

PROJECT MANUAL

including specifications
for construction of

FIRE STATION NO. 46

26720 Bombero Lane
Valencia, CA 91381

for

Five Point Holdings, LLC

Prepared by

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March 19, 2026

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SECTION 02 32 00
GEOTECHNICAL INVESTIGATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Soils Investigation Report:

1. A Soils Investigation Report has been prepared for the site of this Work by the Soils Engineer named on the Project Directory in the Project Manual, EnGeo Geotechnical Engineer, 27742 Hancock Parkway, Valencia, CA 91355.
2. Copies of the Reports may be obtained at the cost of reproduction and handling, upon request addressed to the Owner and accompanied by full payment. They are as follows:
 - a. Project No. 6538.100312, dated May 14, 2025, and all subsequent addenda.

B. Use of Data:

1. The Report is available for bidders' information, but is not a warranty of all subsurface conditions.
2. Bidders should visit the Site and acquaint themselves with existing conditions.
3. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions, but such investigations may be performed only under time schedules and arrangements approved in advance by the Architect.

1.2 QUALITY ASSURANCE

- A. A Soils Engineer will be retained by the Owner to observe performance of work in connection with excavating, trenching, filling, backfilling, and grading.
- B. Readjust work performed that does not meet technical or design requirements, but make no deviation from the Contract Documents without specific written approval from the Architect.

END OF SECTION

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SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide formwork, reinforcement, cast-in-place concrete including hose tower and flag pole footings, monument sign bases, and integrally colored concrete interior slabs where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 03 35 43: Polished Concrete Finishing.
 - 2. Section 10 75 16: Ground-Set Flagpoles.
 - 3. Section 13 36 13.15: Steel Fire Hose Tower.
 - 4. Civil Drawings: Concrete Paving - Concrete pavement and walks.

1.2 REFERENCES

- A. AASHTO M194/M194M - Standard Specification for Chemical Admixtures for Concrete.
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
- C. ACI 301 - Specifications for Concrete Construction.
- D. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.
- E. ACI 305R - Guide to Hot Weather Concreting.
- F. ACI 306R - Guide to Cold Weather Concreting.
- G. ACI 308.1 - Specification for Curing Concrete.
- H. ACI 347R - Guide to Formwork for Concrete.
- I. ACI CODE 318/318R - Building Code for Structural Concrete-Code Requirements and Commentary.
- J. ACI PRC-303 - Guide to Cast-in-Place Architectural Concrete Practice.
- K. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

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- L. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- M. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- N. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
- O. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- P. ASTM C88/C88M - Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulphate.
- Q. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
- R. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
- S. ASTM C150/C150M - Standard Specification for Portland Cement.
- T. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
- U. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.
- V. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- W. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
- X. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- Y. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.
- Z. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types).
- AA. ASTM D2103 - Standard Specification for Polyethylene Film.
- BB. CRSI - (Concrete Reinforcing Steel Institute) Manual of Standard Practice.
- CC. Los Angeles County Building Code 2023 Edition.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the

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specified requirements and the methods needed for proper performance of the work of this Section.

- B. Do not commence placement of concrete until mix designs have been reviewed and approved by the Architect and all governmental agencies having jurisdiction and until copies are at the job site, the batch plant, and the building department.
- C. Comply with all applicable provisions of Chapter 19 of the 2023 Edition of the County of Los Angeles Building Code.
- D. Comply with pertinent provisions of ACI 347R for concrete formwork.
- E. Comply with pertinent provisions of ACI CODE 318/318R for concrete reinforcement and the CRSI "Manual of Standard Practice." If conflict occurs between the Contract Drawings, the Project Manual, ACI 318, and the Manual of Standard Practice, the most stringent takes precedence.
- F. Conform to ASTM C94 for concrete mixing and ASTM C143 for slump testing.
- G. Employ acceptable concrete testing laboratory to perform materials evaluation, testing and design of concrete mixes.
- H. Comply with ACI 301 and ACI 211.1 and ACI 309R specifications and recommendations.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data:
 - 1. Materials list, manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 - 2. Manufacturer's data and installation instructions for proprietary materials including form coatings, ties, and accessories.
 - 3. Shop drawings showing details of bars, anchors, ties, and other items, if any, provided under this Section.
 - 4. Samples of finishes to be approved by the Architect. Submit samples of colored concrete for Architect's selection and approval.
- C. Certificates:
 - 1. Manufacturer's certification that materials meet specification requirements.
 - 2. Material content per cubic yard of each class of concrete furnished.
 - a. Dry weights of cement.

- b. Saturated surface-dried weights of fine and coarse aggregates.
- c. Quantities, type and name of admixtures, including percentage of fly ash replacing cement.
- d. Weight of water.

3. Ready-mix delivery tickets, ASTM C94.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Colored Admixture: Comply with manufacturer's instructions. Deliver colored admixtures in original, unopened packaging. Store in dry conditions.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Schedule placement to minimize exposure to wind and hot sun before curing materials are applied.
- B. Avoid placing concrete if rain, snow, or frost is forecast within 24-hours. Protect fresh concrete from moisture and freezing.
- C. Comply with professional practices described in ACI 305R and ACI 306R.
- D. Schedule delivery of concrete to provide consistent mix times from batching until discharge. Mix times shall meet manufacturer's written recommendations.

PART 2 - PRODUCTS

2.1 CONCRETE FORMWORK

- A. Construct forms to required size and shape, braced and secured to maintain alignment, elevation and position, complying with ACI 347R.
- B. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection, using suitable material for Project conditions.
- C. Provide openings in the formwork to accommodate work of other trades. Accurately place and securely support items built into forms.
- D. Provide forms, true to line and level to the following tolerances:
 - 1. Top of form units, not more than 1/8" in 10'.
 - 2. Vertical face longitudinal axis, not more than 1/4" in 10'.

2.2 REINFORCEMENT MATERIALS AND ACCESSORIES

- A. Bars: Unless noted otherwise on the drawings, provide deformed carbon steel bars complying with ASTM A615, using grades shown on the Drawings.

- B. Welded Wire Fabric: Provide welded steel, complying with ASTM A1064/A1064M, flat sheets.
- C. Bolsters, Chairs, Spacers, and Other Devices for Spacing, Supporting, and Fastening Reinforcement in Place: Use wire bar type supports complying with CRSI recommendations, unless otherwise shown on the Drawings.

2.3 PORTLAND CEMENT

- A. ASTM C150, Type indicated in the drawings, low alkali.
- B. Color: Light grey or white.
- C. Do not change the brand of cement during progress of the work.

2.4 AGGREGATES

- A. Provide hardrock aggregate complying with ASTM C33.
- B. Fine Aggregate: Grade 1/4" to fines.
- C. Coarse Aggregate: Graded 1/4" to fines, maximum sizes hereinafter specified.

2.5 ADMIXTURES

- A. Air Entraining Admixtures: ASTM C260.
- B. Chemical: Type (as required), ASTM C494.
- C. Concrete hardener as specified elsewhere in this Section.
- D. Fly Ash: ASTM C618. Replace cement content of final mixture with no more than 20% Class C fly ash.
- E. Color admixture as specified elsewhere in this Section.

2.6 OTHER MATERIALS

- A. Water: Use only water which is clean and free from deleterious amounts of acid, alkali, salt, and organic materials.
- B. Expansion Joint Filler: Provide preformed strips, non-extruding and resilient bituminous type, of thickness indicated, complying with ASTM D1751.
- C. Vapor Barrier Membrane: Provide 10 mil. thickness reinforced polyethylene sheet under all slab-on-grade, complying with ASTM D2103, fire retardant where required. Refer to the geotechnical report for sand and aggregate base requirements above and below the vapor barrier.
- D. Curing Materials:
 - 1. Curing Paper: Comply with ASTM C171, type 1, regular.

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2. Liquid curing compounds complying with ASTM C309.
- E. Colored Admixture for Integrally Colored Interior Floor Slabs: Scofield CHROMIX[®] Admixtures for Color-Conditioned Concrete as manufactured by Sika Corporation, or equal products by Davis Colors, color as selected by Architect.
 1. Admixture shall be a colored, water-reducing, admixture containing no calcium chloride with coloring agents that are limeproof and ultra-violet resistant.
 2. Colored admixture shall conform to the requirements and recommendations of ACI PRC-303, ASTM C979, ASTM C494 and ASSHTO M194.
 3. Raw pigments are not an equivalent and may not be substituted.
- F. Curing Compound for Integrally Colored Concrete: Curing compound shall comply with ASTM C309 and be of same manufacturer as colored admixture, for use with integrally colored concrete.
 1. Interior Integrally Colored Concrete: Scofield COLORCURE[®] Concrete Sealer by Sika Corporation, or equal products by Davis Colors. Use to cure interior flatwork where regular maintenance is planned.
- G. Building Interior Slabs: Level floors at living areas and Apparatus Room by using a laser screed machine by Somero or Durafloor.
- H. Interior Floor Hardener and Sealer: Refer to Section 03 35 43.

2.7 CONCRETE MIXES, STRENGTHS AND PROPORTIONS

- A. Provide concrete mix design, stamped and signed by a registered civil engineer, per requirements indicated on the General Notes of the Structural Drawings.
- B. Determine exact proportions for the mix, including amounts of moisture, if any, and water, by the Testing Laboratory or Mill, based on cement and aggregates submitted. Submit written reports to Architect for each proposed concrete mix at least 15 days prior to start of work. Secure approval before concrete production begins. Comply with ASTM C31, ASTM C39 and ASTM C88.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
- B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

3.2 CONCRETE FORMWORK

- A. Clean and adjust forms prior to concrete placement. Apply form release agents to wet forms as required. Retighten forms after concrete placement if required.

3.3 CONCRETE REINFORCEMENT

- A. Position support, and secure reinforcement against displacement by formwork, construction, and concrete placing operations. Set wire ties with ends directed away from exposed concrete surfaces.
- B. Install welded wire fabric in as long lengths as practicable, lapping adjoining pieces at least one full mesh.
- C. Provide sufficient numbers of supports and of sufficient strength to carry the reinforcement.
- D. Provide lap splices in concrete per schedule on Structural Drawings, but not less than 16". Stagger lap splices.
- E. Bend reinforcing bars cold.

3.4 CONCRETE MIXING

- A. Unless otherwise approved by the Architect, use ready mixed concrete complying with ASTM C94, except as may be modified by the following:
 - 1. For materials for ready mixed concrete, and for methods of measuring materials, comply with applicable provisions of this Section.
 - 2. Equip the loading plant to handle not less than four sizes of aggregate in such a manner as to prevent intermixing of aggregates until loaded into the weighing hopper.
 - 3. Equip truck mixers with a mixing water tank fitted with a water gage.
 - 4. Mixing:
 - a. Mix each batch of concrete not less than 15 minutes, five minutes of which shall be at the site.
 - b. Rotate the drum at the rate specified by the manufacturer of the mixer as "mixing speed."
 - c. Whenever there is a delay in unloading, rotate the drum slowly at intervals to prevent incipient set of concrete.
 - 5. Addition of Water:
 - a. Normally, do not deliver concrete with total permissible amount of water incorporated therein.

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- b. Unless otherwise approved by the Architect, withhold at least 2-1/2 gallons per cu. yd. and add before the concrete is discharged.
 - c. After water is added, at least five minutes of mixing time shall be immediately prior to discharge.
 - d. Concrete will be rejected if not placed in final position within 1-1/2 hours after water is first added to the batch.
- 6. Concrete at time of placing shall be in such condition that it can be placed properly.
 - 7. Discharge all wash water from the mixing drum before the truck reloads at the batching plant.

B. Cement Grout and Dry-Pack Grout:

- 1. Mix at the site, in composition of one volume of Portland cement to 2-1/2 volumes of fine aggregate.
- 2. Mix the materials dry; then add sufficient water to make the mixture flow under its own weight.
- 3. When grout is used as dry-pack concrete, add sufficient water to make a stiff mixture which can be molded into a sphere.

C. Miscellaneous Provisions:

- 1. Provide strengths of concrete as shown on the Drawings.
- 2. Provide concrete dense and free from honeycomb and other defects.
- 3. Place and finish members to conform to the shapes and dimensions indicated, with all surfaces true to line, plumb, and level.

3.5 INSERTS, ANCHORS, AND EMBEDDED ITEMS

- A. Set and build into the work anchorage devices and other embedded items required for other work that is attached to, or supported by cast-in-place concrete. Coordinate with other trades for locating and setting.
- B. Secure all embedded items in position prior to placing concrete.
- C. Locate sleeves or chases as shown on the Drawings. Obtain prior approval for additional sleeves or chases.
- D. Conduit placed in a concrete slab shall have an outside diameter no greater than 1/3" the thickness of the slab. Do not embed conduit in less than a 3-1/2" slab. Minimum clear distance between conduits shall be 6 inches.

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3.6 CONVEYING AND PLACING CONCRETE

- A. Before placing concrete, thoroughly clean forms, wash out with water, and make tight.
- B. Time of Placing:
 - 1. Do not place concrete until reinforcement, conduits, outlet boxes, anchors, sleeves, hangers, bolts, and other embedded materials are securely and properly fastened in their correct positions.
 - 2. Secure the Architect's approval of reinforcement before commencing placement of concrete.
 - 3. Fire Department representative must be present when concrete is placed.
- C. Preparation:
 - 1. Before new concrete is deposited upon or against concrete that has taken its initial set or has hardened, remove all incrustations from forms and reinforcement.
 - 2. Remove all laitance, oil, and loose particles from concrete and concrete surfaces, and thoroughly clean the forms with water under stiff pressure.
 - 3. Remove loose material from the compacted subbase surface immediately before placing concrete.
- D. Method of Placing:
 - 1. Place concrete only under the degree of inspection described elsewhere in these Specifications, and as required by governmental agencies having jurisdiction.
 - 2. Do not place concrete outside of regular working hours unless required inspection authorities have been notified properly and are present.
 - 3. Comply with ACI 304R, placing concrete in a continuous operation within planned joints or sections.
 - 4. Deposit concrete so that the surface is kept level throughout, a minimum being permitted to flow from one position to another, and place as rapidly as practicable after mixing.
 - 5. Do not use in this Work any concrete not placed within 30 minutes after leaving the mixer.
- E. Tamping and Conveying: Use manual tampers as well as mechanical vibrators to thoroughly work concrete around reinforcement and embedded fixtures, and into corners of forms, during placing operations until the concrete is thoroughly compact and without voids.

- F. Stoppages:
1. Stop concrete placing only where approved by the Architect.
 2. Maintain flow surfaces of freshly placed concrete as level whenever a pour is stopped, providing tight dams to accomplish this.
 3. Make construction joints only where avoidable, and then only at points determined or approved by the Architect.
 4. Provide keys and dowels at construction joints where indicated on the Drawings, and where concrete placement is interrupted.
- G. Concrete Coverage for Reinforcing Bars to Face of Bar unless specifically noted otherwise on the Drawings:
1. Concrete in Contact with Earth, Unformed: 3".
 2. Concrete in Contact with Earth, Formed (No.6 through No.18 bars): 2".
 3. Concrete in Contact with Earth, Formed (No.5 bars and smaller): 1-1/2".
 4. Concrete Not Exposed to Weather or in Contact with Ground (No.14 and No.18 bars): 1-1/2".
 5. Concrete Not Exposed to Weather or in Contact with Ground (No.11 bars and smaller): 1".
 6. Slab-on-Grade: "Mid-Height of Slab".

3.7 SLABS ON EARTH

- A. Preparation for Slabs on Earth:
1. Prepare the subgrade as specified in other Sections.
 2. Do not dampen subgrade at interior floor slabs.
 3. Provide the specified vapor barrier membrane beneath floor slabs on grade.
 - a. Place the membrane in as large sheet as practicable, lapping 12", with the top lap placed in the direction concrete will be spread.
 - b. Carefully cut, fit, and seal the membrane to all pipes and conduits projecting through the membrane, using small sheets, where necessary, and pressure-sensitive tape.
 - c. Do not permit membrane to be punctured except at screed stakes and utility risers.

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B. Placing and Finishing:

1. Tamp the freshly placed concrete, until depressions and irregularities are worked out and the surface is true to finish grades and elevations.
2. Remove excess water and debris worked to the surface in compacting and screeding, and float to a compact and smooth surface.
3. Provide finish as specified.

3.8 TEMPERATURE REQUIREMENTS

A. Cold Weather Requirements:

1. Do not mix or place concrete when the temperature is below 40 degrees F. or when conditions indicate that the temperature will fall below 40 degrees F. within 72 hours.
2. Reinforcement, forms, and ground which concrete will contact must be completely free of frost.
3. The concrete and formwork must be kept at a temperature of not less than 50 degrees F. for not less than 72 hours after placing.

- B. Hot Weather Requirements: Deposit concrete, which is not more than 80 degrees F. If the weather causes the concrete to exceed 80 degrees F., cool the mix by appropriate method.

3.9 PATCHING

- A. Immediately after stripping forms, patch minor defects, form-tie holes, or honeycombed areas, before concrete is dry. Remove ledges and bulges. Repair gravel pockets or honeycombed areas by cutting out to solid surface. Form key and thoroughly wet before placing patching mortar consisting of 1 part cement to 2 parts fine sand. Compact into place and neatly finish to exactly match surface texture. Grind or fill surfaces to produce level, true planes. Match adjacent surfaces.

3.10 PROTECTION AND CURING

- A. Conform to ACI 308.1 requirements.

- B. Protect concrete from natural elements and defacement during construction.

1. Protective Covering: Install protective covering where equipment is to be installed or where construction activities could soil or damage floor or where items are to be stored. Adequately protect concrete inserts and other embedded items from movement, mechanical injury, or from damage by elements.

- C. Keep concrete moist until it has cured for a least 7 days.

- D. Keep all forms wet enough to prevent drying of concrete.
- E. Protect exposed concrete corners from damage.
- F. Fog-spray freshly placed slabs continuously until finishing operations commence. Do not allow slabs to become dry until curing operations are complete. Cure slabs with nonstaining curing paper, wet burlap, or fog sprays; cure vertical surfaces with wet burlap or fog spray. Protect fresh concrete from drying winds, rain, damage, or soiling. Cover finished slabs with curing paper lapped 4" minimum at joints and sealed with waterproof adhesive or masking tape.
- G. Curing and Protection of Integrally Colored Concrete: Apply curing compound for integrally colored concrete according to manufacturer's instructions using manufacturer's recommended application techniques. Apply curing compound at consistent time for each pour to maintain close color consistency.

3.11 CONCRETE FINISHES

- A. After removal of forms, give the concrete surfaces one or more of the finishes specified below.
- B. Revise the finishes as needed to secure the approval of the Architect.

3.12 SLAB LEVELS AND FINISHES

- A. As-Cast Finish: Provide smooth form finish on all vertical concrete surfaces, free of form lines, wood grain or other marks. Carefully sack and patch as required.
- B. Steel Trowel Finish: For all interior slabs, screed, wood float, and steel-trowel surfaces. Trowel until there is shine or gloss and a smooth, hard, dense, impervious surface, free of defects. Use mechanical troweling machines if the desired finish and level tolerances can be obtained by their use, and finish by hand troweling only.
 - 1. Slabs to Receive Membrane Waterproofing: Steel trowel slabs by hand or machines to a true and uniform plane. Hand troweling to produce gloss or shine is not required.
- C. Finish depressed slabs for shower floors by tamping slab with an open grid tamper, screeding with a straightedge and wood floating to a true and uniform surface.
- D. Addition of Materials: Do not add cement, sand, water, or mortar to slab surfaces while finishing concrete.
- E. Slab Levels: Finish all interior concrete slabs to a F(f) (floor flatness) of 50 and F(l) (floor levelness) of 30. Finish all other surfaces true to 1/4" in 10 feet on a straight-edge in any direction. When finish troweling around the edges of the slabs, maintain same elevations as the top surface of the slabs, and maintain same elevations as the top surface of slab.

- F. Mark-Off Lines: Form with edging tool, neat and true-to-line, uniform throughout.
- G. Provide smooth troweled finish with slightly rounded edges for curbs.

3.13 CONTROL JOINTS

- A. Interior Concrete Slabs: Provide concrete control joints at 10 ft on center each way or as indicated on the Drawings. Fill with epoxy sealant flush to surface.

3.14 DEFECTIVE WORK

- A. The following defective work may be ordered by the Architect to be removed and replaced at no additional expense to the Owner:
 - 1. Concrete not correctly formed.
 - 2. Concrete not plumb or level.
 - 3. Concrete not up to specified strength.
 - 4. Concrete containing rock pockets, voids, honeycomb, or cold joints.
 - 5. Concrete containing wood or foreign matter.
 - 6. Concrete not true to elevation.
 - 7. Concrete not pitched to drain.
 - 8. Concrete not finished as specified or shown.
 - 9. Concrete with any loose or roughened or defaced surfaces.
 - 10. Concrete not true to 1/4" in ten feet on straight edge in any direction.
 - 11. Concrete otherwise not in accordance with the Drawings and Specifications.

3.15 CLEAN UP

- A. Remove all excess materials, slush, etc., from the property. Do not wash transit trucks on this property. Remove signs of concrete from adjacent surfaces.
- B. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 03 35 43**POLISHED CONCRETE FINISHING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide sealer and hardener, and polishing of integrally colored interior concrete where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Owner's Administrative Requirements: Quality Requirements.
 - 2. Section 03 30 00: Cast-In-Place Concrete.

1.2 REFERENCES

- A. ADA - Americans with Disabilities Act.
- B. ASTM C779/C779M - Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
- C. ASTM C805/C805M - Standard Test Method for Rebound Number of Hardened Concrete.
- D. ASTM G152 - Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials.
- E. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials.
- F. SCAQMD (South Coast Air Quality Management District) Rule 1113 - Architectural Coatings.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Use a certified installer and adequate number of skilled workmen who are thoroughly trained and experienced in the necessary craft.
 - 2. The special concrete finish manufacturer shall certify applicator.
 - 3. Applicator shall be familiar with the specified requirements and the methods needed for proper performance of work of this Section. Applicator must have availability of proper equipment to perform work within scope of this Project on a timely basis. Applicator should have

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successfully performed a minimum of five (5) projects of at least 5000 square feet each.

- B. Mock-Ups: Apply mock-ups of each type finish, to demonstrate typical joints, surface finish, color variation (if any), and standard of workmanship.
1. Build mock-ups approximately 30 square feet in the location indicated or if not indicated, as directed by the Architect.
 2. Notify Architect seven days in advance of dates and times when mock-ups will be constructed when practical.
 3. Obtain from the Architect approval of mock-ups before starting construction.
 4. If the Architect or Owner's Representative determines that mock-ups do not meet requirements, demolish and remove them from the Site and cast others until mock-ups are approved.
 5. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed work.
 6. Approved mock-ups may become part of the completed work if undisturbed at time of Substantial Completion.
 7. Once mock-ups are approved by the Architect, the Contractor is responsible for protecting the approved mock-ups for the duration of the Project.
- C. Protection: No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete surface. Prevention is therefore essential.
1. All hydraulic powered equipment must be diapered to avoid staining of the concrete.
 2. No trade shall park vehicles on the inside slab. If necessary to complete their scope of work, place drop cloths under vehicles at all times.
 3. Use no pipe cutting machines on the inside floor slab.
 4. Do not place steel on interior slab.
 5. All equipment shall be equipped with non-marking tires.
- D. Pre-Installation Conference: Conduct conference at Project Site to comply with requirements of the Owner's administrative requirements.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.

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B. Product Data:

1. Submit materials list, manufacturer's specifications and other data needed to prove compliance with the specified requirements. Include printed statement of VOC content.
2. Submit manufacturer's recommended installation procedures, which when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.
3. Submit technical data sheet giving descriptive data, curing time, and application requirements.
4. Submit Material Safety Data Sheet (MSDS) and other safety requirements.

C. Test Reports: Provide certified test reports, prepared by an independent testing laboratory, confirming compliance with specified performance criteria.

D. Samples: Supply manufacturer's lab samples to show a smooth surface indicative of the gloss, not the mix color or aggregate size, color or amount of aggregate exposed.

E. Manufacturer's Certification: Provide letter of certification from concrete finish manufacturer stating that installer is certified applicator of special concrete finishes, and is familiar with proper procedures and installation requirements required by the manufacturer.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Deliver materials in original containers, with seals unbroken, bearing manufacturer labels indicating brand name and directions for storage.
- C. Dispense special concrete finish material from factory-numbered and sealed containers. Maintain record of container numbers.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting topping performance.

