10.000 in^4
Design Thick	=	0.174 in	S xx	=	3.10 in^3			
Width	=	4.000 in	R xx	=	1.550 in			
Wall Thick	=	0.187 in	Zx	=	3.670 in^3			
Area	=	2.580 in^2	I yy	=	6.210 in^4	C	=	5.070 in^3
Weight	=	9.420 plf	S yy	=	3.100 in^3			
			R yy	=	1.550 in			
Ycg	=	0.000 in						

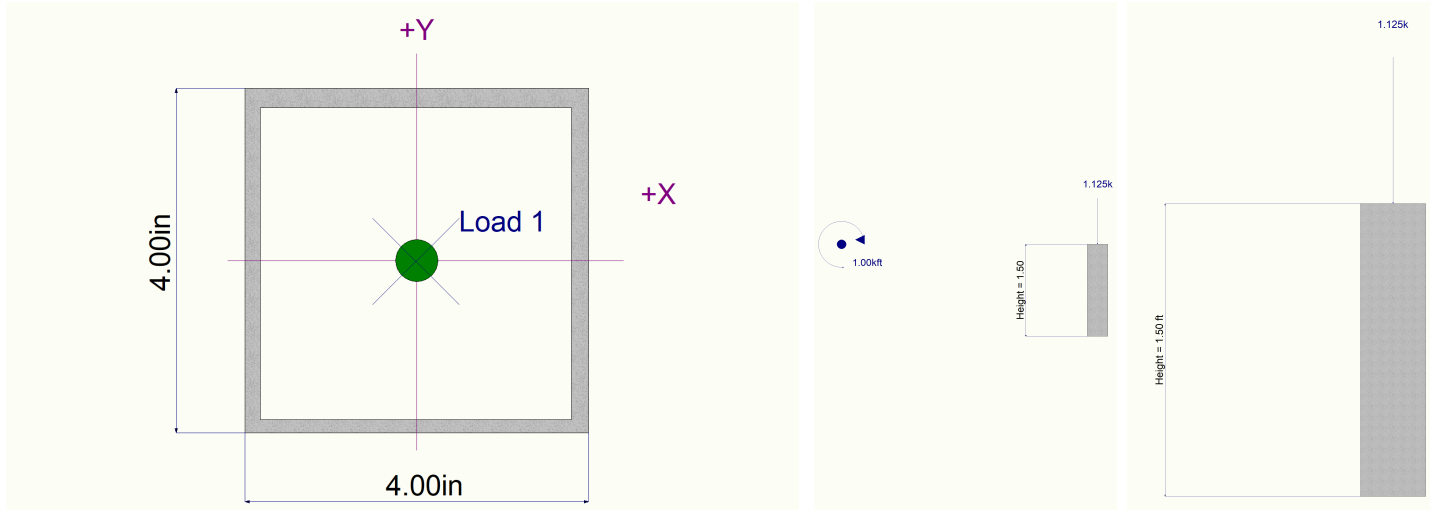
Steel Column

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DESCRIPTION: BENCH COLUMN DECK PLATFORM**Sketches**

Steel Beam

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

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DESCRIPTION: STL ANGLE EA SIDE OF COLUMN**CODE REFERENCES**

Calculations per AISC 360-16, IBC 2021, SDPWS 2021

Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method : Allowable Strength Design

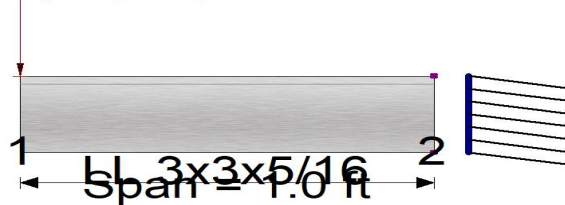
Fy : Steel Yield : 36.0 ksi

Beam Bracing : Completely Unbraced

E: Modulus : 29,000.0 ksi

Bending Axis : Major Axis Bending

Vertical Leg Down

D(0.1250) L(1.0)**Applied Loads**

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added
Load(s) for Span Number 1

Point Load : D = 0.1250, L = 1.0 k @ 0.0 ft

DESIGN SUMMARY**Design OK**

Maximum Bending Stress Ratio =		0.280 : 1		Maximum Shear Stress Ratio =		0.046 : 1	
Section used for this span		LL 3x3x5/16		Section used for this span		LL 3x3x5/16	
Ma : Applied		1.125 k-ft		Va : Applied		1.125 k	
Mn / Omega : Allowable		4.024 k-ft		Vn/Omega : Allowable		24.290 k	
Load Combination		+D+L		Load Combination		+D+L	
Location of maximum on span		0.000 ft		Location of maximum on span		0.000 ft	
Span # where maximum occurs		Span # 1		Span # where maximum occurs		Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.007 in Ratio = 3,617		>=360		Span: 1 : L Only	
Max Upward Transient Deflection		0 in Ratio = 0		<360		n/a	
Max Downward Total Deflection		0.007 in Ratio = 3215		>=240.		Span: 1 : +D+L	
Max Upward Total Deflection		0 in Ratio = 0		<240.0		n/a	