1. Concrete must have an average Floor Flatness rating of at least 50.
2. Concrete must have an average Floor Levelness rating of at least 30.
3. Concrete must be cured a minimum of 28 days or as directed by the manufacturer before concrete finishing can begin.

4. Application of finishing product shall take place 10 days prior to installation of equipment and substantial completion, thus providing a complete, uninhibited concrete slab for application.
5. Flatness testing cost and scheduling is responsibility of the Contractor.
- B. Close areas to traffic during floor application and after application, for time period recommended in writing by manufacturer.
- C. Owner will be responsible for providing disposal of slurry and finish by-products in compliance with all applicable codes.

1.7 WARRANTY

- A. Provide a standard twenty (20) year material, labor and performance warranty,

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Hardening/Sealing Agent:
 1. RetroPlate 99 manufactured by Advanced Floor Products (AFP), 1203 Spring Creek Place, Springville, UT 84663, (801) 489-5663, www.retroplatesystem.com.
 2. Performance Criteria:
 - a. Abrasion Resistance: ASTM C779, up to 400% increase in abrasion resistance.
 - b. Impact Strength: ASTM C805, up to 21% increase in impact strength.
 - c. Ultra Violet Light and Water Spray: ASTM G152 and G153, No adverse effect to ultra violet and water spray.
 - d. Reflectivity: Up to 30% increase in reflectivity.
 3. Reactive penetrating sealers for application to concrete substrates must not exceed the VOC limit of 50 g/L set by the SCAQMD Rule 1113.
- B. RetroPlate Diamond pads distributed by Advanced Floor Products, Inc.
- C. Product Variations: The variegated colors and appearance are unique to each concrete surface and depend on the chemical composition, mix design, porosity, age, texture and color of the concrete substrate. Mottling and wide variations in color and intensity may occur. If contaminants remain on the surface, the penetration of the product may be blocked. Concrete from different loads or pours, and in patched areas, may appear significantly different in color from adjacent areas, when treated with the product.

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- D. Fly Ash: No more than 20% of the weight of the Portland Cement should be substituted for with Class C fly ash.

2.2 OTHER MATERIALS

- A. Water: Potable.
- B. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine substrate, with installer present, for conditions affecting performance of finish. Correct conditions detrimental to timely and proper work. Do not proceed until unsatisfactory conditions are corrected.
- B. Verify that base slab meet finish and surface profile requirements in Section 03 30 00 and Article 1.6 above.
- C. Prior to application, verify that floor surfaces are free of construction laitance.

3.2 APPLICATION

- A. Prepare floor for hardening and sealing application with specified diamond grinding steps, followed by the application of hardening and sealing agent and final polishing steps. Start any of the floor finish applications in presence of manufacturer's technical representative if practical.
- B. Sealing, Hardening and Polishing of Concrete Surface:
 - 1. Only a certified applicator shall apply the specified products. Applicable procedures must be followed as recommended by the product manufacturer and as required to match approved test sample.
 - 2. Aggregate Exposure: Grind the concrete floor surface to a Class B Level of exposed aggregates, achieving fine aggregate (salt and pepper) exposure with little or no medium aggregate exposure at random locations.
 - 3. Polish to pre-determined level based on test sample. Process the concrete floor surface to a Level 2 satin (honed) finished gloss, achieving a low to medium sheen and a matte appearance with or without slight diffused reflection.
 - 4. Coefficient of Friction: Level of finish must exceed ADA recommendations for wet and dry hard surfaces.
 - 5. Achieve waterproofing, hardening, dust-proofing, and abrasion resistance of the surface without changing the natural appearance of the concrete,

except for the sheen. In addition, lack of adherence to F(f) flatness and F(l) levelness specifications can increase the mottled appearance and irregular exposure of aggregate.

6. Finish to within 1/2" of vertical surfaces where practical.

3.3 WORKMANSHIP AND CLEANING

- A. The premises shall be kept clean and free of debris at all times.
- B. Remove spatter from adjoining surfaces, as necessary.
- C. Repair damages to surface caused by cleaning operations.
- D. Remove debris from Jobsite. Dispose of materials in separate, closed containers as provided by the Owner, and in accordance with local regulations.
- E. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

3.4 SPECIFIC QUALIFICATIONS/EXCLUSIONS

- A. This Article, though not mandatory, will greatly improve the understanding and necessary procedures for performing this work properly.
- B. Any unforeseen or hidden conditions requiring repair will be billed at time and materials basis.
- C. Applicator will assume that there is adequate access to electricity and water, and that adequate lighting is provided. 3 Phase 220 50 amp service is required.
- D. Applicator will assume that the floor has not been exposed to the elements. If weather damage has occurred, additional grinding will be billed at time and materials basis.
- E. Removal of contamination of the slab by soil, foot prints, drag marks, welding marks, hydraulic fluids, or any other outside contaminant will be billed at time and materials basis, and will be performed to the best of ability, but without guarantee of removal.
- F. Applicator will assume that the hardening and sealing system will be applied prior to the installation of any floor covering.
- G. This cleaning and sealing of concrete is a wet process and could damage adjacent surfaces, on the immediate floor area, or even the floor levels below. The applicator will endeavor to tape and protect areas adjacent to their work areas to the best of their abilities, but in no case will they be held liable for water damage that occurs to electrical equipment, ceiling tiles, light fixtures, or other adjacent finishes.
- H. No other trades shall be allowed in the area being worked on due to possible safety and floor contamination issues.

- I. The areas to receive the hardening and sealing system shall be delivered to the applicator in clean and swept condition. Remove all equipment and supplies prior to turning the space over to the applicator. If the applicator is required to clean the space, and/or move other's supplies, staging and equipment, it will be done on a time and materials basis.
 - J. Protection of the floor following the application of the hardening and sealing system and polishing is the responsibility of the Owner.
- 3.5 PROTECTION
- A. Protect finished work until fully cured in accordance with manufacturer's recommendations.

END OF SECTION

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SECTION 03 48 26**PRECAST CONCRETE PARKING BUMPERS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide precast concrete parking bumpers (wheel stops) as shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 03 30 00: Cast-In-Place Concrete.
 - 2. Civil Drawings: Concrete Paving.
 - 3. Civil Drawings: Painted Pavement Markings.

1.2 REFERENCES

- A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. Precast concrete specialties shall be manufactured by a company specializing in the manufacture of precast concrete appurtenances.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data:
 - 1. Submit information describing adhesive for parking bumpers.
 - 2. Submit information describing the materials used in the manufacture of the wheel bumpers.
- C. Shop Drawings: Submit shop drawings for precast concrete parking bumpers, including a plan layout and installation details.

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PART 2 - PRODUCTS

2.1 MATERIALS

- A. Precast Concrete Parking Bumpers:
 - 1. 4'-0" long x 5 ½" high x 7 ½" wide.
 - 2. Minimum Compressive Strength: 3,500 pounds per square inch (psi) minimum at 28 days.
 - 3. Air Content: 5 to 8 percent.
 - 4. Provide chamfered corners and drainage slots on underside.
 - 5. Reinforcing Bar: Equivalent to one No. 4 deformed billet steel conforming to ASTM A615, Grade 60, longitudinally placed, with welded stirrups.
 - 6. Adhesive for Securing of Concrete Wheel Bumpers to Substrate: An epoxy two-component type, long curing, manufactured by ChemCo Systems (800) 757-6773.
- B. Fabrication, General: Cast in smooth, well-oiled forms. Remove from forms as soon as blocks can be handled without damage.

PART 3 - EXECUTION

3.1 PARKING BUMPERS INSTALLATION

- A. Locations: Locate where shown on Drawings or as directed. Bumpers are intended at all parking stalls where curbs are not present, to act as wheel stops.
- B. Surface Preparation: Thoroughly clean surfaces to receive parking bumpers free of dirt, sand, oil, grease and other matter detrimental to proper placement.
- C. On Portland Cement Concrete Pavements:
 - 1. Comply with manufacturer's instructions for adhesive. Surfaces to receive adhesive to be free of laitance, dirt, loose particles or other foreign matter and completely cured and dry.
 - 2. Secure bumpers in place with full butter coat of epoxy adhesive in exact location, with no squeeze out of adhesive. Protect bumper from dislocating until adhesive sets.
 - 3. Slightly roughen the smooth surfaces as recommended by the adhesive manufacturer to provide for proper bond. Properly cure the adhesive after placing of bumper unit.

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3.2 CLEANING AND REPAIR

- A. Repair damaged surfaces to acceptance of the Architect. Clean items to remove dirt and stains.
- B. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 04 22 00
CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide concrete unit masonry where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 03 30 00: Cast-In-Place Concrete.
 - 2. Section 05 31 23: Steel Roof Decking.
 - 3. Section 09 24 23: Cement Stucco.
 - 4. Section 09 90 00: Painting and Coating - Waterproofing of unit masonry.
 - 5. Civil Drawings: Concrete Paving.
 - 6. Landscape Drawings: Site Perimeter Walls, Vehicular Swing Gate, and Metal Fencing and Gates.

1.2 REFERENCES

- A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- B. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
- C. ASTM C90 - Standard Specification for Dry-Cast Loadbearing Concrete Masonry Units.
- D. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
- E. ASTM C150/C150M - Standard Specification for Portland Cement.
- F. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
- G. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
- H. ASTM C331/C331M - Standard Specification for Lightweight Aggregates for Concrete Masonry Units.
- I. ASTM C476 - Standard Specification for Grout for Masonry.
- J. C.B.C. - (California Building Code) 2022 Edition.

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- K. CRSI - (Concrete Reinforcing Steel Institute) Manual of Standard Practice.
- L. I.B.C. - (International Building Code) 2024 Edition.
- M. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. Comply with TMS 402/602.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Materials list, manufacturer's specifications and other data needed to prove compliance with the specified requirements.
- C. Shop Drawings: Indicate bars sizes, spacings, locations, reinforcement quantities, bending and cutting schedules, supporting and spacing devices for reinforcement, accessories.
- D. Samples: Submit four samples of decorative block, units to illustrate color, texture and extremes of color range.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Store masonry units above ground on level platforms which allow air circulation under the stacked units.
- C. Cover and protect against wetting prior to use.

1.6 ENVIRONMENTAL CONDITIONS

- A. Do not place masonry units when air temperature is below 40° F.
- B. Protect masonry construction from direct exposure to wind and sun when erected in ambient air temperature of 99°F in the shade, with relative humidity less than 50%.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. Provide medium weight, hollow load-bearing concrete masonry units in accordance with ASTM C90 as referenced by 2024 IBC and 2022 CBC, linear shrinkage not to exceed 0.065% as per ASTM C90, as manufactured by the

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Angelus Block Co. Aggregates used shall conform to ASTM C33 and ASTM C331.

1. Precision Finish CMU: Natural grey, nominal face dimensions of 8" high by 8" depth by 16" long at patio trellis columns and BBQ. Refer to Section 09 24 23 for plastering.
2. Slump Block CMU: Natural grey, nominal face dimensions of 6" high by 8" depth by 16" long at trash enclosure.
 - a. Provide 4" high by 8" depth by 16" long solid slump block cap in natural grey.
 - b. Procure slump block and related materials from the Angelus Block Co. Oxnard plant to match site perimeter walls specified by Landscape Architect.

B. Provide accessory shapes as required.

2.2 REINFORCEMENT AND ACCESSORIES

A. Comply with the following as minimums.

1. Deformed Bars: ASTM A615 grade 60 as shown on the Drawings.
2. Fabricate reinforcement in accordance with recommendations contained in CRSI "Manual of Standard Practice".

2.3 MORTAR

A. Ingredients:

1. Portland Cement: Comply with ASTM C150, type I.
2. Lime: Provide hydrated lime complying with ASTM C207.
3. Aggregate: Provide clean, sharp, well graded aggregate free from injurious amounts of dust, lumps, shale, alkali, surface coatings, and organic matter, and complying with ASTM C144.
4. Water: Provide water free from deleterious amounts of acids, alkalis, and organic materials.

B. Mixing:

1. Provide mortar type "S", as designated on the Drawings in accordance with ASTM C270.
2. Proportions: Provide one part portland cement to 1/2 part hydrated lime and 3-1/2 parts sand by volume.

- C. Color: To match concrete masonry units or as required by Architect.
- D. For Slump Block CMU: Provide Spec Mix #210 mortar to match site perimeter walls.

2.4 GROUT

A. Ingredients:

- 1. Portland Cement: Comply with ASTM C150, type II.
- 2. Aggregate: Provide clean, sharp, well graded aggregate free from injurious amounts of dust, lumps, shale, alkali, surface coatings, and organic matter.
- 3. Water: Provide water free from injurious amounts of acids, alkalis, and organic materials.

B. Mixing:

- 1. Provide "fine grout" or "coarse grout" as designated on the Drawings and in accordance with ASTM C476, with 2000 psi minimum compressive strength at 28 days.
- 2. Proportions:
 - a. For "fine grout," provide one part portland cement to 2-1/4 parts minimum to 3 parts maximum of damp loose sand, with sufficient water to achieve fluid consistency.
 - b. For "coarse grout," provide one part portland cement to 3 parts maximum of damp loose sand to 2 parts coarse aggregate, with sufficient water to achieve fluid consistency.
- 3. "Fluid consistency" is interpreted as meaning as fluid as possible for pouring timely in place without segregation.

- C. Use "fine grout" where called for on the Drawings, where the grout space is less than 3" in its least dimension, and where otherwise required by governmental agencies having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
- B. Coordinate with other trades as required. Refer to Section 09 24 23 for plastering of CMU units.

3.2 INSTALLATION

- A. Do not commence installation of the work of this Section until horizontal and vertical alignment of foundation is within 1" of plumb and the lines shown on the Drawings.
- B. Lay only dry masonry units.
- C. Use masonry saws to cut and fit masonry units. Use full units without cutting wherever possible.
- D. Set units plumb, true to line, and with level courses accurately spaced. Variations from plumb, true, or level of more than 1/8" in 8'-0" in any direction are unacceptable.
- E. Clean the top surface of foundation free from dirt, debris, and laitance, and expose the aggregate prior to start of installing first course.
- F. Accurately fit the units to plumbing, ducts, openings, and other interfaces, neatly patching all holes.
- G. Keep the walls continually clean, preventing grout and mortar stains. If grout does run over, clean immediately.
- H. Avoid the use of less than half size units at corners, jambs and wherever possible.
- I. Provide running bond with vertical joints located at center of masonry units in the alternate course below. Use 3/8" joints.
- J. Do not use chipped or broken units. If such units are discovered in the finished wall, the Architect will require their immediate removal and replacement at no additional cost to the Owner.
- K. Laying Up:
 - 1. Place units in mortar with full shoved bed and head joints.
 - 2. Align vertical cells of hollow units to maintain a clear and unobstructed system of flues.
 - 3. Hold racking to an absolute minimum.
 - 4. Provide cleanouts at the bottom of each cell of hollow units where grout lifts exceed 4'-0". Close the cleanouts after they have been inspected.
 - 5. Bond intersecting walls with masonry units.
 - 6. Cold joints are not permitted.
 - 7. Maintain vertical and horizontal alignment of joints and score lines.

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L. Reinforcement:

1. Provide reinforcement as shown on the Drawings, fully embedded in grout and not in mortar or in mortar joinings.
2. Provide required metal accessories to ensure adequate alignment of steel during grout filling operations.

M. Concave Joints:

1. Maintain uniform joint widths except for minor variations to maintain bond alignment.
2. Mortar joints exposed to weather shall be tooled so that the mortar will be thoroughly compacted and pressed against the edges of the units.
3. All joints on interior and exterior exposed surfaces shall be "raked".
4. Maintain horizontal alignment of joints and score lines.

3.3 GROUTING

A. Perform grouting in strict accordance with the provisions of the governing building code.

1. Solidly fill all vertical cells containing reinforcement or as indicated on the Drawings.
2. Consolidate grout at time of pour by puddling with a mechanical vibrator, filling all cells of the masonry, and then reconsolidating later by puddling before the plasticity is lost.
3. Comply with Note 8 on Structural Drawings of "Concrete Masonry Notes".

3.4 CLEANING

- A. Clean all masonry work at the end of each day's work with a stiff dry brush. Remove all mortar, efflorescence, grout stains and other stains as work progresses.
- B. Inspection and Adjustment: Upon completion of the work of this Section, make a thorough inspection of installed masonry and verify that units have been installed in accordance with the provisions of this Section. Make necessary adjustments.
- C. Clean surfaces of masonry as required for proper application of the specified finishes.
- D. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

SECTION 05 12 23**STRUCTURAL STEEL FOR BUILDINGS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide structural metal as shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 05 31 23: Steel Roof Decking.
 - 2. Section 05 50 00: Metal Fabrications.

1.2 REFERENCES

- A. ANSI/AISC 303 - Code of Standard Practice for Steel Buildings and Bridges.
- B. ANSI/AISC 360 - Specification for Structural Steel Buildings.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- G. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- H. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- J. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.
- K. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- L. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

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- M. AWS D1.1/D1.1M - Structural Welding Code-Steel.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Qualify welding processes and welding operations in accordance with AWS qualification procedures. Comply with AWS code.
- C. Comply with ANSI/AISC 360: Load and Resistance Factor Design.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Producers' or manufacturers' specifications and installation recommendations for the following products, including laboratory test reports and other data required to prove compliance with the specified requirements.
 - 1. Structural steel, including certified copies of mill test reports covering chemical and physical properties showing ASTM conformance.
 - 2. High strength bolts, including nuts and washers.
 - 3. Unfinished bolts and nuts.
 - 4. Structural steel primer paint.
- C. Shop drawings including complete details and schedules for fabrication and shop assembly of members.
 - 1. Include details of cuts, connections, camber, holes, and other pertinent data.
 - 2. Indicate welds by AWS symbols, and show size, type, and length of weld.
 - 3. Provide setting drawings, templates, and directions for installing anchor bolts and other required anchors.
 - 4. Secure field measurements as required.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Delivery and Storage: Deliver materials to the Jobsite and store in a manner to maintain identification and to prevent damage.

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PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel Plates and Shapes, and Bars: Comply with ASTM A36 and ASTM A992 Grade 50 where indicated on the Drawings.
- B. Steel Pipe: Comply with ASTM A53, type E or S, grade B.
- C. Cold-Formed Steel Tubing: Comply with ASTM A500, grade B, $F_y=46\text{ksi}$.
- D. Anchors, Bolts, and Fastenings: Comply with ASTM A307, unless noted otherwise on the Drawings.
- E. Galvanized Structural Steel Sheets: Comply with ASTM A653, coating designation G90.
- F. Galvanizing: Comply with ASTM A123 for assembled products and ASTM A153 for iron and steel hardware.
- G. Electrodes for Welding: Comply with AWS Code, using type and alloy per manufacturer's recommendations.

2.2 FABRICATION

- A. Shop Fabrication and Assembly:
 - 1. Fabricate items of structural steel in accordance with AISC specifications, and as indicated on the approved shop drawings.
 - 2. Provide architectural grade finish for surfaces of members exposed in the final structure free from markings, burrs, and other defects. Grind all exposed welds smooth.
 - 3. All exposed structural steel to be galvanized.
- B. Connections:
 - 1. Provide bolts and washers of types and sizes required for completion of field erection, complying with AISC specifications.
 - 2. Welded Construction: Comply with AWS Code for procedures, appearance, and quality of welds, and methods used in correcting welded work.
 - 3. Form metalwork to required shape, and sizes, with true lines, curves and angles, providing necessary accessories and brackets for assembly and installation.
 - 4. Use concealed fasteners whenever possible.

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C. Holes for Other Work:

1. Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on the approved shop drawings.
2. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut or enlarge by burning.
3. Drill holes in bearing plates.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 ERECTION

- A. Comply with AISC specifications and ANSI/AISC 303.
- B. Anchor Bolts:
 1. Provide anchor bolts, inserts, and other connectors required for securing structural steel to foundations and other in-place work.
 2. Provide templates and other devices necessary for presetting bolts and anchors to accurate locations.
- C. Bases and Bearing Plates: Shop weld to columns and members attached to concrete.
- D. Gas Cutting:
 1. Do not use gas-cutting torches for correcting fabricating errors in the structural framing.
 2. Cutting will be permitted only in secondary members as acceptable to the Architect.
- E. Surveys:
 1. Establish permanent benchmarks necessary for accurate erection of structural steel.
 2. Check elevations of concrete surfaces, and locations of anchor bolts and similar items, before erection proceeds.
- F. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads.

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G. Setting Bases and Bearing Plates:

1. Clean concrete bearing surfaces, bases and bearing plates.
2. Pack grout solidly between bearing surfaces and bases or plate to assure that no voids remain.
3. Provide for steel items bearing on masonry or concrete, as shown. Drill plates to receive anchor bolts.

H. Field Assembly:

1. Set structural frames accurately to the lines and elevations indicated.
2. Align and adjust members forming part of a complete frame or structure before fastening permanently.
3. Clean the bearing surface, and other surfaces which will be in permanent contact, before assembly.
4. Level and plumb individual members of the structure within specified AISC tolerances.
5. Comply with AISC specifications for bearing, adequacy of temporary connections, alignment, and the removal of paint on surfaces adjacent to welds.

3.3 INSPECTION AND TESTS

A. Welding Inspector:

1. When required, Owner will employ and pay for qualified Welding Inspector.
2. Furnish the Architect with a report showing that welding conforms to Drawings and Specifications, and that the quality of the welds has been verified.
3. File reports and test results of all structural steel welds with the applicable building departments.

B. Tests: If required, perform non-destructive weld testing in accordance with AWS standard procedure.

3.4 CLEANING AND PAINTING

- A. Unless otherwise indicated, shop-coat all steel materials not galvanized with corrosion-inhibitive protective primer before delivery to the Site.
- B. Thoroughly clean steel by mechanical means. Wire brush and grind smooth field welds. After cleaning, treat steel materials with vinyl resin primer pre-treatment.

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- C. After cleaning and pre-treatment, prime steel materials with one (1) coat of primer. Do not paint structural steel in the vicinity of a proposed field weld, faying surfaces of bolted joints, or steel to be encased in concrete.
- D. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 05 31 23
STEEL ROOF DECKING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide steel roof deck as shown on the Drawings, as specified herein, and as needed for a complete and proper installation, including the following.
 - 1. Accessories.
 - 2. Formed steel cant strips, eave strips and valley strips.
 - 3. Bearing plates and angles.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 05 12 23: Structural Steel for Buildings.
 - 2. Section 05 50 00: Metal Fabrications.
 - 3. Section 06 10 00: Rough Carpentry.
 - 4. Section 07 61 13: Standing Seam Sheet Metal Roofing.

1.2 REFERENCES

- A. ANSI/SDI AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- E. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.
- F. AWS D1.1/D1.1M - Structural Welding Code-Steel.
- G. AWS D1.3/D1.3M - Structural Welding Code-Sheet Steel.
- H. SDI (Steel Deck Institute) - Roof Deck Design Manual, Second Edition.

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- I. SSPC Paint 15 - (Association for Materials Protection and Performance) Steel Joist Shop Primer/Metal Building Primer.

1.3 PERFORMANCE REQUIREMENTS

- A. Comply with calculated structural characteristics of steel deck according to ANSI/SDI AISI S100.
- B. Design metal deck in accordance with SDI Design Manual.
- C. Refer to Structural Drawings for type of deck.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Shop Drawings: Indicate deck plan, support locations, projections, openings and reinforcement, pertinent details, and accessories.
- C. Product Data: Deck profile characteristics and dimensions, structural properties, and finishes.
- D. Certificates: Certify that products meet or exceed specified requirements.
- E. IAPMO Evaluation Reports: For steel deck.
- F. Submit manufacturer's installation instructions.
- G. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.5 QUALITY ASSURANCE

- A. Installer: Company specializing in performing the work of this Section with minimum (5) years documented experience, approved by manufacturer.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS B2.1.

1.6 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- C. Cut plastic wrap to encourage ventilation and to avoid condensation.
- D. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

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PART 2 - PRODUCTS

2.1 MATERIALS

- A. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 50, G60 zinc coating.
- B. Bearing Plates, Angles: ASTM A36 steel, unfinished, unless indicated otherwise on the Drawings.
- C. Welding Materials: AWS D1.1 and AWS D1.3.
- D. Shop and Touch-Up Primer: SSPC Paint 15, Type 1, red oxide.

2.2 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Flute Closures: Closed cell 16 ga. thick; profiled to fit tight to the deck.
- C. Sump Pans, Sump Plates, Valley Strips, Eave Strips: Fabricated of metal of same type and finish as deck.
- D. Galvanizing Repair Paint: ASTM A780/A780M.

2.3 FABRICATION

- A. Metal Deck: Sheet steel, configured as follows.
 - 1. Span Design: Triple span.
 - 2. Minimum Metal Thickness Excluding Finish: As indicated on Drawings.
 - 3. Nominal Height: fluted profile, as indicated on Drawings.
 - 4. Formed Sheet Width: 24 inches, unless noted otherwise.
 - 5. Side Joints: Per Structural Drawings.
 - 6. Flute Sides: Diagonally ribbed for improved concrete bond.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examination: Verify existing conditions prior to beginning work.
- B. General: Install deck panels and accessories according to applicable specifications and commentary in SDI Design Manual, manufacturer's written instructions, and requirements in this Section.

- C. Bear deck on steel supports with 3 inch minimum bearing. Align and level.
- D. Fasten ribbed deck to steel support members at ends and intermediate supports as indicated in the Structural Drawings.
- E. Weld in accordance with AWS D1.3.
- F. Fasten male/female side laps at 12 inches o.c. maximum, unless noted otherwise in the Structural Drawings.
- G. Reinforce steel deck openings from 6" to 18" in size as indicated on the Drawings.
- H. Install sheet steel closures and angle flashings to close openings between deck and walls, columns, and openings.
- I. Position roof sump pans with flange bearing on top surface of deck. Fasten at each deck flute.
- J. Place metal cant strips in position and fusion weld.
- K. Touch up all damaged areas with field-applied galvanizing paint to match other shop-galvanized areas.

3.2 FIELD QUALITY CONTROL

- A. Owner will engage a qualified independent testing agency to perform field quality-control testing. Refer to pertinent provisions of the Owner's administrative requirements.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional testing and inspecting, at no additional expense to the Owner, will be performed to determine compliance of corrected work with specified requirements.

3.3 CLEANUP AND PROTECTION

- A. Remove all scrap and construction debris from the Site.
- B. Waste Management: Refer to Owner's administrative requirements for recycling requirements.
- C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide miscellaneous metal work items fabricated from metal shapes, which are not part of structural metal or other metal systems, as shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 05 12 23: Structural Steel for Buildings.
 - 2. Section 05 31 23: Steel Roof Decking.
 - 3. Section 09 90 00: Painting and Coating.
 - 4. Landscape Drawings: Metal Fencing and Gates.

1.2 REFERENCES

- A. ANSI ASC A14.3 - American National Standard for Ladders-Fixed-Safety Requirements.
- B. ASME B18.2.1 - Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series).
- C. ASME B18.6.1 - Wood Screws (Inch Series).
- D. ASME B18.6.3 - Machine Screws, Tapping Screws, and Metallic Drive Screws (Inch Series).
- E. ASME B18.21.1 - Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series).
- F. ASTM A27/A27M - Standard Specification for Steel Castings, Carbon, for General Application.
- G. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- H. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings.
- I. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
- J. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

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- K. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
- L. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- M. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
- N. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- O. ASTM A336/A336M - Standard Specification for Alloy Steel Forgings for Pressure and High-Temperature Parts.
- P. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- Q. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- R. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric).
- S. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- T. ASTM A663/A663M - Standard Specification for Steel Bars, Carbon, Merchant Quality, Mechanical Properties.
- U. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- V. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- W. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- X. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- Y. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
- Z. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements.
- AA. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- BB. ASTM F594 - Standard Specification for Stainless Steel Nuts.

- CC. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.
- DD. AWS D1.1/D1.1M - Structural Welding Code-Steel.
- EE. AWS D1.3/D1.3M - Structural Welding Code-Sheet Steel.
- FF. NAAMM - (National Association of Architectural Metal Manufacturers) Metal Finishes Manual.
- GG. NACE No. 3/SSPC-SP 6 - (National Association of Corrosion Engineers) Commercial Blast Cleaning.
- HH. SSPC-PA 1 - (Association for Materials Protection and Performance) Shop, Field, and Maintenance Coating of Metals.
- II. SSPC-SP 3 - (Association for Materials Protection and Performance) Power Tool Cleaning.

1.3 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Welding:
 - 1. Qualify procedures and personnel according to AWS D1.1 and AWS D1.3.
 - 2. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Submit materials list of items proposed to be provided under this Section.
- C. Submit manufacturer's specifications and other data needed to prove compliance with the specified requirements.
- D. Submit Product Data for the Following:
 - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
 - 2. Cast nosings and treads.
 - 3. Paint products.
 - 4. Grout.

- E. Submit manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.
- F. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 - 1. Provide templates for anchors and bolts specified for installation under other Sections.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications.
- B. 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.
- C. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.2 METALS

- A. Steel Plates, Shapes, and Bars: ASTM A36.
- B. Cold-Rolled Carbon Steel Sheets: ASTM A336.
- C. Galvanized Carbon Steel Sheets: G90 zinc coating in accordance with ASTM A653.
- D. Steel Plates to be Bent or Cold-Formed: ASTM A283, grade C.
- E. Steel Bars and Bar-Size Shapes: ASTM A663, or ASTM A36

- F. Cold-Finished Steel Bars: ASTM A108.
- G. Steel Tubing (hot-formed, welded and seamless): ASTM A501.
- H. Steel Tubing (cold-formed, welded and seamless): ASTM A500 or ASTM A36.
- I. Steel Pipe: ASTM A53, Grade A, Schedule 40, black finish unless otherwise noted.
- J. Malleable-Iron Castings: ASTM A47, Grade 32510.
- K. Gray Iron Castings: ASTM A48, class 10.
- L. Aluminum Extrusions: ASTM B221, alloy 6063-T6.
- M. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy to be welded.
- N. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E488, conducted by a qualified independent testing agency.
 - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A47 malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A153/A153M.

2.3 FASTENERS

- A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- C. Lag Bolts: Provide square-head type complying with ASME B18.2.1.
- D. Machine Screws: Comply with ASME B18.6.3.
- E. Wood Screws: Flat head, carbon steel, ASME B18.6.1.
- F. Toggle Bolts: Tumble-wing type, class, and style as needed.
- G. Plain Washers: Round, carbon steel, ASME B18.21.1.
- H. Lock Washers: Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.
- I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load

imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E488, conducted by a qualified independent testing agency.

1. Material: Carbon-steel components zinc-plated to comply with ASTM B633, Class Fe/Zn 5.
2. Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F593 and nuts complying with ASTM F594.

2.4 PAINT

- A. Shop Primers: Provide primers that comply with Section 09 90 00 - Painting and Coating.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.
- C. For repair of galvanizing, use a high zinc-dust content paint.

2.5 GROUT

- A. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C1107, specifically recommended by manufacturer for heavy-duty loading applications.

2.6 CONCRETE FILL

- A. Concrete Materials and Properties: Comply with requirements in Section 03 30 00 for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.7 OTHER MATERIALS

- A. Vertical Steel Ladders: Comply with ANSI A14.3, unless otherwise indicated.
 1. Of widths as indicated, fabricated from mild steel side rails and round steel rungs with square ends headed into rails, and the ends upset.
 2. Ladders shall be anchored at the bottom, top and at intermediate points not more than 5' apart with brackets secured with expansion bolts. Fit rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.
 3. Size brackets to support design loads specified in ANSI A14.3. Brackets shall be of the same size as side rails and, unless otherwise indicated, shall hold the ladder 7" away from the wall.
 4. Provide hot-dip galvanizing for steel ladder.
 5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.

- B. Steel channel and angle frames for doors, duct openings, scuttles, mechanical equipment, louvers, and other frames as shown and detailed of structural shapes shall be neatly fabricated to the exact size required and in accordance with approved shop drawing. Corners shall be neatly joined, welded and ground smooth. Concealed anchors for securing to concrete or masonry shall be welded on the back. Bar stops shall be secured to frames with countersunk flathead screws or plug welded from the back. Wherever required, steel frames shall be prepared to receive the necessary hardware. Where mechanical equipment such as fans, blowers, etc., and sheet metal are shown or specified to be attached to steel frames, the drilling, tapping, and attachment will be performed by trade involved.
- C. Curb angles, corner guards, bumpers, etc. shall be of the sizes and shapes called for and provided with anchors welded to the backs and shall be of the sizes and spacing shown.
- D. Steel Pipe Bollards: Fabricate from Schedule 80 steel pipe and install in the dimensions indicated below and on the Drawings.
1. Apparatus Bay Pipe Bollards: 6" square steel bollards (crash posts) 16 inches beyond the four fold door panels when in the OPEN position to protect thru-beam sensors and their conduit risers, while also providing a visual reference point for the doors' operational area.
 2. Rear Apron Pipe Bollards: 6" square steel bollards adjacent to each vehicle bay door opening to protect the exterior reversing sensors and their conduit risers. Locate bollards 16 inches away from building.
- E. Cast Nosings, Treads, and Thresholds: Fabricate cast aluminum units in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions. Provide units with an integral abrasive finish consisting of aluminum oxide, silicon carbide, or a combination of both.
1. Unless otherwise indicated, provide cross-hatched nosings, 4 inches wide with 1/4-inch lip, for casting into concrete steps.
 2. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
 3. Apply bituminous paint to concealed bottoms, sides, and edges of units set into concrete.
 4. Provide a plain surface texture, unless fluted or cross-hatched surfaces are indicated.
- F. Provide other materials, not specifically described but required for a complete and proper installation, subject to the approval of the Architect.

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2.8 FABRICATION

- A. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Except as otherwise shown on the Drawings or the approved shop drawings, use materials of size, thickness, and type required to produce reasonable strength and durability in the work of this Section.
- C. Shear and punch metals cleanly and accurately. Remove burrs.
- D. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
- H. Remove sharp or rough areas on exposed traffic surfaces.
- I. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- J. Prior to shop painting or priming, properly clean metal surfaces as required for the applied finish and for the proposed use of the item.
- K. On surfaces inaccessible after assembly or erection, apply two coats of the specified primer. Change color of second coat to distinguish it from the first.

2.9 FINISHING

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Steel and Iron Finishes:
 - 1. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
 - a. Exteriors (SSPC Zone 1B): NACE No. 3/SSPC-SP 6.
 - b. Interiors (SSPC Zone 1A): SSPC-SP 3.
 - 2. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1 for shop painting.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 COORDINATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.3 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications 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. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

- D. 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. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
- G. Immediately after erection, clean the field welds, bolted connections, and abraded areas of shop priming. Paint the exposed areas with same material used for shop priming.
- H. Installing Nosings, Treads, and Thresholds:
 - 1. Install with anchorage system indicated to comply with manufacturer's written instructions.
 - 2. Center nosings on tread widths.
 - 3. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.
- I. Installing Pipe Bollards: Anchor bollards in place with concrete footings. Support and brace bollards in position in footing excavations until concrete has been placed and cured. Fill bollards solidly with concrete, mounding top surface.

3.4 MISCELLANEOUS ITEMS

- A. With exceptions as specified, furnish, fabricate, and install all miscellaneous angles, channels, bent plate, clips, anchors, and other miscellaneous metal work required for the complete job as indicated on the Drawings. Such items shall be formed as detailed or if not detailed, as required for the location and purposes served, and in accordance with the applicable provisions specified herein. Furnish and install all miscellaneous metal items not specifically mentioned herein, or in other Sections, but which are customarily considered as part of the Work, the same as if fully specified herein and detailed on the Drawings.

- B. Among other miscellaneous items, the work shall include the furnishing and installation of light steel structural items not noted on the Structural Drawings or called for under Section 05 12 23 - Structural Steel for Buildings, but which are shown on the Architectural Drawings.
- C. Sleeves through masonry or concrete walls and footings shall be furnished and installed, as required, and shall be standard weight steel sections of size sufficient to allow 1/4" clearance all around between the sleeve and item to be inserted. Pipe sleeves in connection with mechanical and electrical work are included in the respective Mechanical and Electrical Sections.
- D. Anchors, brackets, and plates of suitable steel shall be furnished and installed where required in connection with steel, iron, masonry and concrete construction, and shall be complete in all respects.

3.5 CLEANING

- A. Clean and touch-up paint field welds, bolted connections and abraded areas of the shop paint on miscellaneous metals.
- B. Galvanized Surfaces: Clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A780.
- C. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 05 59 12**STAINLESS STEEL KITCHEN FABRICATIONS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide stainless steel kitchen fabrications and galvanized steel counter tops at workrooms where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 06 40 00: Architectural Woodwork.
 - 2. Section 07 92 00: Joint Sealants.
 - 3. Section 08 81 00: Glass Glazing.
 - 4. Section 11 30 13: Residential Appliances.
 - 5. Section 22 00 00: Plumbing.
 - 6. Division 26: Electrical.

1.2 REFERENCES

- A. AISI - American Iron and Steel Institute.
- B. SCAQMD (South Coast Air Quality Management District) Rule 1168 - Adhesive and Sealant Applications.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. Provide stainless steel work fabricated and installed by a shop with a minimum of five (5) years experience in similar work.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Shop Drawings and Product Data:
 - 1. Submit complete, detailed shop drawings and manufacturer's catalog data showing dimensions and rough-in requirements for fabrication and

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installation of each item of kitchen equipment in accordance with the procedure specified, and obtain the approval of the Architect before fabrication is begun. Architect's shop drawing approval does NOT absolve the fabricator of the obligation to ensure that all items fit within their assigned space as designed or intended.

2. Units to be custom fabricated is to be fully detailed and dimensioned to a minimum scale of 3/4 inch to the foot for plan and elevation views and 1-1/2 inch to the foot for sectional views.
3. Include printed statement of VOC content for any adhesives or sealants proposed to be used.

C. Samples:

1. Submit samples of exposed stainless steel finishes, minimum 8" square, for Architect's approval.
2. Submit samples of each sealant proposed to be used, indicating the color range available for each material.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. After completion of fabrication work, apply peel-off adhesive type heavy protection reinforced paper to stainless steel surfaces. Items shall be wrapped, padded and crated when shipped. Dented, scratched, or otherwise defaced stainless steel surfaces shall be removed and replaced.
- C. Delivery and Storage: Deliver and store all items specified herein in dry, protected areas. Keep free of corrosion or other damage. Replace any damaged items, or parts thereof, at no cost to the Owner.
- D. It will be the responsibility of the Installer to protect the fabricated items until they are completely installed and accepted.

1.6 FIELD DIMENSIONS

- A. Sizes given are approximate and are as accurate as can be determined at this time. Verify measurements at the Jobsite prior to fabrication. Stainless steel items must conform to finished building conditions. Where obstructions occur, items must be neatly scribed, fitted to and around same, resulting in a sanitary, homogeneous installation.
- B. Verify all dimensions for proper fit and attachment of all parts.

1.7 GUARANTEE

- A. Submit manufacturers' standard warranties and guarantees in addition to stainless steel subcontractor's standard guarantee.

PART 2 - PRODUCTS

2.1 STAINLESS STEEL FABRICATIONS

- A. Refer to Drawings for construction details.
- B. Stainless Steel: 16 gauge unless noted otherwise, AISI Type 304, hardest workable temper, No. 4 satin finish.
- C. Stainless Steel Counter and Splash:
 - 1. Welding: All shop and field welds shall be continuous and hidden or ground smooth. Exposed welds shall be polished to original finish after grinding with no visible weld lines or buckles. All tops shall be welded into one integral piece.
 - 2. Sink Compartment:
 - a. Sink tops, bowls, drainboards and countertops shall be manufactured of 16 US standard gauge stainless steel Type 304.
 - b. All sinks shall be deep drawn manufacturer's standard sizes or special sizes to be welded seamless. Sink bowls shall have 1-1/2" minimum radius coves at vertical and horizontal corners and a 1/2" radius where bowl joins deck. Sink bowls shall be 19" x 16" x 10" and 19" x 16" x 10" with outlets for garbage disposer and drain specified in Section 22 00 00, and ledge for faucets as required for sink trim as specified.
 - c. Faucets: Refer to Section 22 00 00 - Plumbing.
 - d. Waste Outlets: Refer to Section 22 00 00 - Plumbing.
 - e. Inset Sinks: Construct as specified above for sinks and make an integral part of the top. Tabletop behind sinks shall be punched to receive a deck type combination faucet, unless splash mount has been specified.
 - 3. Drainboards, rims and backs shall be made integrally of one sheet of metal. Where deck meets backsplash, there shall be a 1/2" radius cove, and at the junction of backplash and endsplash, cove shall be 1/2" radius.
 - a. Sink bowls shall be welded integral to drainboards, presenting flush integral seams. No overlapping or soldered edges permitted.
 - b. Raised rim 1/4" high by 3/4" wide shall be provided at the front and ends of all drainboards and counter tops. Drainboards shall have a depressed fan shaped area sloping approximately 1/4" in 18" to sink bowl, assuring positive drainage.

4. Tops shall be 1-1/2" thick with a 1/2" wide return flange at bottom. Backsplashes and endsplashes shall be 1" thick with a 1/2" flange turned down at the wall. "Z" clips shall be provided for attaching backsplash to wall. Provide no-drip marine edge at all countertops.
 5. The entire underside of the top shall be reinforced and bonded with heavy 14 gauge steel channels, 4" web with 3/4" legs. No weld dimples permitted on top surface of stainless steel. Attachments to cabinets shall be provided by wood strips and corner blocks. All stainless steel tops shall be heli-arc butt-fuse welded. All welds shall be ground and polished to invisibility. No soldered seams or lap joints permitted.
 6. One piece welded construction is desirable; a "LAMI-WELD" joint shall be fused in the field, ground and polished to invisibility, free of warpage and distortions.
 7. All undersurfaces shall be coated with heat-resistant underseal for sound deadening and insulation from condensation. Coat with minimum 1/16" thick approved hard-drying mastic material. Spray onto surface after attachment sections are fastened to top. Completely cover and seal.
- D. Drawers: Drawers shall be as indicated on the Drawings.
1. Front of 16 gauge stainless steel double pan construction having a die stamped stainless steel pull.
 2. Drawers shall operate in a pair of double slides equal to Knap and Vogt No. 1500, equipped with metal roller bearing slides and automatic stops, and front recessed pull.
- E. Doors:
1. Cabinet doors to be double cased with 18 gauge No. 4 finish stainless steel exterior and 20 gauge stainless steel interior.
 2. Hinged doors to be mounted on stainless steel piano hinges and to have Engineered Product Co. (EPCO) 592 Heavy-Duty Magnetic Catch. Provide recessed stainless steel pulls.
 3. Side sliding doors to be double cased stainless steel, same as hinged doors, but mount on concealed overhead track with large diameter ball bearing rollers.
 4. Provide adjustable hinges for stainless steel cabinet doors, similar to Blum hinges.
- F. Custom Stainless Steel Utensil Rack: Size as shown. Provide stainless steel utensil hooks at the rate of one for every 6 inches of rack length. Stainless steel to have #4 finish. Fabricate and install per shop drawings, schedules, elevations, details and specifications.

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G. Rolling (Mobile) Cabinets:

1. Casters: Component Hardware Group, T (800) 526-3694, heavy duty swivel plate caster, Model # C31-2051.
2. Magnetic Latches: Adams Magnetic Products, Item # 64C0022, 0.230" o.d., 35 pull pounds, chrome plated.
3. Cabinet Glides: As specified.
4. Cabinet Hinges: Component Hardware Group, T (800) 526-3694, lift-off flag hinge, stainless steel, heavy duty Model # M75-5003.

H. Corner Guards and Wall Caps: Corner guards and chair rails fabricated from 16 gauge diamond plate stainless steel.

I. Cabinet Pulls: Amerock, Model # BP19205-G10, 128 mm dotted pull with nickel finish, welded in place.

2.2 GALVANIZED STEEL COUNTER TOPS

A. Work Bench Top: 18 gauge seamless galvanized sheet metal. Refer to Drawings for bench construction details.

2.3 OTHER MATERIALS

- A. All adhesives and sealants must not exceed the VOC limits set by the SCAQMD Rule 1168.
- B. Silicone Sealant: For damp, wet, and semi-wet locations other than floors where mildew-resistant sealant is required, provide clear sealant, unless otherwise noted. Refer to Section 07 92 00.
- C. Glass at Cabinets and Light Boxes: Refer to Drawings.
- D. Provide other materials, not specifically described but required for a complete and proper installation, subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which this work will be performed. Inspect the location of the stainless steel work to verify job conditions and dimensions. Do not proceed with fabrication and installation until unsatisfactory dimensions and conditions have been corrected in a manner acceptable to the installer.

3.2 FABRICATION AND INSTALLATION

- A. Coordinate with electrical work and provide openings for all outlets and junction boxes.

- B. In general, stainless steel items shall be shop fabricated of one-piece construction, shipped to the Jobsite completely assembled.
 - 1. Units too large to transport or enter the building as one piece shall be constructed so that welded field joints can be made at the Jobsite.
 - 2. Joints welded at the Jobsite shall be equal to the quality of construction specified above.
- C. Polish all exposed surfaces as per Drawings.
 - 1. The grain of polishing shall run in the same direction on horizontal and vertical surfaces of each individual fabricated item, except in cases where table or sink tops join at right angles, where finish of horizontal sections of each piece terminating in a mitered edge shall be acceptable.
 - 2. Where sinks and adjacent drainboards are equipped with backsplash, grain of polish shall be consistent in direction throughout the length of the backsplash and the sink compartment.
- D. Magnetic Latches: Install four (4) per unit as shown.
- E. Set units plumb and true, anchored securely to adjoining work and supporting substrate. Adjust to a level tolerance of 1/16" per ft. maximum variation from level.
- F. Where electrical receptacles occur, cut recesses in walls as required to permit the installation to fit snugly against such walls, leaving no gaps or other openings.
- G. Final Polishing: At completion of installation work, stainless steel surfaces shall be gone over with a portable polishing machine and buffed to perfect surfaces. Painted surfaces shall be carefully gone over and retouched as required.

3.3 SEALING

- A. Attach stationary items including corner guards and chair rails to substrate work, and seal with clear, odorless silicone sealant. Sealant is to be utilized for items as required.
- B. Where stationary items are installed less than 4 inches from walls, provide approved vermin-proof seal between the items and substrate. Generally, this shall consist of an angle of the same material as the item, fastened to the item and the substrate with bolts, with silicone sealer applied between the item and the substrate or other pieces of the item, such as partitions, floors, bases, etc. This shall be fully detailed in shop drawing submittals.

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3.4 CLEANUP

- A. Clean all surfaces, internally and externally. Restore exposed finishes to remove abrasions and other damages. Polish exposed surfaces. Replace work which cannot be successfully restored.
- B. Broom clean and remove from the Site all scraps and debris from this work.
- C. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide and install wood framing, sheathing, furring and other rough carpentry as indicated on the Drawings, specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Structural Drawings: Shop-Fabricated Wood Trusses (Design-Build).
 - 2. Section 06 20 00: Finish Carpentry.
 - 3. Section 06 40 00: Architectural Woodwork.

1.2 REFERENCES

- A. ANSI/AWC FDS - (American National Standards Institute, Inc./American Wood Council) Fire Design Specification for Wood Construction with Commentary, 2024 Edition.
- B. APA (The Engineered Wood Association) - Engineered Wood Construction Guide.
- C. ASME B18.2.1 - Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series).
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- F. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions.
- G. ASTM D5456 - Standard Specification for Evaluation of Structural Composite Lumber Products.
- H. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- I. AWP A T1 - Use Category System: Processing and Treatment Standard.
- J. C.B.C. (California Building Code) 2022 Edition.
- K. C.C.R. (California Code of Regulations) Title 17 - Public Health.