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values						Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx/Vnx/Omega
D Only												
Dsgn. L = 1.00 ft	1	0.031	0.005		-0.13	0.13	6.72	4.02	1.00	1.00	0.13	40.56 24.29
+D+L												
Dsgn. L = 1.00 ft	1	0.280	0.046		-1.13	1.13	6.72	4.02	1.00	1.00	1.13	40.56 24.29
+D+0.750L												
Dsgn. L = 1.00 ft	1	0.217	0.036		-0.87	0.87	6.72	4.02	1.00	1.00	0.88	40.56 24.29
+0.60D												
Dsgn. L = 1.00 ft	1	0.019	0.003		-0.07	0.07	6.72	4.02	1.00	1.00	0.08	40.56 24.29

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.0075	0.000		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions		1.125
Max Upward from Load Combinations		1.125
Max Upward from Load Cases		1.000
D Only		0.125
+D+L		1.125
+D+0.750L		0.875
+0.60D		0.075
L Only		1.000

Steel Beam

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DESCRIPTION: ANGLE BETWEEN TUBE

CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, SDPWS 2021

Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method : Allowable Strength Design

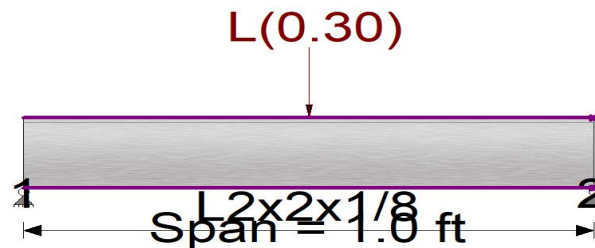
Fy : Steel Yield : 36.0 ksi

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

E: Modulus : 29,000.0 ksi

Bending Axis : Major Axis Bending

Vertical Leg Down



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added

Load(s) for Span Number 1

Point Load : L = 0.30 k @ 0.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =		0.216 : 1	Maximum Shear Stress Ratio =		0.046 : 1
Section used for this span		L2x2x1/8	Section used for this span		L2x2x1/8
Ma : Applied		0.075 k-ft	Va : Applied		0.150 k
Mn / Omega : Allowable		0.347 k-ft	Vn/Omega : Allowable		3.234 k
Load Combination		L Only	Load Combination		L Only
Span # where maximum occurs		Span # 1	Location of maximum on span		0.000 ft
Span # where maximum occurs		Span # 1	Span # where maximum occurs		Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0 in	Ratio =	0	<360 n/a
Max Upward Transient Deflection		0 in	Ratio =	0	<360 n/a
Max Downward Total Deflection		0.002 in	Ratio =	6064	>=240. Span: 1 : L Only
Max Upward Total Deflection		0 in	Ratio =	0	<240.0 n/a

Maximum Forces & Stresses for Load Combinations

Load Combination			Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
Segment Length	Span #		M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Dsgn. L = 1.00 ft	1			0.000				0.56	0.34	1.00	1.00	-0.00	5.40	3.23
L Only														
Dsgn. L = 1.00 ft	1		0.216	0.046	0.07		0.07	0.58	0.35	1.00	1.00	0.15	5.40	3.23
+0.750L														
Dsgn. L = 1.00 ft	1		0.162	0.035	0.06		0.06	0.58	0.35	1.00	1.00	0.11	5.40	3.23

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
L Only	1	0.0020	0.500		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.150	0.150
Max Upward from Load Combinations	0.113	0.113
Max Upward from Load Cases	0.150	0.150
L Only	0.150	0.150
+0.750L	0.113	0.113

Steel Beam

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

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DESCRIPTION: STL BENCH FRAME**CODE REFERENCES**

Calculations per AISC 360-16, IBC 2021, SDPWS 2021

Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method : Allowable Strength Design