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- L. FS UU-B-790A - Building Paper, Vegetable Fiber: (Kraft, Waterproofed, Water Repellent, and Fire Resistant).
- M. PS 1-95 - Voluntary Product Standard for Construction and Industrial Plywood.
- N. Redwood Inspection Service - Standard Specifications for Grades of California Redwood Lumber.
- O. SCAQMD (South Coast Air Quality Management District) Rule 1168 - Adhesive and Sealant Applications.
- P. WCLIB - West Coast Lumber Inspection Bureau.
- Q. WWPA (Western Wood Products Association) - Western Lumber Product Use Manual.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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.
 - 1. Framers: Experienced in the erection of parallel-strand lumber beams and capable of showing evidence of having successfully completed projects of similar scope and complexity within the previous five (5) years.
- B. Codes and Standards: In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, unless otherwise specifically directed or permitted by the Architect, comply with the following.
 - 1. "Western Lumber Product Use Manual" of the WWPA for selection and use of products included in that manual.
 - 2. "Engineered Wood Construction Guide" of the APA.
 - 3. "Standard Specifications for Grades of California Redwood Lumber" of the Redwood Inspection Service, when Redwood is used.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Shop Drawings: Show materials, member sizes, dimensions, hardware, anchorage and relationship to adjacent materials for prefabricated wood trusses.
- C. Product Data: Manufacturer's technical data and material specifications for parallel-strand lumber (PSL).
- D. Product data highlighting the VOC (Volatile Organic Compound) content of all adhesives and sealants used in this work per the SCAQMD Rule #1168.

- E. For composite-wood products, documentation indicating that products meet maximum formaldehyde emissions limits set by Sections 93120 - 93120.12, Title 17 of the CCR.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Protection: Carefully pile lumber off the ground. Cover all materials and protect from weather.

1.6 WARRANTY

- A. Manufacturer's Limited Lifetime Warranty: Parallel-strand lumber (PSL) products delivered shall be free from manufacturing errors or defects in workmanship and material. The products, when correctly installed and maintained, shall be warranted to perform as designed for the normal and expected life of the building.

PART 2 - PRODUCTS

2.1 GRADE STAMPS

- A. Identify framing lumber by the grade stamp of the WCLIB, or such other grade stamp as is approved in advance by the Architect.
- B. Identify plywood as to species, grade, and glue type by the stamp of the APA.
- C. Parallel-strand lumber (PSL) shall be identified by a stamp indicating the product type and grade, ICC-ES evaluation report number, manufacturer's name, plant number and the independent inspection agency's logo.

2.2 MATERIALS

- A. All composite wood products including hardwood plywood veneer core and hardwood plywood composite core must meet maximum formaldehyde emissions limits set by Sections 93120 - 93120.12, Title 17 of the CCR.
- B. All adhesives and sealants must not exceed the VOC limits set by the SCAQMD Rule 1168.
- C. Provide materials in the quantities needed for the Work shown on the Drawings, and meeting or exceeding the following standards of quality:
 - 1. Minimum lumber grades and stress grades noted on Structural Drawings.
 - 2. All Sill Plates Bearing on Concrete or Masonry: Pressure treated Douglas Fir.
 - 3. Plywood: Standard sheathing with exterior glue. PS 1-95 with factory grading mark, as noted on Drawings.

4. Wood Preservative:
 - a. Preservative chemicals acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - b. Preservative Treatment by Pressure Process: AWPA T1, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA T1 with inorganic boron (SBX).
 5. Rough Hardware:
 - a. Steel Items:
 - 1) Comply with ASTM A36 unless noted otherwise on the Drawings.
 - 2) Use galvanized at exterior locations.
 - b. Machine Bolts: Comply with ASTM A307 unless noted otherwise on the Drawings.
 - c. Lag Bolts: Comply with ASME B18.2.1.
 - d. Nails:
 - 1) Use common except as otherwise noted.
 - 2) Comply with ASTM F1667.
 - 3) Use galvanized at exterior locations.
 6. Building Paper: Kraft paper complying with FS UU-B-790A.
- D. Parallel-Strand Lumber (PSL):
1. Product: Parallam® PSL 2.2E DF by Weyerhaeuser, manufactured to the standards set forth in the ICC Evaluation Service Report No. ESR-1387.
 2. Design: Parallel-strand lumber (PSL) shall be designed to fit the dimensions and loads indicated on the Drawings.
 - a. Fire Rating: Parallel-strand lumber is permitted as a substitute for conventional wood framing in fire-resistive assemblies.
 - 1) PSL shall be sized for the same load-carrying capacity as the sawn lumber specified in the assembly, and its dimensions shall be equal to or greater than those specified for the sawn lumber.
 - 2) The fire resistance of PSL members may be calculated in accordance with Chapter 3 of the ANSI/AWC FDS.

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3. Performance Standards: Products shall be proven by testing and evaluation in accordance with the provisions of ASTM D5456.
4. Adhesives: Waterproof type conforming to ASTM D2559.
- E. Other Materials: Provide other materials, not specifically described but required for a complete and proper installation, subject to the approval of the Architect.

2.3 FABRICATION

- A. Fabrication or cutting shall not proceed until the Architect has approved the submittal package.
- B. Parallel-strand lumber (PSL) shall be produced by the manufacturer in a plant listed in the report referred to above and under the supervision of an approved third-party inspection agency. It shall be manufactured from strands of wood fiber in a continuous process with all strands oriented to the length of the member and then fed into a press in the desired lay-up pattern. All members are to be free of finger or scarf joints or mechanical connections in full-length members.

1. Tolerances (Dry Material):

Finished Length (As Specified): $\pm 1/4"$.

Depth/Width $\leq 3.5"$ Wide / $\leq 14"$ Deep: $\pm 1/8"$.

Depth/Width $> 3.5"$ Wide / $> 14"$ Deep: $\pm 3/16"$.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 GENERAL FRAMING

- A. Workmanship: Carefully lay out, fit, and erect all framing plumb and level. Produce joints which are tight, true, and well nailed, with members assembled in accordance with the Drawings and with pertinent codes and regulations.
- B. General:
 1. In addition to framing operations normal to the fabrication and erection indicated on the Drawings, install all wood blocking, backing, and framing required for the work of other trades.
 - a. For rooms with "industrial shelving", provide 4x continuous backing full-length of the shelving.

2. Bearing studs may be notched to a depth not exceeding 1/4 its width but no closer than 5/8" to the edge of the stud.
3. Non-bearing studs may be notched to a depth not exceeding 40% of its width of bored to 60% of its width but not closer than 5/8" to the edge of the stud.

C. Bracing:

1. Brace all walls not solidly sheathed with 1 x 6 diagonal bracing at each end and at 25 feet on center per C.B.C.
2. Adequately brace structure as erection progresses.

3.3 BLOCKING

- A. Install blocking as required to support items of finish and to cut off concealed draft openings, both vertical and horizontal, between all ceiling and floor areas.
- B. Install solid blocking between joists at points of support and wherever sheathing is discontinuous. Blocking may be omitted where joists are supported on metal hangers.

3.4 ALIGNMENT

- A. On framing members to receive a finished surface, align the finish subsurface to vary not more than 1/8" from the plane of surfaces of adjacent furring and framing members.

3.5 INSTALLATION OF PARALLEL-STRAND LUMBER (PSL)

- A. Refer to Structural Drawings for shop-fabricated wood truss drawings, details and specifications.
- B. Notify manufacturer prior to installation of products to review and discuss product installation guidelines.
- C. Install in accordance with the Drawings and any manufacturer drawings and installation suggestions.
- D. Temporary construction loads that cause stresses beyond design limits are not permitted.
- E. Provide safety bracing keep the parallel-strand lumber (PSL) straight and plumb as required and to assure adequate lateral support for the individual PSL members and the entire system until the sheathing material has been applied.

3.6 INSTALLATION OF PLYWOOD SHEATHING

- A. Placement: Place plywood with face grain perpendicular to supports and continuously over at least two supports, except where otherwise shown on the Drawings.

3.7 FASTENING

A. Nailing:

1. Use only common wire nails of the dimension shown on the nailing schedule, except where otherwise specifically noted on the Drawings.
2. Use untreated steel nails for interior work and concealed framing, and galvanized nails for all exposed exterior work.
3. Use nails long enough to penetrate at least one-half thickness of material.
4. Remove split members and replace with members complying with the specified requirements.

B. Bolts and Screws:

1. Drill holes 1/16" larger in diameter than the bolts being used.
2. Drill straight and true from one side only.
3. For lag screws and wood screws, prebore holes same diameter as root of threads, enlarging holes to shank diameter for length of shank.
4. Screw, do not drive, lag screws and wood screws.

3.8 NAILING SCHEDULE

- #### A.
- Unless otherwise directed by the Architect, comply with the nailing schedule and other fastening requirements contained in the pertinent regulations of governmental agencies having jurisdiction.

3.9 CLEANUP

- #### A.
- Broom clean inside and out, removing from the Site all scraps and other debris left or caused by this work.
- #### B.
- Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 06 20 00
FINISH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Install wood trim and other items not specifically described as being installed under other Sections of these Specifications.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 06 10 00: Rough Carpentry.
 - 2. Section 06 40 00: Architectural Woodwork.
 - 3. Section 10 80 00: Other Specialties.

1.2 REFERENCES

- A. APA (The Engineered Wood Association) - Engineered Wood Construction Guide.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. C.C.R. (California Code of Regulations) Title 17 - Public Health.
- D. NAAWS 4.0 - North American Architectural Woodwork Standards Edition 4.0.
- E. SCAQMD (South Coast Air Quality Management District) Rule 1168 - Adhesive and Sealant Applications.
- F. UL - UL Solutions Inc.
- G. WWPA - (Western Wood Products Association) Western Lumber Product Use Manual.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. The following standards shall apply to the work of this Section, except where more stringent requirements are specified herein:
 - 1. Woodwork Institute - NAAWS 4.0.

2. WWPA Western Lumber Product Use Manual.

C. Provide kiln dried lumber for all finish carpentry.

1.4 SUBMITTALS

A. Comply with pertinent provisions of the Owner's administrative requirements.

B. Product data highlighting the VOC (Volatile Organic Compound) content of all adhesives and sealants used in this work per the SCAQMD Rule #1168.

C. For composite-wood products, documentation indicating that products meet maximum formaldehyde emissions limits set by Sections 93120 - 93120.12, Title 17 of the CCR.

1.5 PRODUCT HANDLING

A. Comply with pertinent provisions of the Owner's administrative requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All adhesives and sealants must not exceed the VOC limits set by the SCAQMD Rule 1168.

B. All composite wood products including hardwood plywood veneer core and hardwood plywood composite core must meet maximum formaldehyde emissions limits set by Sections 93120 - 93120.12, Title 17 of the CCR.

C. Closet Shelving:

1. Shelves 11-1/2" Wide or Less: Douglas Fir-Hemlock, B and Better grade; or Ponderosa Pine, B and Better grade.

2. Shelves Wider Than 11-1/2": 3/4" thick, A-D group 1, interior plywood with 3/8" x 3/4" Douglas Fir or Pine bands on visible edges.

D. Clothes Rods: Douglas Fir, 1-3/8" diameter, with nylon sockets each end and Stanley 7045 steel bracket at center of all rods 48" long or longer.

E. Plywood Panels for Backboards for Telephone and Electrical Components: As required by serving utility, minimum APA C-D Plugged, Exposure 1 Durability Classification, 3/4 inch thick.

1. Fire-Retardant Treated Plywood: If required by authorities having jurisdiction or serving utility, provide fire-retardant treated plywood with a flame spread rating of 25 or less (Class A) when tested in accordance with ASTM E84. Pyro-Guard by Hoover Treated Wood Products Inc., APA C-D, pressure impregnated with interior fire-retardant; each piece shall bear UL classification mark.

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- F. Exposed Hardwood: Natural white maple, stained and finished per Architect.

2.2 OTHER MATERIALS

- A. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
- B. Provide other materials, not specifically described but required for a complete and proper installation, subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 MEASUREMENTS

- A. Verify all dimensions by taking field measurements as required.

3.3 WORKMANSHIP

- A. Produce joints which are true, tight, and well nailed with all members assembled in accordance with the Drawings.
- B. Jointing:
 - 1. Make joints to conceal shrinkage; miter exterior joints; cope interior joints; miter or scarf end-to-end joints.
 - 2. Install trim in pieces as long as possible, jointing only where solid support is obtained.
- C. Fastening:
 - 1. Install items straight, true, level, plumb, and firmly anchored in place.
 - 2. Where blocking or backing is required, coordinate as necessary with other trades to ensure placement of required backing and blocking in a timely manner.
 - 3. Nail trim with finish nails of proper dimension to hold the member firmly in place without splitting the wood.
 - 4. On exposed work, set nails for putty.
 - 5. Screw, do not drive, wood screws; except that screws may be started by driving and then screwed home.

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3.4 INSTALLATION OF OTHER ITEMS

- A. Install items in strict accordance with the Drawings, and the recommended methods of the manufacturer as approved by the Architect, anchoring firmly into position at the prescribed location, straight, plumb, and level.

3.5 FINISHING

- A. Sandpaper finished wood surfaces thoroughly as required to produce a uniformly smooth surface, always sanding in the direction of the grain; except do not sand wood which is designed to be left rough.
- B. No coarse grained sandpaper mark, hammer mark, or other imperfection will be accepted.
- C. Prepare all woodwork installed hereunder by cleaning and sanding as required to receive finishes specified in Section 09 90 00 - Painting and Coating.

3.6 MISCELLANEOUS SPECIALTIES INSTALLATION

- A. Install all items specified under Section 10 80 00 which are not to be installed by the manufacturer, supplier or under other Sections of the Specifications.
- B. Install in accordance with the Drawings, the manufacturer's printed installation instructions, or any additional requirements specified.
- C. Securely fasten all wall-mounted items to solid backing or blocking.

3.7 CLEANING UP

- A. Keep the premises in a neat, safe, and orderly condition at all times during execution of this portion of the Work, free from accumulation of sawdust, cut-ends, and debris.
- B. Sweeping:
 - 1. At the end of each working day, and more often if necessary, thoroughly sweep surfaces where refuse from this portion of the Work has settled.
 - 2. Remove the refuse to the area of the job site set aside for its storage.
 - 3. Upon completion of this portion of the Work, thoroughly broom clean all surfaces.
- C. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

SECTION 06 40 00
ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide architectural woodwork where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 06 10 00: Rough Carpentry - Wood blocking, grounds and support framing.
 - 2. Section 06 20 00: Finish Carpentry - Interior carpentry exposed to view that is not specified in this Section.
 - 3. Section 07 92 00: Joint Sealants.
 - 4. Section 08 71 00: Door Hardware.
 - 5. Section 09 21 16: Gypsum Board Assemblies.
 - 6. Section 09 90 00: Painting and Coating.

1.2 REFERENCES

- A. C.C.R. (California Code of Regulations) Title 17 - Public Health.
- B. NAAWS 4.0 - North American Architectural Woodwork Standards Edition 4.0.
- C. SCAQMD (South Coast Air Quality Management District) Rule 1168 - Adhesive and Sealant Applications.
- D. Woodwork Institute - (CCP) Certified Compliance Program.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. Codes and Standards:
 - 1. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, comply with NAAWS 4.0 for the grades specified.

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- a. If provisions of the grade specified are in conflict with, or modified by the Drawings and/or Specifications, the modifications shall govern.
2. Before delivery to the jobsite the millwork supplier shall provide a Woodwork Institute Certified Compliance Certificate indicating the millwork products being supplied for this Project, and certifying that these products fully meet all the requirements of the grade or grades specified.
3. After installation is complete the millwork supplier shall provide a Woodwork Institute Certified Compliance Certificate indicating and certifying that the installation of the provided products fully meets all the requirements of the grade or grades specified.
4. Each elevation of casework and each laminated plastic top and each solid surface top shall bear a Woodwork Institute Certified Compliance Label.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data:
 1. Materials list of items proposed to be provided under this Section.
 2. Product data highlighting the VOC (Volatile Organic Compound) content of all adhesives and sealants used in this work per the SCAQMD Rule #1168.
 3. For composite-wood products, documentation indicating that products meet maximum formaldehyde emissions limits set by Sections 93120 - 93120.12, Title 17 of the CCR.
 4. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades. Provide a Woodwork Institute Certified Compliance Label on the first page of the shop drawings.
 5. Samples of the proposed materials.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Comply with Section 13 of NAAWS 4.0.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All adhesives and sealants must not exceed the VOC limits set by the SCAQMD Rule 1168.

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- B. All composite wood products including hardwood plywood veneer core and hardwood plywood composite core must meet maximum formaldehyde emissions limits set by Sections 93120 - 93120.12, Title 17 of the CCR.
- C. Fabricate architectural woodwork to "custom grade" standards of the NAAWS 4.0. Cabinets shall be Type I multiple self-supporting units, modular casework, Type A frameless flush overlay door and drawer front construction.
- D. Glass for Display Cabinets: 1/4 inch, clear tempered float.
- E. Finishing: Mill finish architectural woodwork in accordance with pertinent provisions of Section 09 90 00 of these Specifications. Comply with NAAWS 4.0 Section 5 requirements.

2.2 CASEWORK

- A. Shop fabricate casework as shown on the Drawings.
- B. Comply with NAAWS 4.0 Section 10 requirements.
- C. Provide Formica laminated plastic for locker, cabinet and shelving faces, drawer fronts and exposed ends, including both sides of doors and all exposed edges. Color and pattern as approved by Architect.
- D. Install the finish hardware supplied under Section 08 71 00 of these Specifications.
- E. Gaps between doors, drawers, and false fronts shall be equal throughout each elevation, and shall not exceed 1/8".

2.3 COUNTER TOPS

- A. Types and Sizes: Shop fabricate counter tops and splashes to the types and dimensions shown on the Drawings.
- B. Counter tops and splashes shall be Formica solid acrylic, in colors and patterns selected by the Architect from standard colors and patterns of the approved manufacturer. Verify sink installation.

2.4 OTHER MATERIALS

- A. Interior Standing and Running Trim: Wood species and cut as selected by Architect. Comply with NAAWS 4.0 Section 6 requirements.
- B. Provide other materials and miscellaneous items, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FIELD MEASUREMENTS

- A. Take necessary measurements in the field to assure proper dimensions for the work of this Section.

3.3 FABRICATION

- A. Fabricate the work of this Section in strict accordance with the approved shop drawings and the referenced standards, anchoring all items firmly into position.

3.4 INSTALLATION

- A. Install the work of this Section in strict accordance with the approved shop drawings and the referenced standards, anchoring all items firmly into position.

3.5 CLEANING UP

- A. Keep the premises in a neat, safe, and orderly condition at all times during execution of this portion of the Work, free from accumulation of sawdust, cut-ends, and debris.
- B. At the end of each working day, and more often if necessary, thoroughly sweep surfaces where refuse from this portion of the Work has settled.
- C. Remove the refuse to the area of the job site set aside for its storage.
- D. Upon completion of this portion of the Work, thoroughly broom clean all surfaces.
- E. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 07 14 16**COLD FLUID-APPLIED WATERPROOFING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide a single component moisture cured, modified polyurethane waterproofing membrane on planter and retaining walls not part of building walls.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 03 30 00: Cast-in-Place Concrete.
 - 2. Section 04 22 00: Concrete Unit Masonry.

1.2 REFERENCES

- A. ASTM C836/C836M - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
- B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
- C. ASTM D471 - Standard Test Method for Rubber Property-Effect of Liquids.
- D. ASTM D1653 - Standard Test Methods for Water Vapor Transmission of Organic Coating Films.
- E. ASTM D2240 - Standard Test Method for Rubber Property-Durometer Hardness.
- F. ASTM D2369 - Standard Test Method for Volatile Content of Coatings.
- G. EPA Method 24 - Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Elastomeric waterproofing system shall be manufactured by a firm with a minimum of twenty (20) years experience in the production of elastomeric waterproofing.
- B. Installer Qualifications: A firm which has at least five (5) years documented experience in work of the type required by this Section, and is qualified in writing by the manufacturer to install the specified products.
- C. Pre-Installation Conference and Inspection: After review of submittals but before starting installation of the work of this Section, conduct a meeting at the Project site attended by the Owner's Project Manager, Architect, waterproofing applicator, and a technical representative of the elastomeric waterproofing material manufacturer. The

waterproofing applicator and material manufacturer's technical representative shall inspect the substrates to receive work of this Section and report defective conditions to Owner's Project Manager and Architect.

- D. Manufacturer's Representative: Provide arrangements necessary to have a trained representative of the manufacturer visit the Project site on a weekly basis during elastomeric waterproofing work to review installation procedures.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Submit manufacturer's product data including complete installation instructions and material safety data sheets (SDS) for each product indicated.
- C. Shop Drawings: Submit shop drawings indicating each condition of the work. Indicate all adjoining work, methods of adhesion, attachment, and related conditions.
- D. Samples: Submit samples of fully cured elastomeric membrane waterproofing on flat plywood board, approximately 2 ½" x 4" illustrating color and texture.
- E. Certificates: Submit a certificate stating applicator is certified by the elastomeric waterproofing material manufacturer and, upon completion, submit a certificate stating that elastomeric waterproofing systems have been installed in conformance with reviewed submittals and manufacturer's recommendations.
- F. Experience Record: Submit a list of at least five (5) installations on which each of the materials and systems proposed for installation have been in satisfactory service for at least five (5) years.
- G. Submit manufacturer's maintenance manual.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Deliver materials, except bulk material, in manufacturer's unopened containers fully identified with manufacturer's name, trade name, type, class and grade. Each container shall be identified with material name, date of manufacturer and batch number.
- C. Store materials in unopened containers. Store above grade and under cover, protect from damage.

1.6 PROJECT CONDITIONS

- A. Install suitable impervious type masking to preclude staining of surfaces to remain exposed wherever elastomeric waterproofing abuts or laps on to other finish surfaces, and provide additional protection as necessary to supplement masking; cover entire area of building subject to damage or staining.

- B. Protect adjacent work during installation of work of this Section.
- C. Install work of this Section, only in dry weather and when temperature of surfaces to receive waterproofing are above 40° F and below 100° F.
- D. Do not install any materials when water in any form is present on the surface or if materials are wet. Install coating materials when rain is not anticipated within 8 hours of application.

1.7 WARRANTY

- A. **Manufacturer's Warranty:** Manufacturer's standard warranty in which waterproofing manufacturer agrees to furnish waterproofing material to repair or replace those materials installed according to manufacturer's written instructions that exhibit material defects or otherwise fail to perform as specified under normal use within warranty period specified.
 - 1. **Access for Repair:** Owner shall provide unimpeded access to the Project and the waterproofing system for purposes of testing, leak investigation, and repair, and shall reinstall removed cladding and overburden materials upon completion of repair.
 - 2. **Warranty Period:** Five (5) years after date of Substantial Completion.
- B. **Installer's Warranty:** Submit 2 executed copies of the Installer's five (5)-year warranty on a form acceptable to the Owner, covering work of this Section, including all components of waterproofing system, signed and countersigned by Installer and Contractor.

1.8 EXTRA MATERIALS

- A. Upon completion of the work of this Section, deliver to the Owner an extra stock equaling five (5) gallons of each type of waterproofing used in the Work, tightly sealed in unopened containers. Clearly label each container with project name and type of waterproofing.

PART 2 - PRODUCTS

2.1 ELASTOMERIC MEMBRANE WATERPROOFING SYSTEM

- A. **Manufacturer:** Holcim Solutions and Products US, LLC, 26 Century Boulevard, Suite 205, Nashville, Tennessee 37214, (800) 878-7876, holcimpacpoly.com.
- B. **Pacific Polymers® Elasto-Deck BT DG** as a standard of quality, conforming to the following: Cold applied liquid, moisture-cured, monolithic polyurethane elastomeric waterproofing membrane, complying with ASTM C836.
 - 1. **Application:**
 - a. 60 mils thick - smooth surfaces.
 - b. 90 mils thick - rough surfaces.