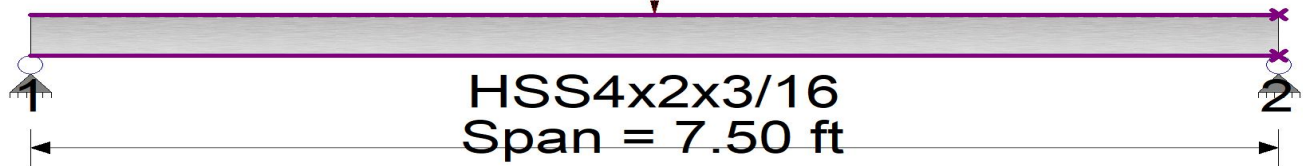
Fy : Steel Yield : 46.0 ksi

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

E: Modulus : 29,000.0 ksi

Bending Axis : Major Axis Bending

Vertical Leg Down

D(0.1250) L(1.0)**Applied Loads**

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading

Load(s) for Span Number 1

Point Load : D = 0.1250, L = 1.0 k @ 3.750 ft

DESIGN SUMMARY**Design OK**

Maximum Bending Stress Ratio =

0.402 : 1

Maximum Shear Stress Ratio =

0.029 : 1

Section used for this span

HSS4x2x3/16

Section used for this span

HSS4x2x3/16

Ma : Applied

2.158 k-ft

Va : Applied

0.5883 k

Mn / Omega : Allowable

5.371 k-ft

Vn/Omega : Allowable

20.003 k

Load Combination

+D+L

Load Combination

+D+L

Span # where maximum occurs

Span # 1

Span # where maximum occurs

Span # 1

Maximum Deflection

Max Downward Transient Deflection

0.144 in Ratio =

626 >=360

Span: 1 : L Only

Max Upward Transient Deflection

0 in Ratio =

0 <360

n/a

Max Downward Total Deflection

0.166 in Ratio =

541 >=180

Span: 1 : +D+L

Max Upward Total Deflection

0 in Ratio =

0 <180

n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
D Only													
Dsgn. L = 7.50 ft	1	0.053	0.004	0.28		0.28	8.97	5.37	1.00	1.00	0.09	33.41	20.00
+D+L													
Dsgn. L = 7.50 ft	1	0.402	0.029	2.16		2.16	8.97	5.37	1.00	1.00	0.59	33.41	20.00
+D+0.750L													
Dsgn. L = 7.50 ft	1	0.314	0.023	1.69		1.69	8.97	5.37	1.00	1.00	0.46	33.41	20.00
+0.60D													
Dsgn. L = 7.50 ft	1	0.032	0.003	0.17		0.17	8.97	5.37	1.00	1.00	0.05	33.41	20.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.1663	3.771		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.588	0.588
Max Upward from Load Combinations	0.588	0.588
Max Upward from Load Cases	0.500	0.500
D Only	0.088	0.088
+D+L	0.588	0.588
+D+0.750L	0.463	0.463
+0.60D	0.053	0.053
L Only	0.500	0.500

Pole Footing Embedded in Soil

Project File: 24120 CALC 241011.ec6

LIC# : KW-06016350, Build:20.24.09.03

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DESCRIPTION: HANDRAIL FOOTING

Code References

Calculations per IBC 2021 1807.3, SDPWS 2021
 Load Combinations Used : ASCE 7-22 / IBC 2024 (L<=100psf)

General Information

Pole Footing Shape Rectangular
 Pole Footing Width 16.0 in
 Calculate Min. Depth for Allowable Pressures
 No Lateral Restraint at Ground Surface
 Allow Passive 400.0 pcf
 Max Passive 1,500.0 psf

Controlling Values

Governing Load Combination Only
 Lateral Load 0.350 k
 Moment 1.225 k-ft

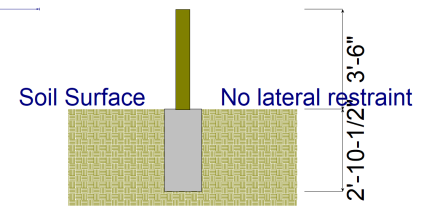
NO Ground Surface Restraint

Pressures at 1/3 Depth
 Actual **370.826** psf
 Allowable **371.252** psf

Minimum Required Depth 2.875 ft

Footing Base Area 1.778 ft²
 Maximum Soil Pressure 0.0 ksf

Point Load



Applied Loads

Lateral Concentrated Load (k)		Lateral Distributed Loads (k/ft)		Vertical Load (k)
D : Dead Load	k		k/ft	k
Lr : Roof Live	k		k/ft	k
L : Live	0.350 k		k/ft	k
S : Snow	k		k/ft	k
W : Wind	k		k/ft	k
E : Earthquake	k		k/ft	k
H : Lateral Earth	k		k/ft	k
Load distance above ground surface	3.50 ft	TOP of Load above ground surface	ft	
		BOTTOM of Load above ground surface	ft	

Load Combination Results

Load Combination	Forces @ Ground Surface		Required Depth - (ft)	Pressure at 1/3 Depth		Soil Increase Factor
	Loads - (k)	Moments - (ft-k)		Actual - (psf)	Allow - (psf)	
	0.000	0.000	0.13	0.0	0.0	1.000
L Only	0.350	1.225	2.88	370.8	371.3	1.000
+0.750L	0.263	0.919	2.50	331.2	332.7	1.000