C. Physical Properties:

	Property	Typical Results	Test Method
1.	Consistency	Thixotropic	Visual Observation
2.	Color	Black	
3.	Weight Per Gallon	7.8 +/- 0.2	Density Cup
4.	Solid Content (%)		
	Weight Volume	92 +/-2 90 +/- 2	ASTM D2369
5.	VOC Content (g/l)	75	EPA Method 24
6.	Viscosity (cps)	250 - 450	Brookfield Viscometer
7.	Recoat Time (@77F; 50% R.H.)	16 - 24 hrs	
8.	Hardness (Shore A Durometer)	35 +/- 5	ASTM D2240
9.	Tensile Strength (psi)	250 +/- 50	ASTM D412
10.	Elongation @ Break (%)	500 +/- 50	ASTM D412
11.	Flash Point (F)	120F	Pensky Martens CC
12.	Water Absorption (7 days @ RT)	1.76%	ASTM D471
13.	Perm Rating		ASTM D1653
14.	Temperature Service Range	-50°F - 180°F	

2.2 RELATED MATERIALS

- A. Detail Fabric: Tie-Text Polyester Fabric.
- B. Substrate Primer: DECKTHANE Primer or Elasto-Poxy Primer VOC.
- C. Sealant: PERMATHANE® SM7120 PU, single-component, moisture-cured sealant.
- D. Backer Rod: Closed-cell Polyethylene rod, such as Ethafoam.
- E. Protection Course: GreenGuard PB4 or J-Drain 700.

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Concrete:
 - 1. Concrete surfaces shall be trowel finished followed by a light brooming, left free of loose particles, ridges, projections, voids and droppings that would interfere with the application of the coatings.
 - 2. Concrete surfaces shall be water cured in lieu of curing compounds for a minimum of 28 days. If curing compounds are furnished, they shall be pre-approved by the manufacturer of the waterproofing system.
- B. All substrate conditions and surfaces shall be subject to inspection and acceptance by the manufacturer and installer. Do not proceed with work until unsatisfactory conditions have been corrected. Commencing of waterproofing work shall constitute acceptance.

3.2 PREPARATION

- A. All surfaces must be broom clean, dry, sound and free of voids, bug holes, rock pockets, honeycombs, protrusions, excessive roughness, foreign matter, frost, ice and other contaminants which may inhibit application or performance of the waterproofing membrane system.
- B. Concrete: All surfaces to receive elastomeric waterproofing system shall be completely cleaned by sandblasting or blastac.
- C. Cracks and Control Joints:
 - 1. Except for non-moving shrinkage cracks, all other cracks and joints must be sealed with sealant and fabric reinforced according to manufacturer's recommendations.
 - 2. Large cracks, 1/16" and over, shall be routed out as required by the manufacturer and sealed with an approved elastomeric sealant. Apply sealant to inside area of cracks only. Do not install on concrete deck surfaces.
 - 3. Seal secondary control and expansion joints with sealant and backer rod as recommended in the installation specifications of the elastomeric membrane waterproofing.

3.3 PROTECTION

- A. Protect building from damage resulting from spillage, dripping and dropping of materials. Prevent materials from entering and clogging drains and waterways.

- B. Protect the work of this Section until Substantial Completion.

3.4 INSTALLATION

- A. Install Elastomeric membrane waterproofing in accordance with manufacturer's printed instructions except as hereinafter specified. Coordinate the work so the complete membrane is installed in a continuous operation, and that all areas where installation has started, per coat, are completed the same working day.

- B. Elastomeric Membrane Waterproofing - 60 Mils thickness/Smooth Surface Installation:

1. All cracks 1/16" and over must be V-Grooved and filled with polyurethane sealant and installed according to manufacturer's recommendations.
2. At intersections of membrane and horizontal and vertical walls, corners, columns, pipes and other penetrations, caulk a 3/8" - 1/2" fillet bead at the meeting angle using polyurethane sealant. Allow for a minimum overnight cure of the sealant before applying fabric reinforcement embedded in a stripe coat of waterproofing applied at 40 - 42 square feet per gallon (35 mils WFT).
3. After detail work is completed allow to cure a minimum of "Overnight" (12-16 hours). All surface areas to receive membrane are to be primed.
4. Apply by, roller, trowel, brush or squeegee the first coat of waterproofing membrane at a rate of 40 - 42 square feet per gallon (35 mils WFT).
5. After an overnight cure (16-24 hours), apply a second coat of waterproofing at the same 40 - 42 square feet per gallon (35 mils WFT).

- C. Elastomeric Membrane Waterproofing - 90 Mils thickness/Rough Surface Installation:

1. All cracks 1/16" and over must be V-Grooved and filled with polyurethane sealant and installed according to manufacturer's recommendations.
2. At intersections of membrane and horizontal and vertical walls, corners, columns, pipes and other penetrations, caulk a 3/8" - 1/2" fillet bead at the meeting angle using polyurethane sealant. Allow for a minimum overnight cure of the sealant before applying fabric reinforcement embedded in a stripe coat of waterproofing applied at 40 - 42 square feet per gallon (35 mils WFT).
3. After detail work is completed allow to cure a minimum of "Overnight" (12-16 hours). All surface areas to receive membrane are to be primed.
4. Apply three coats at 45 square feet per gallon per coat, allowing for an overnight cure (16 - 24 hours) between coats.

3.5 INSPECTION

- A. The wet film thickness of each coat shall be checked during application by averaging numerous measurements taken with a film gauge and thickness shall be sufficient that when cured the dry film thickness will be as specified herein.

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- B. All surfaces coated shall be visibly checked to ensure areas have not been missed and all holidays in the film are repaired.
- C. All coating work shall be subject to inspection at any time to assure a strict compliance with the manufacturer's recommendations. Test areas shall be cut whenever requested by the manufacturer's technical representative to verify conformance to the Specifications. Any unsatisfactory area shall be remedied by the applicator.

3.6 PROTECTION COURSE

- A. Install protection board on cured membrane after testing, without delay, so that the period of exposure shall be minimized.

3.7 CLEAN UP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.
- B. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 07 21 16
BLANKET INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide building insulation where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to the following.
 - 1. Thermal Insulation for wall studs, rafter spaces and elsewhere as indicated.
 - 2. Sound attenuation insulation for sound control within interior wall partitions and elsewhere as indicated.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 06 10 00: Rough Carpentry.
 - 2. Section 07 52 16.12: Hot-Mopped Styrene-Butadiene-Styrene Modified Bituminous Membrane Roofing.
 - 3. Section 07 61 13: Standing Seam Sheet Metal Roofing.
 - 4. Section 07 62 00: Sheet Metal Flashing and Trim.
 - 5. Section 09 21 16: Gypsum Board Assemblies.

1.2 REFERENCES

- A. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- B. ASTM C1320 - Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C.
- E. UL - Underwriters Laboratories.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. Upon completion of this portion of the Work, complete and post a certificate of insulation compliance in accordance with pertinent requirements of governmental agencies having jurisdiction.
- C. Installers: Trained applicators approved by manufacturer.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Provide data on product characteristics, performance criteria, and limitations.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Manufacturer: Johns-Manville International, Inc. (JM), PO Box 5108, Denver, CO 80217. ASD. Tel: (800) 654-3103, www.jm.com.

2.2 FORMALDEHYDE-FREE BATT INSULATION

- A. Formaldehyde-Free Foil Faced Glass-Fiber Batt Insulation: JM Formaldehyde-Free Foil Faced Batts; ASTM C665, Type III, Class B, Category 1 with maximum flame-spread and smoke-developed indices of 75 and 150, respectively.

- 1. Refer to Drawings for thicknesses and R-values.

2.3 SOUND ATTENUATION INSULATION

- A. Fire-Rated Sound Attenuation Insulation: ASTM C665, Type I, with a glass fiber mat septum for one (1) hour rated partitions; non-faced glass fiber acoustical insulation, panel width to fit stud and truss spaces by thickness indicated on Drawings, UL labeled, fire hazard classification of 25/50 or less when tested in accordance with ASTM E84. Refer to Drawings for R-values.

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- B. Sound Attenuation Insulation: ASTM C665, Type I and ASTM E136; non-faced glass fiber acoustical insulation, panel width to fit stud and truss spaces by thickness indicated on Drawings, surface burning characteristics complying with ASTM E84. Refer to Drawings for R-values.

2.4 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for complete and proper installation, subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
- B. Remove, or protect against, projections in construction framing which may damage or prevent proper insulation.

3.2 INSTALLATION, GENERAL

- A. Install the work of this Section in strict accordance with the original design, requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedure, anchoring all components firmly into position.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
- B. Tape ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

- C. Install acoustic insulation at interior walls spaces where indicated on Drawings, without gaps or voids. Do not compress insulation.
- D. Install glass-fiber blankets in cavities formed by framing members according to the following requirements:
 - 1. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 - 2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
- E. For wood-framed construction, install mineral-fiber blankets in accordance with ASTM C1320 and as follows:
 - 1. With faced blankets having stapling flanges, secure insulation by friction fit inset or face stapling flanges to sides of framing members.
 - 2. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to produce airtight installation after concealing finish material is in place.

3.4 CLEANUP

- A. Remove all scraps and debris from the site and thoroughly broom clean all surfaces inside and out.
- B. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 07 52 16.12**HOT-MOPPED STYRENE-BUTADIENE-STYRENE
MODIFIED BITUMINOUS MEMBRANE ROOFING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Supply and install modified bitumen membrane roofing with protective covering, base flashings, cant strips and counter flashings where indicated on Drawings, as specified herein, and as needed for a complete and proper installation.
 - 1. Modified Bitumen Roofing System: Four-ply hot mopped bitumen mineral surfaced roofing system.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 05 31 23: Steel Roof Decking.
 - 2. Section 06 10 00: Rough Carpentry.
 - 3. Section 07 21 16: Blanket Insulation.
 - 4. Section 07 61 13: Standing Seam Sheet Metal Roofing.
 - 5. Section 07 62 00: Sheet Metal Flashing and Trim.
 - 6. Section 07 72 33: Roof Hatches.
 - 7. Section 07 92 00: Joint Sealants.
 - 8. Section 22 00 00: Plumbing.

1.2 REFERENCES

- A. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
- B. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance near Ambient Temperature Using a Portable Solar Reflectometer.
- C. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
- D. ASTM D312/D312M - Standard Specification for Asphalt Used in Roofing.
- E. ASTM D4601/D4601M - Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.

- F. ASTM D6162/D6162M - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.
- G. FM 1-28 - (Factory Mutual Insurance Company) Property Loss Prevention Data Sheet - Wind Design.
- H. NRCA (National Roofing Contractors Association) - Roofing and Waterproofing Manuals.
- I. UL - (UL Solutions) Fire Hazard Classifications.

1.3 PERFORMANCE REQUIREMENTS

- A. Energy Performance: Provide roofing system with Solar Reflectance minimum of 0.70 when calculated according to ASTM C1549 and emissivity of at least 0.90 per ASTM C1371 based on testing identical products by a qualified testing agency.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Experienced Installer ("Roofer") to perform modified bitumen roofing work who has specialized in the installation of work similar to that required for this Project and who is approved by system manufacturer.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with five (5) years documented experience.
- C. Source Limitations: Obtain all components from the single source roofing manufacturer guaranteeing the roofing system. All products used in the system shall be labeled by the single source roofing manufacturer issuing the guarantee.
- D. Perform work in accordance with NRCA Roofing Manual, NRCA Waterproofing Manual, and manufacturer's instructions. Maintain one copy of each document on Site.
- E. Mechanical and electrical subcontractors shall coordinate their work with roofing subcontractor. Flashing, counter-flashing and through-roof penetration flashing shall be performed by roofing subcontractor in accordance with manufacturer's recommendations.
- F. Workmanship Liability: Information or assistance provided by the Owner's Inspector does not relieve the roofing installer of strict compliance with Specifications, Drawings and roofing material manufacturer's requirements.
- G. Notify Owner's Inspector 72 hours prior to starting roofing installation and each time work is to be performed.

1.5 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.

- B. Shop Drawings: Indicate setting plan for layout of seams, direction of laps, base flashing details.
- C. Product Data:
 - 1. Membrane materials, base flashing materials, and protective coating.
 - 2. Cool Roof Rating Council rating stamp for the material of this Section.
 - 3. Product data highlighting the emissivity rating of the material of this Section when tested in accordance with ASTM C1371.
- D. Verification Samples: Provide for each product specified.
- E. Manufacturer's Installation Instructions.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Manufacturer's Field Reports: Submit under provisions of the Owner's administrative requirements.
- H. Prior to roofing system installation, provide a copy of the Guarantee Application Confirmation document issued by roofing system manufacturer indicating that the project has been reviewed for eligibility to receive the specified guarantee and registered.
- I. Provide an Asphalt Confirmation Number (ACN) that indicates that the asphalt was registered with the approved asphalt source.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable code for roof assembly fire hazard requirements.
- B. UL Listing: Class A Fire Hazard Classification.
- C. FM Listing: Roof Assembly Classification Class 1 Construction, wind uplift requirement of 1-90, in accordance with FM 1-28.

1.7 PRE-INSTALLATION CONFERENCE

- A. Approximately two weeks prior to scheduled commencement of modified bitumen roofing installation and associated work, meet at Project site to review Specifications and to walk deck.
- B. Installer, installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of rooftop units and other work in and around roofing that must precede or follow roofing work (including mechanical work if any), Architect, Owner's Inspector, Contractor and others directly concerned with performance of the work are to be in attendance.
- C. Review installation procedures and coordination required with related work.

1.8 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Deliver products in manufacturer's original containers, dry, undamaged, seals and labels intact.
- C. Store products in weather protected environment, clear of ground and moisture.
- D. Stand roll materials on end.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Asphalt temperature should be at the Equiviscous Temperature of $\pm 25^{\circ}$ F, at the point of application.
- B. Do not apply roofing membrane to damp or frozen deck surface.
- C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.
- D. Temporary Roofing: When adverse job conditions or weather conditions prevent permanent roofing and associated work from being installed in accordance with requirements, and Contractor determines that roofing cannot be delayed because of need for job progress or protection of other work, proceed with installation of temporary roofing. Engage roofing Installer to provide temporary roofing and to remove it prior to proceeding with permanent roofing work.

1.10 WARRANTY

- A. Manufacturer's Warranty: Submit executed copy of roofing manufacturer's No Dollar Limit Roofing System Guarantee, signed by an authorized representative of the modified bitumen roofing system manufacturer, on a form that is acceptable to the Owner, for not less than twenty (20) years after date of Substantial Completion.
 - 1. Single-source special guarantee includes roofing plies, base flashings, liquid applied flashing, roofing membrane accessories, and other approved single-source components of roofing system marketed by the manufacturer.
- B. Installer's Warranty: Submit two (2) executed copies of the Installer's two (2)-year warranty on a form acceptable to the Owner, covering work of this Section, including all components of roofing system, signed and countersigned by Installer (Roofer) and Contractor.

1.11 EXTRA MATERIALS

- A. Provide an additional 20 lineal feet of installed roof walkway for Owner's use in roof maintenance.

- B. Furnish extra materials packaged with protective covering for storage and identified with labels clearly describing contents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Johns Manville.
- B. GAF Materials Corporation.

2.2 MATERIALS

- A. Membrane Roofing System: Johns Manville 4CND-HA-CR or equal by GAF.
- B. Sheathing Paper: Red-rosin type, minimum 3 lb/100 sq. ft.
- C. Base Felt: ASTM D4601, Type II, asphalt-impregnated and coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides, Johns Manville PermaPly 28 or equal by GAF, 1 layer.
- D. Intermediate Felts: Asphalt-coated fiberglass ply felt, Johns Manville GlasPly Premier or equal by GAF, 2 layers.
- E. Cap Sheet: Johns Manville DynaKap FR T1 CR G or equal by GAF, bearing a Cool Roof Rating Council rating label and achieving an emissivity of at least 0.9 per ASTM C1371 testing procedure. Fire-resistant, premium, fiberglass/polyester composite reinforced, SBS (Styrene-Butadiene-Styrene) modified bitumen cool roof cap sheet, 1 layer, conforming to ASTM D6162, Type I, Grade G.
- F. Asphalt: Trumbull asphalt or another manufacturer approved asphalt.
 - 1. Up to 1/2" incline per foot, 190° F, Type III, Steep, 69 pounds total weight, conforming to ASTM D312.
 - 2. 1/2" to 3" incline per foot, 220° F, Type IV, Special Steep, 69 pounds total weight, conforming to ASTM D312.
- G. Asphalt Primer: ASTM D41, Type II. JM Asphalt Primer or equal by GAF.
- H. Base Flashings: Elastomeric, modified bitumen flashing sheet incorporating a flexible fiber glass and polyester composite mat in a blend of SBS (Styrene-Butadiene-Styrene) rubber and asphalt. DynaFlex CR G by Johns Manville, or equal by GAF.
- I. Liquid Applied Flashing: A liquid and fabric reinforced flashing system created with a stitch bonded polyester scrim and a two-component, moisture cured, elastomeric, liquid applied flashing material, consisting of an asphalt extended urethane base material and an activator. PermaFlash System by Johns Manville, or equal by GAF.

- J. Sealants: Refer to Section 07 92 00.
- K. Traffic Pads: Bituminous composition type, Johns Manville DynaTred Roof Walkway or equal by GAF, 32" x 32" size, color as selected by Architect.
- L. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secured, and verify adjacent roof members do not vary more than 1/4 inch in height.
- C. Verify deck surfaces are dry and free of snow or ice.
- D. Confirm dry deck by moisture meter with 12 percent moisture maximum.
- E. Verify roof openings, curbs, pipes, conduit, sleeves, ducts, and vents through roof are solidly set, and wood cant strips, wood nailing strips and reglets are in place.

3.2 SHEATHING PAPER INSTALLATION

- A. Over wood board decks, one ply of sheathing paper must be used under the base felt, next to the deck.
- B. Loosely lay sheathing paper in a single layer over all wood deck areas, side and end lapping each sheet a minimum of 2 inches and 6 inches, respectively.
- C. Seal side and end laps with tape.

3.3 MEMBRANE APPLICATION

- A. Apply base felt, intermediate felts and cap sheet in accordance with manufacturer's instructions.
- B. On roof decks with slopes up to 1/2" per foot, the roofing felts and modified bitumen sheets may be installed either perpendicular or parallel to the roof incline.
- C. Apply all felts so that they are firmly and uniformly set, without voids, into the hot asphalt. All felt edges shall be well sealed. The asphalt shall be applied just before the felt, at a nominal rate of 23 pounds per square. Asphalt temperature should be at the Equiviscous Temperature (EVT) of $\pm 25^{\circ}$ F at the point of application.

- D. For modified bitumen sheets, the asphalt temperature shall be at a minimum of 400°F when the sheet is set into it for maximizing the bonding of the modified bitumen sheet.
- E. Cap sheets must be allowed to relax in an unrolled position prior to installation.

3.4 FLASHINGS AND ACCESSORIES

- A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions.
 - 1. Prime substrates with asphalt primer if required by roofing system manufacturer.
- B. Secure to nailing strips and reglets at 4 inches oc.
- C. Seal flashings and flanges of items penetrating or protruding through the membrane.
- D. Coordinate installation of roof drains, curbs, and related flashings.
 - 1. Roof Drains: Flash drain using liquid applied flashing system. Clamp roofing membrane, flashing, and stripping into roof-drain clamping ring.
 - a. Install stripping according to roofing system manufacturer's written instructions.
 - 2. Flash all penetrations using liquid applied flashing system.

3.5 ROOF WALKWAY INSTALLATION

- A. Use same asphalt recommended for use with membrane application.
- B. Leave a minimum of 1" open spaces in all directions between walkway boards to provide for drainage of the roofing system.
- C. Ensure that all four corners of each piece are fully and firmly set prior to walking on the board.

3.6 FIELD QUALITY CONTROL

- A. Field inspection will be performed under provisions of the Owner's administrative requirements.
- B. Correct identified defects or irregularities.
- C. Upon completion of work, test for leaks by plugging the drains or damming areas and filling with three inches of water. Allow water to stand for 24 hours and inspect for leakage. Make necessary adjustments to stop leakage and retest until watertight.

3.7 CLEANING

- A. In areas where finished surfaces are soiled by work of this Section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.
- B. Repair or replace defaced or disfigured finishes caused by work of this Section.
- C. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

3.8 PROTECTION

- A. Upon completion of roofing, institute appropriate procedures for surveillance and protection of roofing during remainder of construction period.
- B. Where traffic must continue over finished roof membrane, protect surfaces.
- C. Protect exposed roof terminations at parapets or other walls and curbs until permanent flashing is applied.
- D. At end of construction period, or at a time when remaining construction will in no way affect or endanger roofing, inspect roofing and prepare a written report, with a copy to the Architect, describing nature and extent of damage found.
- E. Repair or replace (as required) deteriorated or defective work found at time of above inspection to a condition free of damage and deterioration at time of Substantial Completion and in accordance with requirements of specified warranties.

3.9 FINAL INSPECTION

- A. Final inspection will be performed by the Owner's Inspector.

END OF SECTION

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SECTION 07 61 13**STANDING SEAM SHEET METAL ROOFING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide factory-formed and field-assembled, prefinished standing-seam metal roofing where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
 - 1. Provide associated flashings, accessories, sealant, fastening devices and supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a watertight installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 05 31 23: Steel Roof Decking.
 - 2. Section 05 50 00: Metal Fabrications.
 - 3. Section 06 10 00: Rough Carpentry - Shop-Fabricated Wood Trusses.
 - 4. Section 07 52 16.12: Hot-Mopped Styrene-Butadiene-Styrene Modified Bituminous Membrane Roofing.
 - 5. Section 07 62 00: Sheet Metal Flashing and Trim.
 - 6. Section 07 92 00: Joint Sealants.

1.2 REFERENCES

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members.
- B. ASTM A755/A755M - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
- C. ASTM A792/A792M - Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- D. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance near Ambient Temperature Using a Portable Solar Reflectometer.
- E. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
- F. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

- G. ASTM E408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
- H. ASTM E1514 - Standard Specification for Structural Standing Seam Steel Roof Panel Systems.
- I. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
- J. ASTM E1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
- K. ASTM E1680 - Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems.
- L. ASTM E2140 - Standard Test Method for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head.
- M. IBC - International Building Code 2024 Edition.
- N. SMACNA - (Sheet Metal & Air Conditioning Contractors' National Association) Architectural Sheet Metal Manual.
- O. UL 580 - (UL Solutions) Tests for Uplift Resistance of Roof Assemblies.

1.3 DESIGN AND PERFORMANCE REQUIREMENTS

A. General:

1. Engineer panels in accordance with the latest edition of AISI S100 and Commentary.
2. Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss. Fasten metal roof panels to the framing members with concealed anchor clips designed to allow for thermal movement of the panels.
3. Live load, wind load, thermal load and deflection requirements shall be designed in accordance with IBC 2024 requirements.

B. Roof Performance:

1. Wind Uplift Resistance Classification: Roof assembly shall be Class 90 as defined by UL 580 specifications.
2. Resistance to Air Infiltration: Completed roof system shall have air leakage of not more than 0.06 cfm/sq. ft. when tested in accordance with ASTM E1680 at static test pressure differential of 6.24 psf.

3. Resistance to Water Infiltration: No leakage through panel joints when tested in accordance with ASTM E1646 at static test pressure differential of 15.0 psf.
 4. Resistance to Water Penetration: No leakage through panel side seams and endlaps after six (6) hours when tested in accordance with ASTM E2140 at a static water pressure head of six (6) inches.
- C. Energy Performance:
1. Prefinished metal roof panels shall have a Cool Roof Rating Council rating label and shall achieve an emissivity of at least 0.83 per ASTM E408 based on testing identical products by a qualified testing agency.
 2. Provide metal roofing with three-year, aged solar reflectance index of minimum 0.25 when calculated according to ASTM C1549 based on testing identical products by a qualified testing agency.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing and supplying architectural metal roof systems to the region where the work is to be performed, with a minimum of ten (10) years documented experience. Panels specified in this Section shall be produced in a permanent facility with fixed base roll-forming equipment.
- B. Installer Qualifications:
1. Company specializing in the installation of metal roofing with minimum five (5) years documented experience, with installers and supervisors approved by the panel manufacturer.
 2. Engineering Responsibility: Preparation of data for metal roof panels, including shop drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- C. Single Source Responsibility for Metal Roofing Materials: Obtain metal panel materials and related components from a single manufacturer, as a complete system.
- D. Workmanship Liability: Information or assistance provided by the Owner's Inspector does not relieve the Installer of strict compliance with Specifications, Drawings and roofing material manufacturer's requirements.
- E. Meetings:
1. Pre-Roofing Meeting: Prior to start of installation, arrange a meeting to be held at the Jobsite to review Specifications and to walk deck. Require attendance by Contractor's superintendent, Owner's Inspector, supervisory personnel of roofing Installer and, if required for warranty

provisions, representative of roofing products manufacturer. Owner's Project Manager, if authorized by Owner, will attend.

- a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
- b. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
- c. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
- d. Review structural loading limitations of deck during and after roofing.
- e. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
- f. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
- g. Review temporary protection requirements for metal panel systems during and after installation.
- h. Review procedures for repair of metal panels damaged after installation.
- i. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

2. Progress Meetings: An additional two meetings regarding roofing with all of the required attendees as stated above shall also take place at both 50%, and 100% completion of the roof work scope.

- F. Notification: Notify Owner's Inspector 72 hours prior to starting installation and each time work is to be performed.

1.5 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Materials list, manufacturer's specifications and other data needed to prove compliance with the specified requirements. Include the following.
 1. Data substantiating materials comply with requirements.
 2. Detailed specification of construction and fabrication.

3. Manufacturer's preparation instructions and recommendations, and installation instructions.
4. Storage and handling requirements and recommendations.
5. Cool Roof Rating Council rating label for prefinished metal roof panels.
6. Product data highlighting the emissivity rating of the material of this Section when tested in accordance with ASTM E408.

C. Shop Drawings:

1. Detailed drawings at a scale of not less than 3 inches per 12 inches (1:5) showing layout of panels, anchoring details, joint details, trim, flashing, and accessories. Show details of weatherproofing, terminations, and penetrations of metal work. Show details to allow for expansion and contraction.
2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
3. Indicate locations of field- and factory-applied sealant.

D. Samples:

1. A sample of each type of metal panel, 12 inches long by actual panel width, showing proposed metal thickness and seam profile, complete with factory finish. Include clips, fasteners, closures, and other metal panel accessories.
2. Exposed Sealants: For each type and color of joint sealant required. Install joint sealants in 1/2-inch wide joints formed between two 6-inch-long strips of material matching the appearance of metal panels adjacent to joint sealants.

E. Product Test Reports:

1. Based on evaluation of comprehensive tests performed by a qualified testing agency, include reports for air infiltration, water penetration, and structural performance.
2. Submit test reports prepared by UL indicating wind uplift rating of proposed roof system.
3. Submit certification by the manufacturer that roofing assembly has been tested in accordance with ASTM E1592.
4. Submit clip fastener pull-out tests.
5. Submit concentrated load test data certifying compliance with specified performance requirements.

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- 6. Submit emissivity results indicating compliance with minimum requirements of ASTM E408.
- F. Manufacturer's Proof of Liability Insurance: Provide proof of \$2,000,000 liability insurance for metal roof system and comply with current independent testing and certification as specified.
- G. Closeout Submittals: Provide maintenance data for metal panels.

1.6 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Deliver and store materials carefully with seals unbroken and in dry condition. Upon receipt of panels and other materials, Installer shall examine the shipment for damage and completeness.
- C. Store panels above ground in a clean, dry place. Protect against damage and discoloration. Elevate one end to allow moisture run off. Stack all materials to prevent damage and to allow for adequate ventilation.
- D. Do not overload roof structure with stored materials. Do not permit material storage or traffic on completed roof surfaces.
- E. Handle panels with non-marring slings. Do not bend panels.
- F. Protect panels against standing water and condensation between adjacent surfaces. If panels become wet, immediately separate sheets, wipe dry with clean cloth, and allow to air dry.
- G. Strippable film shall be applied to the top side of all prefinished metal to protect the finish during fabrication, shipping, and field handling. Remove any strippable film coating prior to installation and do not allow it to remain on the panels in extreme cold, heat or in direct sunlight.
- H. Do not allow panels to contact treated lumber.
- I. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results.
- B. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 COORDINATION

- A. Coordinate metal panel roof assemblies with rain drainage work, flashing, trim, and construction of parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

- A. All materials and workmanship provided are guaranteed against defects, including coverage for degradation of metal finish, water tightness and integrity of seals, after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.
 - 1. Galvalume Substrate Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following.
 - a. Structural failures including rupturing, or perforating.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - c. Warranty Period: Forty (40) years from date of Substantial Completion.
 - 2. Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period. Exposed panel finish deterioration includes, but is not limited to, the following.
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244 for a period of thirty (30) years from date of Substantial Completion.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214 for a period of thirty (30) years from date of Substantial Completion.
 - c. Cracking, chipping, peeling, or failure of paint to adhere to bare metal for a period of forty (40) years from date of Substantial Completion.
 - 3. Watertightness Warranty: Manufacturer's no dollar limit form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain watertight, including leaks, within specified warranty period.

- a. Shop drawings must be provided to, reviewed, and approved by panel manufacturer prior to panel system installation.
- b. Inspections by panel system manufacturer technical representative are required. Perform first inspection when underlayment and flashing are in place and second inspection when the roof is complete.
- c. Warranty Period: Twenty (20) years from date of Substantial Completion.
- 4. Installer Warranty: Furnish a written warranty signed by the panel applicator guaranteeing materials and workmanship for watertightness of the roofing system, flashings, penetrations, and against all leaks.
 - a. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
 - 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Berridge Manufacturing Company; Double-Lock Zee-Lock (180° Seam).

2.2 ROOF PANEL MATERIALS

- A. Base Metal: Aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Grade 40, yield strength 40 ksi minimum, with Galvalume® Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
- B. Roof Panel Style and Configuration:
 - 1. 2" high standing seam, 22 gauge steel, 16" panel size, flat pan, double folded joint type, Dark Bronze color.
 - 2. Factory fabricated panel with integral continuous overlapping seams suitable for continuous locking or crimping by mechanical means during installation. Field roll formed panel profiles will not be acceptable.

2.3 FLASHING AND TRIM

- A. Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
- B. Finish flashing and trim with same finish system as adjacent metal panels. Do not use lead or copper.
- C. Panel Penetration Flashing: Manufacturer and type as recommended by panel manufacturer.
- D. Hem all exposed edges of flashing on underside, 1/2 inch.

2.4 GUTTERS AND DOWNSPOUTS

- A. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels, roof fascia and rake trim.
- B. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.

2.5 OTHER MATERIALS

- A. Clips: Continuous Zee Rib to accommodate thermal movement, fabricated with 24 gauge zinc-coated (galvanized) steel sheet.
- B. Panel Sealant: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish. Joint sealant shall be silicone sealant of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight, and as recommended in writing by metal panel manufacturer.
- C. Self-Adhering High-Temperature Underlayment: Provide manufacturer approved self-adhering, cold-applied sheet underlayment consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
- D. Steel Panel Fasteners: Stainless-steel fasteners for surfaces exposed to the exterior; galvanized-steel fasteners for surfaces exposed to the interior, type and size as approved for the applicable loading requirements.

- E. Panel Accessories: Provide components required for a complete, weathertight panel system including copings, fasciae, mullions, sills, corner units, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Gaskets and Insulating Compounds: Non-absorptive and suitable for insulating contact points of incompatible materials. Insulating compounds shall be non-running after drying.
 - 2. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
 - 3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
- F. Provide other materials, not specifically described but required for a complete and proper installation, subject to the approval of the Architect.

2.6 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing.
 - 1. Comply with indicated profiles and with dimensional and structural requirements.
 - 2. Panels shall be factory formed. Field formed panels are not acceptable.
 - 3. Unless otherwise shown on Drawings or specified herein, fabricate panels in continuous one-piece lengths and fabricate flashings and accessories in longest practical lengths.
 - 4. Fabricate panels with panel stiffeners as required to maintain fabrication tolerances and to withstand design loads.
 - 5. Panels shall be factory correctively-leveled.
- B. Roof Panel Fabrication:
 - 1. Provide roof panels in full length from ridge to eave.
 - 2. Seams:
 - a. Panel seams shall interlock entire length of seam.
 - b. Design standing seam to lock up and resist joint disengagement during design wind uplift conditions as calculated according to local building codes.

- c. Provide factory sealant within confines on trailing edge of female seam leg to aid in resistance of leaks and provide panel-to-panel seal while allowing expansion and contraction movement, and the seams shall be continuously locked or crimped together by mechanical means during installation.
- 3. Clips:
 - a. Provide UL listed clip designed to allow panels to thermally expand and contract and provide ± 1 inch of thermal movement. Clip shall incorporate a self-centering feature to allow 1" of movement in both directions along panel length.
 - b. Sealant: Factory-installed sealant to provide continuity of seal at clip locations.
 - c. Clip shall be designed to meet positive and negative pressures as calculated per local building code.
 - d. Engineer panels to use concealed anchors that permit expansion and contraction, except at eaves, end laps, ridges, valleys, hips and gables.
- C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 - 3. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer,
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.7 FINISHES

A. Steel Panels and Accessories:

- 1. Two-Coat Fluoropolymer Exterior Finish: Full strength Hylar 5000® fluoropolymer (PVDF) coating containing not less than 70 percent PVDF resin by weight in color coat applied by the manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.75 ± 0.05 mil over

0.20 ± 0.05 mil primer coat, to provide a total top side dry film thickness of 0.95 ± 0.10 mil.

2. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 3. Finish shall conform to all tests for adhesion, flexibility, and longevity as specified by the Hylar 5000® finish supplier.
- B. Concealed Finish: Interior finish (bottom side) shall be coated with a primer and urethane coating with a minimum total dry film thickness of 0.35 mil. Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.
- D. Protect painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of work.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
- C. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.
- D. Field Measurements:
1. Coordinate field measurements and fabrication schedule with construction progress.
 2. Field measure prior to fabrication. Show recorded dimensions on shop drawings, including locations of shop-fabricated openings.

3. If field measurements differ from Drawing dimensions, notify Architect prior to fabrication.

E. Substrate Tolerances: Deviations from flat plane shall not exceed the following.

1. 1/4 inch in 20 feet.
2. 1/2 inch across building elevation.

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

3.2 PREPARATION

A. Protection:

1. Treat, or isolate with protective material, and contacting surfaces of dissimilar materials to prevent electrolytic corrosion.
2. Require workmen who will be walking on roofing panels to wear clean, soft-soled work shoes that will not pick up stones or other abrasive material, which could cause damage or discoloration.
3. Protect work of other trades against damage and discoloration.

B. Surface Preparation: Clean and dry surfaces prior to applying sealant.

3.3 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply according to manufacturer's instructions at locations indicated, wrinkle free, in shingle fashion to shed water. Cover underlayment within 14 days or as directed by the underlayment product manufacturer.

3.4 METAL PANEL INSTALLATION

A. Install standing seam system in orientation, sizes, and locations indicated on Drawings, and in strict accordance with manufacturer's instructions. Anchor securely in place using clips and fasteners spaced in accordance with manufacturer's recommendations for design wind load criteria. Fully seat adjacent panels to achieve continuous engagement of standing seam joint.

1. Lap panels away from prevailing wind direction.
2. Do not stretch or compress panel side-laps.
3. Secure panels without warp or deflection.
4. Panels should be continuous without end laps.
5. Align bottoms of metal panels and fasten.

6. Locate and space fastenings in uniform vertical and horizontal alignment.
 7. Install panels plumb, level and straight with seams parallel, conforming to design indicated on Drawings.
- B. Provide concealed anchors at all panel attachment locations. Exposed fasteners are not allowed, except to fasten flashings, at fixed points, or as indicated on Drawings.
- C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using self-tapping fasteners.
- D. Install pressure plates, if required, at locations indicated in manufacturer's written installation instructions.
- E. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip and metal roof panel are completely engaged.
- F. Dissimilar Metals:
1. Where sheet metal is in contact with dissimilar metals, execute juncture to facilitate drainage and minimize possibility of galvanic action.
 2. At point of contact with dissimilar metal, coat metal with protective paint or tape which can be placed between metals.
- G. Field apply sealant to penetrations, transitions, and other locations necessary (not standing seam) for airtight, waterproof installation.
- H. Installation Tolerances: Match dimensional tolerances of substrate.

3.5 CUTTING AND FITTING

- A. Cut and fit neat, square and true. Torch cutting is prohibited where cut is exposed to final view. Where necessary to saw-cut panels, debur cut edges.
- B. Openings 6 Inches and Larger in Any Direction: Shop fabricate and reinforce to maintain original load capacity.

3.6 FLASHING AND TRIM INSTALLATION

- A. Flash and seal metal panels at perimeter of all openings. Install flashings to cover underlayment. Do not begin panel installation until underlayment and flashings that will be concealed by metal panels are installed.
- B. Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Follow manufacturer's directions and Architect approved shop drawings.

2. Remove strippable protective film, if used, immediately preceding flashing installation.
 3. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
 4. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
- C. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer. Provide weathertight escutcheons for pipe and conduit penetrating panels.

3.7 GUTTER AND DOWNSPOUT INSTALLATION

- A. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- B. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between. Connect downspouts to underground drainage system indicated.

3.8 ACCESSORY INSTALLATION

- A. Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 1. Install components required for a complete metal panel system including trim, fasciae, copings, corners, seam covers, flashings, sealants, gaskets, fillers, and similar items.

3.9 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

3.10 PROTECTION

- A. Do not allow traffic on completed roof. If required, provide cushioned walk boards.
- B. Protect installed roof panels and trim from damage caused by adjacent construction until completion of installation.
- C. Do not apply touch-up paint to damaged paint areas that involve minor scratches.
- D. Panels or flashings that have severe paint and/or substrate damage shall be replaced as directed by the Architect or Owner's Project Manager.

3.11 CLEANUP

- A. Keep premises clean during roofing installation and leave same clean when roof is completed. At completion of each day's work and at work completion, sweep panels flashings and gutters clean. Do not allow fasteners, cuttings, filings or scraps to accumulate.
- B. Clean any grease, finger marks or stains from the panels in accordance with manufacturer's recommendations.
- C. Remove all scrap and construction debris from the Site.
- D. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

3.12 FINAL INSPECTION

- A. Final inspection will be performed by the Owner's Inspector.

END OF SECTION

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SECTION 07 62 00**SHEET METAL FLASHING AND TRIM****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide flashing and sheet metal not specifically described in other Sections of these Specifications but required to prevent penetration of water through the exterior shell of the building, and as needed for a complete and proper installation including the following.
1. Reglets.
 2. Conductor heads.
 3. Splash pans.
 4. Roof-penetration flashing.
 5. Scuppers.
 6. Exposed trim and gravel stops.
 7. Copings.
 8. Base flashing.
 9. Counterflashing.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
1. Section 07 52 16.12: Hot-Mopped Styrene-Butadiene-Styrene Modified Bituminous Membrane Roofing.
 2. Section 07 61 13: Standing Seam Sheet Metal Roofing.
 3. Section 07 72 33: Roof Hatches.
 4. Section 07 92 00: Joint Sealants.
 5. Section 09 90 00: Painting and Coating.

1.2 REFERENCES

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM B32 - Standard Specification for Solder Metal.

- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- D. SMACNA - (Sheet Metal & Air Conditioning Contractors' National Association) Architectural Sheet Metal Manual.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. In addition to complying with pertinent codes and regulations, comply with pertinent recommendations contained in current edition of "Architectural Sheet Metal Manual" published by SMACNA.
- C. Standard commercial items may be used for flashing, trim, reglets, and similar purposes provided such items meet or exceed the quality standards specified.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data:
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 - 3. Manufacturer's recommended installation procedures.
- C. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Galvanized Iron:
 - 1. Provide sheet metal or sheet iron of a standard brand of open-hearth copper-bearing steel, copper-molybdenum iron, or pure iron sheets.
 - 2. Zinc Coating:
 - a. Provide zinc coating by hot-dip galvanize to all flashing and sheet metal surfaces.

- b. Weight: Provide not less than 1-1/4 oz. per sq. ft. or more than 1-1/2 oz. per sq. ft, to surfaces required to be galvanized.
 - c. Comply with ASTM A653.
- B. Gages: Where sheet metal is required and no material or gage is indicated on the Drawings, provide 24 gage.

2.2 OTHER MATERIALS

- A. Nails, Rivets, and Fasteners: Use only soft iron rivets having rust-resistive coating, galvanized nails, and cadmium plated screws and washers in connection with galvanized iron and steel.
- B. Flux: Where flux is required, use raw muriatic acid.
- C. Solder: Where solder is required, comply with ASTM B32.
- D. Parapet Coping: Provide galvanized metal parapet coping with continuous cleat as manufactured by Construction Metals Inc.
- E. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 WORKMANSHIP

- A. General:
 - 1. Form sheet metal accurately and to the dimensions and shapes required, finishing molded and broken surfaces with true, sharp, and straight lines and angles and, where intercepting other members, coping to an accurate fit and soldering securely.
 - 2. Unless otherwise specifically permitted by the Architect, turn exposed edges back 1/2".
- B. Form, fabricate, and install sheet metal so as to adequately provide for expansion and contraction of the finished Work.
- C. Weatherproofing:
 - 1. Finish watertight and weathertight where so required.

2. Make lock seam work flat and true to line, sweating full of solder.
 3. Make lock seams and lap seams, where soldered, at least 1/2" wide.
 4. Where lap seams are not soldered, lap according to pitch, but in no case less than 3".
 5. Make flat and lap seams in the direction of flow.
- D. Joints:
1. Join parts with rivets or sheet metal screws where necessary for strength and stiffness.
 2. Provide suitable watertight expansion joints for runs of more than 40'-0", except where closer spacing is indicated on the Drawings or required for proper installation.
 3. Seal moving joints in metal work with elastomeric sealing complying with ASTM C920.
- E. Nailing:
1. Whenever possible, secure metal by means of clips or cleats, without nailing through the exterior metal.
 2. In general, space nails, rivets, and screws not more than 8" apart and, where exposed to the weather, use lead washers.
 3. For nailing into wood, use barbed roofing nails 1-1/4" long by 11 gage.
 4. For nailing into concrete, use drilled plug holes and plugs.
- F. Flashings and Metal Trim: Provide all flashings, reglets, counterflashings, gravel stops, parapet caps, metal trim, and any other fabricated items and miscellaneous sheet metal work indicated or required to provide a watertight installation. The most important items and those requiring detail descriptions are mentioned. Miscellaneous items and trim not mentioned or described shall be furnished and installed in accordance with the intent of the Drawings and Specifications and as required to complete the Work.
- G. Reglets and Counterflashings: Reglets and counterflashings shall be installed in accordance with the manufacturer's printed installation drawings and instructions and as otherwise detailed on the Drawings.
- H. Vent Flashings: Make plumbing and mechanical vent flashings entirely of 4-lb. lead. Fabricate flanges a minimum of 18" square, and long enough to allow for turning over lead into the end of the vent pipe. Vent flashings will be supplied in Section 22 00 00 but installed under this Section. Coordinate all vent flashing with roofing system and match color and finish of same.

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3.3 EMBEDMENT

- A. Embed all metal in connection with roofs in a solid bed of mastic, using materials and methods described in Section 07 92 00 of these Specifications.

3.4 SOLDERING

- A. Thoroughly clean and tin the joint materials prior to soldering.
- B. Perform soldering slowly, with a well heated copper, in order to heat the seams thoroughly and to completely fill them with solder.
- C. Perform soldering with a heavy soldering copper of blunt design, properly tinned for use.
- D. Make exposed soldering on finished surfaces neat, full flowing, and smooth.
- E. After soldering, thoroughly wash acid flux with a soda solution.

3.5 TESTS

- A. Upon request of the Architect, demonstrate by hose or standing water that the flashing and sheet metal are completely watertight.

3.6 CLEANUP

- A. Remove all scraps and debris from the Site caused by this work.
- B. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 07 65 26**SELF-ADHERING SHEET FLASHING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide flexible rubberized asphalt adhesive based self-sealing flashing tape required to prevent penetration of water through the exterior shell of the building, as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 06 10 00: Rough Carpentry.
 - 2. Section 07 92 00: Joint Sealants.
 - 3. Section 08 41 13: Aluminum-Framed Entrances and Storefronts.
 - 4. Section 08 42 26.11: Folding Glass Walls.
 - 5. Section 08 51 13: Aluminum Windows.
 - 6. Section 09 24 23: Cement Stucco.

1.2 REFERENCES

- A. AAMA 711 - Specification for Self-Adhering Flashing Used for Installation of Exterior Wall Fenestration Products.
- B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
- C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- D. ASTM D3652/D3652M - Standard Test Method for Thickness of Pressure-Sensitive Tapes.
- E. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors, and Skylights.
- F. SCAQMD (South Coast Air Quality Management District) Rule 1168 - Adhesive and Sealant Applications.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data:
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements. Include printed statement of VOC content.
 - 3. Manufacturer's recommended installation procedures.
- C. Samples: Each type of product specified.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Comply with manufacturer's recommendations for storage and handling of each product.

1.6 WARRANTY

- A. Completed installation shall be guaranteed against defects of material for a period of five (5) years from the date of Substantial Completion.
 - 1. Submit manufacturer's warranty that flashing and accessories are free of defects at time of delivery, and are manufactured to meet manufacturer's published physical properties and material specifications.
 - 2. Submit installer's warranty that flashing and accessories have been installed in accordance with manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All adhesives must not exceed the VOC limits set by the SCAQMD Rule 1168.
- B. Flashing: Vycor® Plus Flashing manufactured by GCP Applied Technologies, Inc.
 - 1. 0.5 mm of a black colored rubberized asphalt adhesive integrally bonded to 0.1 mm of cross-laminated polyethylene film to provide a min. 0.6 mm (25 mil) thick membrane. Membrane shall be interleaved with silicone-coated release paper until installed.

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2. Meets or exceeds the requirements set forth in AAMA 711 voluntary specification for self adhered flashing Level 3 requirement for elevated temperature exposure.
3. Meets or exceeds the requirements set forth in ASTM E2112 for flashing exterior windows and doors.
4. Water Penetration around Nails: ASTM D1970 Section 7.9, modified per section 5.2.1 of AAMA 711 voluntary specification - Pass 1.2 in. head of water.
5. Tensile Strength: ASTM D412, Die C Modified - minimum 143 psi.
6. Thickness: ASTM D3652 - minimum 25 mils.
7. Color: Visual inspection - black film with white printing.

2.2 FLASHING ACCESSORIES

- A. Primer: Perm-A-Barrier WB Primer manufactured by GCP Applied Technologies, Inc.
 1. Water-based primer for imparting an aggressive, high tack finish on the treated substrate.
 2. Flash Point: No flash to boiling point.
 3. Solvent Type: Water.
 4. VOC Content: Not to exceed 10 g/L.
 5. Application Temperature: 25° F and above.
 6. Freezing point (as packaged): 21° F.
- B. Plastic Corner Guards: VYCORner manufactured by GCP Applied Technologies, Inc.
- C. Provide other materials, not specifically described but required for a complete and proper installation, subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine conditions, with installer present, for compliance with requirements for installation, tolerances, and other specific conditions affecting performance of flashing. Remove all deleterious materials from surfaces to be flashed. Do not proceed until unsatisfactory conditions are corrected.
- B. Review requirements for sequencing of installation of flashing assembly with installation of windows to provide a weather-tight flashing assembly.

3.2 INSTALLATION

- A. General: Install flashing to dry surfaces at air and surface temperatures of 25° F and above in accordance with manufacturer's recommendations at locations indicated. Primer is not required for most wood substrates including plywood and OSB, provided they are clean and dry.
- B. Flexible Wall Flashing:
 - 1. Precut pieces of flashing to easily handled lengths for each location.
 - 2. Remove silicone-coated release paper and position flashing carefully before placing it against the surface.
 - 3. When properly positioned, place against surface by pressing firmly into place by hand roller. Fully adhere flashing to substrate to prevent water from migrating under flashing.
 - 4. Overlap adjacent pieces 2 in. and roll all seams with a steel hand roller.
 - 5. Trim bottom edge 1/2 in. back from exposed face of the wall. Flashing shall not be permanently exposed to sunlight.
 - 6. At heads, sills and all flashing terminations turn up ends a minimum of 2 in. and make careful folds to form an end dam, with the seams sealed.
 - 7. Do not expose flashing membrane to sunlight for more than one hundred and twenty days prior to enclosure.
- C. Accessories:
 - 1. When required by dirty or dusty site conditions or by surfaces having irregular or rough texture, apply primer by brush or roller at the rate recommended by manufacturer, prior to flashing installation. Allow primer to dry completely before flashing application.
 - 2. Install prefabricated corner guards at window sills in accordance with manufacturer's recommendations.

3.3 CLEANUP AND PROTECTION

- A. Remove all scraps and debris from the Site caused by this work.
- B. Protect installed sheet flashing from damage during construction.
- C. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

SECTION 07 72 33**ROOF HATCHES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide roof hatches where shown on Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 05 50 00: Metal Fabrications - Metal framing at opening; ladder.
 - 2. Section 06 10 00: Rough Carpentry - Treated wood blocking.
 - 3. Section 07 52 16.12: Hot-Mopped Styrene-Butadiene-Styrene Modified Bituminous Membrane Roofing.
 - 4. Section 07 62 00: Sheet Metal Flashing and Trim.
 - 5. Section 07 92 00: Joint Sealants.
 - 6. Section 09 90 00: Painting and Coating - Field painting roof hatch cover and curb.

1.2 REFERENCES

- A. SMACNA (Sheet Metal and Air Conditioning Contractors National Association) - Architectural Sheet Metal Manual.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. In addition to complying with pertinent codes and regulations, comply with pertinent recommendations contained in current edition of "Architectural Sheet Metal Manual" published by SMACNA, for installation and flashing of units.
- C. Manufacturer/Installer: Company specializing in the manufacturing and installation of components specified in this Section with minimum of five years documented experience.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.

- B. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work. Include with the shop drawings a statement verifying that the assembly proposed will meet the acoustic requirements listed as specified herein.
- C. Product Data: Provide manufacturer's data on shape of components, materials and finishes, anchor types and locations.
- D. Manufacturer's Installation Instructions: Indicate procedures and perimeter conditions requiring special condition.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Deliver, store, handle and protect products in accordance with manufacturer's instructions.

1.6 FIELD MEASUREMENTS

- A. Verify actual locations of roof hatches and other construction to which roof accessories must fit by accurate field measurements before fabrication; show field measurements on final shop drawings. Coordinate schedule with construction progress to avoid delay of Work.

1.7 WARRANTY

- A. Provide ten (10) year manufacturer's written warranty in addition to guaranty provisions of the Owner's administrative requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Nystrom Building Products.
- B. The Bilco Company.
- C. Milcor, Inc.
- D. Babcock-Davis.

2.2 ROOF HATCH COMPONENTS

- A. Roof Hatch Unit: 3'-0" x 2'-6" single leaf type, for ladder access.
- B. Integral Curb: Minimum 14-gauge galvanized steel with G90 coating, prime painted, sheathed with 1 inch polyisocyanurate insulation; curb height shall be 12 inches, integral cap flashing to receive roof flashing system; and extended flange for mounting.

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- C. Cover: Minimum 14-gauge galvanized steel with G90 coating, prime painted, cover insulation shall be 1 inch polystyrene retained by 22-gauge galvanized steel inner liner. Continuous neoprene gasket to provide weatherproof seal.
- D. Hardware: Manufacturer's standard manually operated type with compression spring operators, positive snap latch with turn handles inside and out, and padlock hasp inside; automatic hold-open arm with vinyl covered grip handle for easy release; cadmium plated finish.
- E. Hinges: Manufacturer's standard recommended type to suit application.

2.3 FABRICATION

- A. Fabricate free of visual distortions and defects. Weld corners and joints.
- B. Provide for removal of condensation and weather-tight assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.
- B. Verify that deck and other items affecting work of this Section are in place and positioned correctly.

3.2 INSTALLATION

- A. Install roof hatches and related components in accordance with manufacturer's instructions.
- B. Coordinate installation of components of this Section with installation of roofing membrane and base flashing.
- C. Coordinate installation of sealant and roofing cement with work of this Section to ensure water tightness.
- D. Coordinate installation of flashing flanges into reglets.
- E. Install items plumb, straight, square, level, and in their proper elevation, plane and location.
- F. When closed, the hatch covers shall compress the gaskets to achieve an airtight seal under all environmental conditions, even after the hatches have been opened and closed multiple times.
- G. Put operating components through at least five complete operating cycles, adjusting as required and achieving optimum ease of operation.

3.3 CLEANING AND ADJUSTING

- A. Clean surfaces, remove debris and packages from the Site.
- B. Adjust movable parts for smooth operation.
- C. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 07 92 00**JOINT SEALANTS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Throughout the Work, seal and caulk joints where shown on the Drawings, between dissimilar materials and elsewhere as required to provide a positive barrier against passage of moisture and passage of air.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.

1.2 REFERENCES

- A. ASTM C834 - Standard Specification for Latex Sealants.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- C. ASTM D1056 - Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
- D. FS A-A-272B - Caulking Compounds.
- E. SCAQMD (South Coast Air Quality Management District) Rule 1168 - Adhesive and Sealant Applications.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project with minimum five (5) years documented experience.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Submit manufacturer's specifications and other data needed to prove compliance with the specified requirements.
- C. Submit manufacturer's recommendations which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

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- D. Samples: Prior to ordering materials, submit to the Architect samples of each sealant proposed to be used, indicating the color range available of each material in an "exposed" location.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Do not retain at the Job site material that has exceeded the shelf life recommended by its manufacturer.

1.6 WARRANTY

- A. Special Manufacturer's Warranty for All Exterior Sealants: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within twenty (20) year minimum from date of Substantial Completion.
- B. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
 - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

1.7 EXTRA MATERIALS

- A. Provide an additional five (5) tubes of each type of sealant used on the Project for Owner's maintenance use.

PART 2 - PRODUCTS

2.1 PRIMERS

- A. Use only those primers that are quick drying, colorless, and non-staining, have been tested for durability on the surfaces to be sealed and are specifically recommended for this installation by the manufacturer of the sealant used.

2.2 SEALANTS

- A. All adhesives and sealants must not exceed the VOC limits set by the SCAQMD Rule 1168.

- B. Joint Material Types: Color of sealant to match color of adjacent work.
1. One-part polysulfide, ASTM C920, nonsag, Class 25 sealant without primer. Use for vertical and horizontal joints in connection with concrete, plaster, steel, aluminum and glass. Do not use in traffic areas.
 2. Two-part polysulfide, ASTM C920. Use for vertical and horizontal joints in connection with masonry, concrete, plaster, steel, aluminum and glass. Do not use in traffic areas.
 3. One part moisture curing, gun grade polyurethane sealant for general purpose use in concrete, masonry, window frame perimeters and similar type construction joints. For exterior and interior use. Conform to ASTM C920, Type S, Grade NS, Class 25, Use NT, M, T, A and O.
 4. Multi-part polyurethane base, ASTM C920. Use for vertical joints in connection with all building materials.
 5. One part acrylic sealant. Use for vertical and horizontal joints in connection with all building materials such as exterior sills, jamb and heads of window frames, door frames, louvers and similar openings, and where metal, wood or other materials abut or join masonry, concrete or each other. Do not use in traffic areas.
 6. 2-part elastomeric sealant, polyurethane-based, complying with ASTM C920, Class A, Type I (self-leveling) unless Type II is recommended by manufacturer for application shown. Use for exterior applications other than building joints, such as concrete pavement and sidewalks, or other types of pavement.
 7. Butyl rubber sealant for interior applications, composed of polymerized butyl rubber and inert fillers (pigments), solvent-based with minimum 75% solids, non-sag consistency, tack-free time of 24 hours or less, paintable, non-staining, complying with FS A-A-272B.
 8. One-part mildew-resistant silicone sealant, complying with ASTM C920, Type S, Grade NS, Class 25, translucent or white in color. Use for interior joints in ceramic tile and at plumbing fixtures.
 9. For all interior joints not otherwise scheduled, provide acrylic latex, one-part, non-sag, mildew resistant acrylic emulsion compound complying with ASTM C834, Type S, Grade NS, formulated to be paintable to match adjacent surfaces.
 10. For other applications, provide products especially formulated for the proposed use and approved in advance by the Architect.
 11. Modified Sealant: Where recommended by manufacturer, provide bituminous-modified compound, recommended for compatibility in required application.

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12. Acoustical Joint Sealant: Refer to Section 09 21 16.

2.3 BACKUP MATERIALS

- A. Joint Backing: ASTM D1056, round, recommended by sealant manufacturer to suit application; oversized 25 percent larger than joint width.
- B. Use only those backup materials that are specifically recommended for this installation by the manufacturer of the sealant used, which are non-absorbent, and which are non-staining.

2.4 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 APPLICATION AND WORKMANSHIP

- A. Surface Preparation:
 - 1. Clean joints and spaces to be sealed of all dirt, dust, mortar, oil, and other foreign materials. Where necessary, degrease with an approved solvent or commercial agent. Dry surfaces thoroughly before application of sealant.
 - 2. Enclose all joints on three sides. Where grooves have not been provided, clean out suitable grooves to the depth required or as indicated on Drawings and grind to a minimum width of 1/4 inch without damage to the adjoining work. Do not grind on metal surfaces.
 - 3. Prepare surfaces to receive sealant according to manufacturer's specifications. Use air pressure or other approved methods. Use masking tape to keep sealant off exposed surfaces.
 - 4. Verify that joint backing and release tapes are compatible with sealant.
- B. Application:
 - 1. Locations: Seal around all openings in exterior walls. Seal all other joints as specified, shown on drawings, and required to properly waterproof the building.

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2. General: Use only experienced mechanics using proper tools. Apply as specified and in accordance with the manufacturer's installations and recommendations.
3. Priming: Prime concrete, porous surfaces, and any other surfaces recommended by the manufacturer, before applying sealants. Apply primer with a brush that will reach all parts of joints to be filled.
4. Packing: Fill joints and spaces deeper than 1/2 inch with packing to within 1/2 inch of surface. Then fill joints with sealant. Use a minimum of 3/8" caulking compound in all joints 1/2" or deeper.
5. Sealant: Do not use compounds when they become too jelled to be discharged in a continuous flow from the gun. Do not modify compounds with liquids, solvents, or powders.
6. Joint Backing: Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.
7. Tools and Workmanship: Use guns with proper size nozzles. Use sufficient pressure to fill all voids and joints solidly. In sealing around openings, include entire perimeter of each opening, unless shown otherwise. If gun is impracticable, use suitable hand tools.
8. Finishing: Neatly point seal joints on flush surfaces with beading tool, and internal corners with eaving tool. Cleanly remove excess material. Leave exposed sealant free of wrinkles and uniformly smooth. Completely seal before final coats of paint are applied.
9. Flashing: Properly prime all flashing and set in mastic.

3.3 CLEANING UP

- A. Clean adjacent surfaces free from sealant as the installation progresses, using solvent or cleaning agent recommended by the manufacturer of the sealant used.
- B. Upon completion of the work of this Section, promptly remove from the Job site all debris, empty containers and surplus material derived from this portion of the Work.
- C. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 08 11 13.13**STANDARD HOLLOW METAL DOORS AND FRAMES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide steel doors and frames which are not specifically described in other Sections of these Specifications, where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to the following.
 - 1. Steel doors.
 - 2. Steel door frames.
 - 3. Sidelight frames.
 - 4. Fire-rated door and frame assemblies.
 - 5. Fire-rated window frames.
 - 6. Louvers in doors.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 07 92 00: Joint Sealants.
 - 2. Section 08 14 16: Flush Wood Doors.
 - 3. Section 08 71 00: Door Hardware.
 - 4. Section 08 81 00: Glass Glazing - Glass in glazed openings in doors and frames.
 - 5. Section 09 90 00: Painting and Coating.

1.2 REFERENCES

- A. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- B. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- C. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies.
- D. SDI-100 - (Steel Door Institute) Specifications for Standard Steel Doors and Frames.
- E. UL - UL Solutions Inc.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. Unless specifically otherwise approved by the Architect, provide all products of this Section from a single manufacturer.
- C. Manufacture doors in accordance with the latest standards of SDI-100.
- D. Fire-Rated Assemblies: Provide assemblies complying with NFPA 80 that are listed and labeled by UL, for fire-protection ratings indicated, based on testing according to NFPA 252 and NFPA 257.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: For each type of door and frame indicated, include door designation, type, material description, core description, construction details, label compliance, sound and fire resistance ratings and finishes.
- C. Shop Drawings: Show details of each frame type, elevations of door and window designs, details of openings, and details of construction, installation, and anchorage.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Deliver doors and frames palletted, wrapped or crated to provide protection during transport and job storage.
- C. Store doors and frames at the building site under cover, in a dry location on minimum 4-inch-high wood blocking. Provide 1/4-inch space between stacked doors to promote air circulation. Cover stacked units to avoid dampness or other wet construction work, to protect from rusting.
- D. During and after installation, protect frames and doors from damage from construction activities. Damaged doors and frames will be rejected and must be replaced with new doors and frames without additional cost.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide standard products of Ceko Door, Curries Company, or Republic Doors & Frames.

2.2 METAL DOORS

- A. Door Type and Design: Provide full-flush design, in dimensions and types shown on the Drawings, labeled or non-labeled as indicated on the Door Schedule in the Drawings, properly reinforced for the finish hardware described in Section 08 71 00 of these Specifications. Provide smoke seals at any doors opening onto the Apparatus Bays.
- B. Interior Door Performance: Level 2 - 18 gage, heavy duty.
- C. Exterior Door Performance: Level 3 - 16 gage, extra heavy duty.

2.3 METAL DOOR AND WINDOW FRAMES

- A. Frame Type and Design: Provide frames of the types and dimensions shown on Drawings, labeled or non-labeled as indicated on the Door Schedule in the Drawings, in 16 gage for interior frames and 14 gage for exterior frames, properly reinforced for the finish hardware described in Section 08 71 00 of these Specifications, with appropriate anchors as required. Miter corner joints and provide continuous weld joints.

2.4 OTHER MATERIALS

- A. Door Louvers: Provide manufacturer's standard louvers as indicated on Drawings.
- B. For Glazed Doors and Frames: Provide steel glazing stops and moldings of sizes indicated for field installation with countersunk oval head sheet metal screws. Stops and moldings shall be #16 gage material unless otherwise indicated or specified. For fire-rated, safety-rated glass, refer to Section 08 81 00.
- C. Provide other materials not specifically described but required for a complete and proper installation, subject to the approval of the Architect.

2.5 FINISH

- A. Doors and Frames: Pre-clean and shop prime each door for finish painting which will be performed at the job site under Section 09 90 00 of these Specifications.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Frames: Set accurately in position, plumb, aligned, and braced securely until permanent anchors are set. Anchor bottom of frames securely to floors with expansion bolts or powder-driven fasteners. Build-in wall anchors or secure to

adjoining constructions as indicated or required. Where frames require ceiling struts or other overhead bracing, anchor securely to structure above. Fill frames solid with Portland cement grout where shown or required by class of opening.

1. Install fire-rated frames according to NFPA 80.
- B. Hanging Doors: Hang all doors expertly and fit snug against all stops. Fit accurately and hang free from hinge; bind with uniform clearance of 3/32" at heads and jambs. After hanging, make all adjustments and then remove lockset hardware for finish painting. Reinstall hardware after finish painting.
 1. Clearances for Fire-Rated Doors: As required by NFPA 80.
- C. Finish Hardware:
 1. Secure templates from the finish hardware supplier, and accurately install, or make provision for all hardware at the factory.
 2. Install accurately and securely without marking or defacing hardware or finish work. Fasten hardware with machine screws or bolts.
 3. Embed thresholds in approved mastic, and secure to concrete floors with stainless steel screws in nonferrous expansion shields, unless other type anchors are shown.
 4. Test all hardware to assure correct alignment and operations.
 5. Protect finish hardware until completion of building. Leave all hardware in perfect working order. Clean and polish.
- D. Weatherstripping: Expertly install weather-stripping for exterior doors and frames.
- E. Labeled Doors and Frames: Install labeled doors and frames, including hardware and operational characteristics, in accordance with NFPA 80.

3.3 SEALANT

- A. Seal and caulk perimeter of door frames where shown or required to fill space between frame and adjoining material. Sealant materials and applicable requirements of Section 07 92 00 apply to this work.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments:
 1. Check and readjust operating finish hardware items in hollow metal work just prior to final inspection.
 2. Leave work in complete and proper operating condition.
 3. Remove defective work and replace with work complying with the specified requirements.

- B. Immediately after erection, sand smooth all rusted and damaged areas of prime coat, and apply touchup of compatible air-drying primer.
- C. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide flush wood doors, complete in place with finish hardware installed, where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to the following.
1. Solid core doors with sustainable hardwood veneer faces.
 2. Fire-rated wood doors.
 3. Louvers in wood doors.
 4. Vision lites.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
1. Section 06 10 00: Rough Carpentry.
 2. Section 06 20 00: Finish Carpentry.
 3. Section 08 11 13.13: Standard Hollow Metal Doors and Frames.
 4. Section 08 71 00: Door Hardware.
 5. Section 09 90 00: Painting and Coating.

1.2 REFERENCES

- A. ANSI A208.1 - The American National Standard for Particleboard.
- B. ANSI/WDMA I.S.1A - Industry Standard for Interior Architectural Wood Flush Doors.
- C. C.C.R. (California Code of Regulations) Title 17 - Public Health.
- D. NAAWS 4.0 - North American Architectural Woodwork Standards Edition 4.0.
- E. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- F. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- G. SCAQMD (South Coast Air Quality Management District) Rule 1168 - Adhesive and Sealant Applications.

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- H. UL 10B - (UL Solutions Inc.) Fire Tests of Door Assemblies.
- I. Woodwork Institute - (CCP) Certified Compliance Program.

1.3 QUALITY ASSURANCE

- A. Manufacturer: Firm (woodwork manufacturer) with no less than five (5) years of production experience similar to this Project, whose qualifications indicate the ability to comply with the requirements of this Section.
- B. All doors shall be fabricated by the manufacturer to the dimensions specified.
- C. Single Source Responsibility: A single manufacturer shall provide and install the work of this Section.
- D. Door modifications are not permitted, unless reviewed by the Architect.
- E. Regulatory Requirements:
 - 1. Fire Door and Panel Construction: Conform to NFPA 252 and UL 10B. All intumescent seals to be provided within the structure of the door. Surface mounted intumescent seals are not acceptable.
 - 2. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as scheduled.
- F. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, comply with NAAWS 4.0 and ANSI/WDMA I.S.1A for "Premium" grade doors.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Submit materials list and Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 - 1. For composite-wood products, documentation indicating that products meet maximum formaldehyde emissions limits set by Sections 93120 - 93120.12, Title 17 of the CCR.
- C. Submit four finished samples, approximately 8" x 8" in size, of each of the proposed door face materials. Veneer samples shall represent the range of color and grain expected to be provided.
- D. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details; location and extent of hardware blocking, factory finishing, fire ratings and other pertinent data.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.

B. Delivery and Storage:

1. Deliver doors in manufacturer's original containers, clearly marked with manufacturer's name, brand name, size, thickness, and identifying symbol on the covering.
2. Provide a clean area, well-ventilated and protected from direct sunlight, excessive heat, rain or moisture.
3. Store doors flat on a level surface, at least 4" off the floor. Cover to keep clean, but permit air circulation. Millwork shall be acclimated to existing conditions for 72 hours prior to installation.
4. Store and protect wood doors from damage until final acceptance by Owner.

1.6 WARRANTY

- A. Guarantee all wood doors for two (2) years against warpage or defects, agreeing to replace such defect, including installation and finish.

PART 2 - PRODUCTS

2.1 INTERIOR DOORS

- A. All composite wood products including hardwood plywood veneer core and hardwood plywood composite core must meet maximum formaldehyde emissions limits set by Sections 93120 - 93120.12, Title 17 of the CCR.
- B. All adhesives must not exceed the VOC limits set by the SCAQMD Rule 1168.
- C. Solid wood core flush veneered, 5 ply, faced both sides with natural vertical grain Douglas Fir faced veneer for transparent finish, fully bonded to core, 1-3/4" thick, fire rated as indicated.
- D. Particleboard Core: ANSI A208.1, Grade LD-1 or Grade LD-2.
- E. Fabricate fire rated doors in accordance with NAAWS 4.0 and to UL requirements. Attach fire-rating label to door.
- F. Edge Strips: Kiln-dried Douglas Fir.
- G. Face Veneer: Premium grade veneer shall be Grade "AA". Minimum thickness shall be 0.0277 inches before sanding and 0.020 inches after sanding of specified face veneer.
- H. Adhesive and Bonding: Bonding between veneer plies of wood face panel, and between door faces, frame and core unit shall be fabricated with type I or II waterproof adhesives for interior doors.
- I. Door type, size, and location of lights and louvers shall be as indicated on the door schedule.

- J. Openings for lights, louvers and grilles shall be performed by the manufacturer, or in a certified door service mill in accordance with manufacturer's details, and in compliance with testing agency requirements.
- K. Prefinished Louvers: At least 18-gauge cold rolled steel frames and 18-gauge blades; type FLDL-UL by Anemostat, Carson, CA.
- L. Prefinished Light Proof Louvers: Type DRDL by Anemostat+ii.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install fire rated and non-rated doors as specified in the NAAWS 4.0, Section 9 and provide a Woodwork Institute Certified Compliance Certificate for installation at Substantial Completion. In addition, install fire rated doors in accordance with NFPA 80 and to UL requirements.
- B. Hanging Doors: Hang doors expertly and fit snug against all stops. Fit accurately and hang free from hinge bind with uniform clearance of 1/16" at heads and jambs and 1/4" over finish floor surface. Undercut doors for carpeting and ventilating purposes where required.
- C. Doors shall operate freely, but not loosely, without sticking or binding, without hinge-bind conditions and with hardware properly adjusted and functioning.
- D. Install finish hardware in strict accordance with the recommendations of its manufacturer.
- E. Remove finish hardware for finishing and reapply after finishing is complete and dry.

3.3 CLEANING UP AND PROTECTION

- A. Broom clean inside and out and remove all scraps and other debris from Site caused by this work.
- B. Maintain proper environmental conditions after acceptance of millwork.
- C. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

SECTION 08 33 23
OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide insulated overhead coiling service doors, electrical operators, controls, and accessories, as shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 03 30 00: Cast-In-Place Concrete.
 - 2. Section 05 50 00: Metal Fabrications - Support framing and framed opening.
 - 3. Section 06 10 00: Rough Carpentry.
 - 4. Section 06 20 00: Finish Carpentry - Wood jamb and head trim.
 - 5. Section 07 92 00: Joint Sealants.
 - 6. Section 08 35 13.12: Electric Four-Fold Apparatus Doors.
 - 7. Section 08 71 00: Door Hardware.
 - 8. Section 09 24 23: Cement Stucco.
 - 9. Section 09 90 00: Painting and Coating - Field painting.
 - 10. Division 26: Electrical - Electrical wiring and conduit, fuses, disconnect switches, connection of operator to power supply, installation of control station and wiring, and connection to alarm systems.

1.2 REFERENCES

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. International Code Council (ICC) - International Energy Conservation Code (IECC).
- C. UL - Underwriters Laboratories.

1.3 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Operation: Electric motor.
- B. Wind Load Uniform Pressure: 20 psf.

- C. Wall Mounting Condition: Interior face of wall on each side of door opening.
- D. Hood Type: Round.
- E. Operation: Design door assembly, including operator, to operate for not less than 50,000 cycles.
- F. Installed System Sound Transmission Class (STC) Rating: STC rating of 23 required on an insulated door with header seal.
- G. Air Infiltration: Meets IECC requirements with air leakage rate of 0.47 cfm/ft².
- H. U-factor: Meets IECC requirements with U-Factor rating of 0.90 Btu/hr-ft²-F.
- I. Programmable Mid-Stop: Adjustable from 3-30 seconds, feature to enable partial opening of the door to a preprogrammed position for energy savings, time savings, and convenience.
- J. Ventilation Feature: The door to partially open for a pre-determined amount of time when a device such as a CO detector is activated; the door to close once the CO detector is clear.
- K. Fire Station Timer: Push button or pull cord used to activate the open cycle and timer to close feature. Only the push button or pull cord will control the timer to close.
- L. Timer-To-Close: Door to close automatically after a predetermined amount of time has elapsed, for security and convenience.
- M. Drive Reduction: Primary reduction by a belt drive. Secondary reduction by chain and sprocket.
- N. Adjustable Friction Clutch: To help protect the door and operator from damage should it come into contact with any obstruction.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing work of this Section with a minimum of five (5) years' experience in the fabrication and installation of security closures.
- B. Installer Qualifications: Company specializing in performing work of this Section with minimum five (5) years documented experience and certified in writing by system manufacturer.
- C. Single-Source Responsibility: Provide doors, tracks, motors and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.
- D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.5 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including the following.
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Details of construction and fabrication.
 - 4. Installation instructions.
- C. Shop Drawings: Include detailed plans, elevations, details of framing members, anchoring methods, required clearances, hardware, and accessories. Include relationship with adjacent construction.
- D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches long, representing actual product, color, and patterns.
- E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- F. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.

1.6 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.
- D. Store materials in a dry, warm, ventilated weathertight location.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results.
- B. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 COORDINATION

- A. Coordinate work of this Section with other operations and installation of adjacent materials to avoid damage to installed materials.

- B. Coordinate installation of electrical service with Division 26. Complete wiring from disconnect to unit components.
- C. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07 92 00.

1.9 WARRANTY

- A. Warranty: Manufacturer's limited door and operator system to be free from defects in materials and workmanship for three (3) years after Date of Substantial Completion or 50,000 cycles, whichever occurs first.
- B. ArmorBrite™ Finish Applied to Curtain, Guides, Bottom Bar, Headplates: Manufacturer's limited Premium Finish warranty against cracking or peeling for two (2) years after Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INSULATED ROLLING SERVICE DOORS

- A. Provide insulated overhead coiling doors manufactured by Raynor Inc., 1101 East River Road., P.O. Box 448, Dixon, IL 61021-0448, <https://www.raynor.com>, Tel: 815-288-1431.

- 1. Basis of Design: Raynor DuraCoil Flat Insulated Slats (Series IF).

2.2 CURTAIN

- A. Insulated Slats: The curtain shall consist of steel interlocking flat slats.
 - 1. Steel slats shall be commercial quality hot-dipped galvanized (G-90) steel per ASTM A653.
 - 2. Profile shall be flat type for doors up to 40 feet wide.
 - 3. Front slat shall be fabricated of 22 gauge galvanized steel.
 - 4. Back slat shall be fabricated of 24 gauge galvanized steel.
 - 5. Slat cavity shall be filled with polyisocyanurate core the entire length of each slat.
 - a. Curtain R-Value: 6.24.
- B. Lateral movement of the slats shall be contained by means of cast-iron galvanized end locks fastened to the ends of every other slat with zinc-plated steel rivets.
 - 1. Windlocks shall be provided as required by door size or special windload requirements.
 - 2. Windlocks to be galvanized cast-iron and fastened with zinc-plated steel rivets.

2.3 BOTTOM BAR, GUIDES, HEADPLATES AND BRACKETS

- A. Bottom Bar: Curtain bottoms shall be structurally reinforced with a minimum of two roll-formed galvanized steel angles, minimum 1 1/2" x 1 1/2" x 1/8".
- B. Guides: All guide assemblies shall be fabricated from three structural steel angles. Guide angles shall be minimum 3" x 2" x 3/16" and fitted with two removable curtain stops each. Wall mounted angles shall be continuous type.
- C. Headplates: 3/16" minimum steel plate attached to the guide assembly with heavy-duty self-aligning precision bearing.
- D. Brackets: Mounting bracket plates shall be made from a minimum 3/16" steel plate and attached to the wall angle of the guide assembly with 1/2" diameter Grade 5 bolts. The drive side bracket shall be fitted with a sealed ball bearing.

2.4 COUNTERBALANCE, BARREL AND HOOD

- A. Counterbalance: The curtain shall be counterbalanced by means of oil tempered, helical torsion springs, grease-packed and mounted on a single continuous steel torsion shaft. Springs shall be compression spring design to facilitate any counterbalance maintenance.
- B. Barrel: The barrel shall be made from a minimum 4 1/2" O.D. x 0.120 wall structural steel pipe. Deflection of pipe under full load shall not exceed 0.03" per foot of span.
- C. Hood: Full-width with internal hood baffle weatherseal. Hood shall be 24 gauge, hot-dipped galvanized steel with rolled edges.

2.5 WEATHERSEALS

- A. Air Infiltration Package: The door shall be provided with vinyl jamb seal, rubber header seal, and rubber hood baffle. Product to meet IECC requirement of air leakage <1.00 cfm/ft².
 - 1. Hood Weatherseal: A reinforced neoprene sheet to rest on the curtain to minimize air infiltration.
 - 2. Guide Weatherseal: Snap-on dual durometer vinyl extrusion to inhibit air infiltration between the guide and the curtain.
 - 3. Door Bottom Seal: Single contact type bottom astragal.

2.6 ELECTRIC MOTOR OPERATION

- A. ControlHoist™ Optima Commercial Door Operator, UL listed, size as recommended by manufacturer to move door in either direction at not less than 8" nor more than 1 foot per second.
 - 1. Operation Mode: Jackshaft with manual chain hoist.

2. Drive: Gear.
 3. Motor: Continuous-duty, overload-protected motor with high starting torque.
 - a. Motor Horsepower Rating: Continuous Duty, 3/4 HP.
 4. Electrical Power Requirements: 208 volt three phase.
 5. Duty Cycle: 30 cycles per hour.
 6. Monitored Entrapment Protection Device: Provide one (1) exterior, light curtain type photo eye, NEMA 4 rated, recessed into bollard. Photo eye shall cover from floor level to 72" above floor.
 7. Electro Magnetic Brake System: 24V DC brake.
- B. Operator Controls:
1. Control Wiring: Solid state circuitry with provisions for connection of a monitored reversing device, external radio control hook-up and maximum run timer. Provisions for timers to close and mid stop and lock bar sensor capability.
 - a. Wiring Options: 24V Class 2, On-Board Selection.
 2. 3-Button Control Station: Three button momentary contact "open-stop", constant pressure on close (can be changed to momentary to close).
 3. Controls for interior location.
 4. Controls flush mounted.
 5. Circuit Board: Solid state logic with LCD display.
 - a. LCD (Liquid Crystal Display): The 16 character LCD display shall allow for easy programming with an intuitive setup menu. Status indicators shall provide real-time status and display error messages for easy troubleshooting assistance.
 - b. Cycle Counter: LCD (Liquid Crystal Display) shall clearly indicate the exact number of cycles logged for easy maintenance support.
 6. Exterior Radio Control Terminal: For connection of radio controls. When the range is an issue, provide an optional external mounted radio receiver to allow the flexibility for the receiver to be moved to a new location for improved range.
 7. Radio Controls: For each door provide one radio receiver with 1,600' range and two transmitters. Transmitters shall contain selector buttons to enable operator to open any door.

2.7 FINISHES

- A. Slats and hood shall be galvanized in accordance with ASTM A653 and receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on powder coat.
 - 1. ArmorBrite Powdercoat finish.
 - 2. Color as selected by the Architect to match electric four-fold apparatus doors.
- B. Structural Angle Bottom Bar, Guide Assemblies, Headplate and Brackets:
 - 1. ArmorBrite Powdercoat finish.
 - 2. Color as selected by the Architect.
- C. Non-galvanized exposed ferrous surfaces shall receive one coat of rust-inhibitive primer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify opening sizes, tolerances and conditions are acceptable. Verify that site conditions are acceptable for installation of doors, operators, controls, and accessories.
- B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Rolling steel service doors shall be installed by an authorized manufacturer's distributor.
- B. Install door, guides and operating equipment complete with all necessary accessories and hardware according to shop drawings and manufacturer's instructions.
- C. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

- D. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- E. Fit and align assembly, including hardware, level and plumb, to provide smooth operation.
- F. Install perimeter trim and closures.

3.4 ERECTION TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation from Plumb: 1/16 inch.
- C. Maximum Variation from Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10-ft straight edge.

3.5 ADJUSTING AND CLEANING

- A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.
- B. Lubricate bearings and sliding parts and adjust doors for smooth and noiseless operation, balance, clearance, and similar requirements.
- C. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.
- D. Remove labels and visible markings.

3.6 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Provide the services of an authorized representative of the coiling door manufacturer to instruct the Owner's personnel in the proper operation and routine maintenance of the doors.

3.7 CLEANING AND PROTECTION

- A. Remove temporary coverings and protection of adjacent work areas, and protect installed products until completion of Project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove and legally dispose of construction debris from Project Site.
- D. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

SECTION 08 35 13.12**ELECTRIC FOUR-FOLD APPARATUS DOORS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide electrical four-fold doors, also designated as apparatus bay doors, complete, where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 03 30 00: Cast-In-Place Concrete.
 - 2. Section 05 50 00: Metal Fabrications.
 - 3. Section 06 10 00: Rough Carpentry.
 - 4. Section 08 33 23: Overhead Coiling Doors.
 - 5. Section 08 81 00: Glass Glazing.
 - 6. Section 09 90 00: Painting and Coating.
 - 7. Division 26: Electrical - Electrical connections for powered operators and accessories.

1.2 REFERENCES

- A. AISC - (American Institute of Steel Construction) Steel Construction Manual 16th Edition: Load and Resistance Factor Design.
- B. ANSI/NEMA 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- E. ASTM A513/A513M - Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- H. NFPA 70 - National Electrical Code.
- I. UL - Underwriters Laboratories.

1.3 SYSTEM DESCRIPTION

- A. Doors shall consist of four panels per opening with surface mounted tube frames, horizontal folding, with electrically operated with glazed vision windows. Doors shall open and close at an average door travel speed of not less than two feet of opening width per second.
- B. Operation of four-fold metal doors includes overhead mounted electro-mechanical operators.
- C. The bi-fold (four-fold) doors are designed for the most adverse conditions to include but not limited to the following: Earthquakes, Hurricanes, Extreme Weather Conditions, High Wind Loads, High Usage, High Cycle.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. Single Source Responsibility: Furnish electric four-fold units by one manufacturer, including hardware, accessories, mounting and installation components.
- C. Qualifications:
 - 1. Manufacturer: Company specializing in manufacture of four-fold doors for fire stations and similar uses with a minimum of ten (10) continuous years of documented experience and having successfully completed not fewer than ten (10) local projects.
 - 2. Installer: Company with a minimum of five (5) years documented experience in the installation of four-fold doors, trained and certified by the four-fold door manufacturer and capable of showing not less than five (5) satisfactory local installations.
- D. Doors shall be designed to withstand external or internal horizontal wind loads of 120mph (3 second gust) per ASCE 7. The maximum allowable deflection shall not exceed L/120 of the span. Fiber stresses in main members shall be limited to 27,000 pounds per square inch. Steel frames shall be designed in accordance with the AISC "Steel Construction Manual". In addition, door construction shall withstand seismic loads defined on the Structural Drawings and required by code.

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- E. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.
- F. Pre-Installation Meeting: After approval of submittals but prior to beginning installation of work of the Section, conduct a meeting at the Site attended by the Owner's Project Manager, Architect, manufacturer's representative and the installer of four-fold doors to describe in detail the installation process and to establish agreement, coordination and responsibilities. Prepare a detailed report of this meeting and furnish copies to the Owner's Project Manager and all attendees.

1.5 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Submit manufacturer's product data, annotated to indicate all features proposed for the Project. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for folding doors.
- C. Shop Drawings: Submit shop drawings showing details of construction, welding, clearance requirements, metal gauges, finish, electrical requirements, design data and related work. Submit complete, dimensioned, rough-in diagrams for electrical connections. Show sizes and locations of hinges, handles, and vision panels. Show electrical characteristics of motors, coordinated with requirements of Division 26. Show wiring diagrams and components of control panels.
- D. Setting Drawings: For anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors that are to be embedded in masonry, and for cutouts required in other work, including support-beam punching template.
- E. Samples: Submit corner sample showing panel construction and sheeting with specified finish. Submit one-fold hinge, one jamb hinge, and one operating system of size required for doors on the Project. Samples will be reviewed, and if acceptable, stamped to indicate approval. Samples will be retained for the duration of the Project, and if requested by installer, will be returned to the installer at completion of Project.
- F. Manufacturer's Experience Record: Submit evidence showing satisfactory experience over a period of ten (10) years together with not less than ten (10) local projects furnished over a period of not less than ten (10) years. Include contact names, phone numbers and addresses.
- G. Installer's Experience Record: Submit certification from manufacturer of doors that installer is trained and authorized to install the doors, and has satisfactorily completed not fewer than five (5) local installations within the last two (2) years.

H. Calculations:

1. Structural: Submit complete calculations showing conformance to structural load and deflection requirements specified. Include seismic calculations for seismic zone in which the Project is located. Calculations shall be reviewed and stamped by a civil or structural engineer registered in the State of California.
2. Electrical: Submit calculations substantiating electrical motor performance and operating speed.

I. Closeout Submittals:

1. Operating and Maintenance Manuals: Submit complete, showing all requirements for operation and maintenance of the four-fold doors. Provide recommendations for routine maintenance and spare parts required for normal operation, as well as drawings identifying parts and operating schematic of door and controls. Provide a complete ladder diagram and schematic together with suggested troubleshooting procedures. Provide complete information on sources for repair and maintenance.
2. Record Drawings: Provide complete set of shop drawings, annotated to show installation conditions and any field modifications made to the doors and to the surrounding conditions.

1.7 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Deliver all materials to the installation site in the manufacturer's original packaging. Packaging shall contain manufacturer's name, identification number and other related information.
- C. Store delivered materials and equipment in protected location above ground with adequate ventilation free from dust, water and other work of construction, and so as to permit access for inspection and handling.
- D. Handle materials carefully to prevent damage.

1.8 PROJECT SITE CONDITIONS

- A. Do not commence installation of doors until other rough work in the area of the doors is completed, electrical rough-in for the doors is complete and accepted and adjacent interior and exterior concrete surfacing is cured and finished.
- B. Environmental Limitations: Do not deliver or install folding doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

- C. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.9 WARRANTY

- A. Provide certified copies of Manufacturer's written standard limited warranty covering defects in material and workmanship for the doors and all mechanical parts for a period of five (5) years from the date of final acceptance. Provide one (1) year warranty for all electrical parts. Provide replacement parts for all work which becomes defective during warranty period.
- B. Provide installer's warranty to replace parts which become defective during manufacturer's warranty period specified above.

PART 2 - PRODUCTS

2.1 GLAZED FOUR-FOLD DOOR SYSTEM

- A. Provide electric powered apparatus room door systems as manufactured by Door Engineering and Manufacturing, 101 Power Drive, Mankato, MN 56001, (800)-959-1352.
- B. Basis of Design: Door Engineering and Manufacturing FF300 Series.

2.2 MATERIALS

- A. Steel Tube: ASTM A513/A513M and ASTM A500/A500M.
- B. Steel Sheets: Cold-rolled steel sheets of commercial quality, complying with ASTM A1008/A1008M.
- C. Hardware: Manufacturer's standard components.
- D. Fasteners: Zinc-coated steel.
- E. Sealant: Eclectic Brand E6100 Adhesive Caulk.

2.3 DOOR PANEL CONSTRUCTION

- A. Surface Mounted Tube Frame: Supply pre-hung tube frame system constructed of minimum TS6x4x3/16", designed to anchor to masonry wall construction or weld to steel structure. All hinges, track supports and operator supports shall be factory attached.
- B. Door framing shall be minimum 11-gauge structural steel tube with 16-gauge steel sheet on the exterior and interior faces.
- C. Sheeting shall be formed on the vertical edges with no visible welds on the interior or exterior panel faces.
- D. All frames and framing members shall be true to dimension and square in all directions.

- E. Exposed welds and welds which interfere with the installation of various parts shall be ground smooth and flush.
- F. Vision Windows: Provide 1" insulated, tempered, vision panels of the size, shape and location as noted on the Drawings. Glazing shall be 1/4-inch thick tempered low-e, dual pane, clear glass.
- G. Insulation: Unglazed portions of the door sections shall be filled with insulating material, fitted to cover the entire surface of the door panel between the structural members.
 - 1. Insulation: Fiberglass batts, 2-inches thick. U-value of 0.12 or less and R-value of 8 or more.
- H. After fabrication, test door panels for conformance to tolerance specified below. Do not use panels which exceed acceptable tolerance.

2.4 HARDWARE

- A. General: Provide hardware necessary for a complete installation. Hardware shall be heavy-duty type, including guide tracks and brackets, trolleys, center guides, not less than three pairs of jamb and fold hinges per opening, and all bolts, nuts, fittings, fasteners, etc. necessary for complete installation and operation.
- B. All hardware, including hinges and trolleys, shall be bolted to the panel for easy removal for service or panel replacement.
- C. Doors up to 16' wide and under 30 psf windload shall require no floor mounted supports, guides or tracks.
- D. Top tracks shall be adjustable on the end track hangers to allow for adjustment of the door panels in the open position and easily replaceable without removal of the door framing or operators.
- E. Jamb hinges shall be dual shear and have two thrust bearings and two needle bearings. Fold hinges shall be stainless steel and be dual shear with two thrust bearings. All bearings shall be completely concealed within the hinge barrel and include grease zerks. All hinge pins shall be minimum 3/4" diameter hardened steel.
- F. Provide plastic guards at jamb hinges to prevent access through hinge space.

2.5 WEATHERSTRIPPING

- A. Weatherstripping material shall be adjustable and readily replaceable and provide a substantially weather-tight installation. Weatherstripping at center shall be 1/16" EPDM and include no exposed fasteners on the exterior side of the panel. Weatherstripping at sill shall include two 1/16" EPDM sweeps with an aluminum retainer. The retainer shall be attached to the door with adhesive.

- B. Provide full perimeter jamb and head weatherstripping.

2.6 OPERATION

- A. Doors shall be electronically operated with provision for emergency manual operation.
 - 1. Operating Unit: Door operator shall be mounted above the center of the door head. The operator shall consist of a motor, a spring disk clutch assembly, and two belt driven gear reducers with one common shaft powering both gear reducers in opposite rotation. Door operator shall have sufficient horsepower, to open or close doors against 30 mile per hour wind load pressure without noise or vibration. The gear reducer shall have gears immersed in all-weather lubricant, sealed in a heavy housing. Operator shall automatically lock the door in the closed position.
 - 2. Drive and clutch assembly shall cause door to stop instantly when door panel hits an obstacle to prevent damage to the door, the operator or vehicles.
- B. Electric Motors: High-starting torque, instantly reversible, of sufficient horsepower and torque output to move the door in either direction from any position. Motors shall be capable of producing specified travel speed without exceeding the rated capacity. Motors shall conform to NEMA standards, Class B insulation and a service factor of 1.0.
 - 1. The motor control circuit shall incorporate a manual reset overload relay with a positively adjustable rotary type limit switch using 3 individual limit switches.
- C. Push buttons shall be NEMA 4 x rated, 3 button type with the buttons marked "OPEN", "CLOSE", AND "STOP". The "OPEN" button shall be of the type requiring only momentary pressure by the operator to cause the door to go from the closed to the fully open position. The "CLOSE" button shall require momentary pressure from the operator to maintain the closing motion of the door. When the door is in motion and the "STOP" button is pressed the door shall stop instantly and remain in the stop position. From the stop position the door may then be operating in either direction by pushing the "OPEN" or "CLOSE" button. The sequence of "STOP" shall put the photoelectric eyes into inactive mode for the purpose of partially opening the doors for ventilation. At any time the "OPEN" or "CLOSE" button is activated, the doors and photoelectric eyes will be put into normal operation and function.
- D. Control Panel: Provide each door with a NEMA 12 control panel enclosure, housing a reversing across-the-line type magnetic motor starter with thermal-overload protection. The control panel shall contain relays, fuses, terminal strips, and other electronic components as required to provide the specified operating sequences. All components shall be prewired to the terminal strips and neatly labeled. Power circuits in excess of 200 volts shall be provided with control transformers to reduce voltage in the control circuit to 120 volts. Control panel assembly shall be UL labeled.

- E. Limit Switches: Rotary type switches with NEMA rated micro-switches.
- F. Photo Electric Eyes: Provide two (2) industrial grade photoelectric eyes, one located in front and one located to the rear of the door panels when doors are in the open position. Photoelectric eyes shall be infrared type with transmitter and receiver. Units shall be provided in a NEMA 4x housing. Photoelectric eyes shall be non reflective through beam systems with LED alignment indicators and supervised relay outputs for providing a detect signal in case of power failure. Photo eyes shall be 100 volt AC. Photoelectric eyes shall be recessed mounted with no exposed conduit.
- G. Cycle Counter: Seven-digit cycle counter shall count opening and closing of doors. One cycle shall be one open and one close.
- H. Reversing Device: Provide pneumatic type reversing edges located full length of the door on the leading edges of the two center sections. Reversing edges shall automatically reverse the doors if they come in contact with an obstruction during closing. The reversing edges shall be in addition to and separate from specified limit switches.
- I. Remote Controls: For each door provide one radio receiver with 1,600' range and two transmitters. Transmitters shall contain selector buttons to enable operator to open any door.

2.7 SHOP FINISHING

- A. General: Thoroughly clean, pre-treat and prime surfaces of the door assembly including fixed panels trim, support and closure pieces.
- B. Factory Finish: Door panels and tube frames shall be finished with manufacturer's standard PPG Spectracron epoxy primer and polyurethane top coat. Architect to select from manufacturer's standard color chart.
- C. Operator and operating hardware shall be powder-coated in manufacturer's standard gray.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that rough construction in the area to receive the doors is complete and that surfaces to receive hinges, guides, motor, controls and other devices are properly anchored, smooth, flat and ready to receive work.
- B. Verify that jamb construction is sufficiently sized and properly anchored to support the weight of the doors.
- C. Permanent or temporary electric wiring shall be brought to the door opening before installation is started and shall be completed so as not to delay the inspection test.

3.2 INSTALLATION

- A. Provide steel tube door frames as required by door manufacturer, at each door opening, and provide approved anchorage to building wall. Install door and operating equipment complete with necessary hardware, jamb and head weatherstrips, anchors, inserts, hangers and equipment supports in accordance with final shop drawings, manufacturer's instructions and as specified herein.
- B. Bolt or weld guide track support brackets to head of opening and bolt door track to brackets.
- C. Test and adjust doors to be plumb and true to line for smooth operation and uniform clearance at head, jambs and between panels.

3.3 FIELD QUALITY CONTROL

- A. Arrange for door manufacturer to provide a field service specialist at commencement of installation to instruct installer in methods and to ensure that Project conditions are satisfactory.

3.4 ERECTION TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Tolerance: No door shall be bowed, warped, or out of line, in the vertical or horizontal plane of the door opening by more than 1/8 inch in 20 feet.

3.5 ADJUSTING, CLEANING AND PROTECTION

- A. Installer shall perform an Inspection of the doors and a complete operating test in the presence of the Contractor as soon as the erection is complete. Any defects noted shall be corrected.
- B. After door approval in the above test, the Contractor shall assume the responsibility for any damage or rough handling of the doors during construction until the building is turned over to the Owner and final inspection is made.
- C. Clean surfaces and repaint abraded or damaged finished surfaces to match factory-applied finish.
- D. Protect finished installation until final acceptance of Contract.
- E. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

3.6 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Provide the services of an authorized representative of the four-fold door manufacturer to instruct the Owner's personnel in the proper operation and routine maintenance of the doors.

END OF SECTION

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SECTION 08 41 13**ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide exterior aluminum-framed storefronts and exterior and interior manual-swing aluminum storefront doors where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 07 65 26: Self-Adhering Sheet Flashing.
 - 2. Section 08 42 26.11: Folding Glass Walls.
 - 3. Section 08 51 13: Aluminum Windows.
 - 4. Section 08 71 00: Door Hardware.
 - 5. Section 08 81 00: Glass Glazing.

1.2 REFERENCES

- A. AAMA 501.1 - Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure.
- B. AAMA 501.5 - Test Method for Serviceability of Exterior Fenestration After Thermal Cycling.
- C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- E. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- F. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- G. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- H. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

- I. ASTM E413 - Classification for Rating Sound Insulation.
- J. ASTM E1332 - Standard Classification for Rating Outdoor-Indoor Sound Attenuation.
- K. NAAMM AMP 500 - (National Association of Architectural Metal Manufacturers) Metal Finishes Manual.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following.
 - 1. Structural loads.
 - 2. Thermal movements.
 - 3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
 - 4. Dimensional tolerances of building frame and other adjacent construction.
 - 5. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferred to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
 - d. Noise or vibration created by wind and thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.
 - f. Sealant failure.
 - g. Failure of operating units to function properly.
- B. Structural Loads:
 - 1. Wind Loads: 20 pounds per square foot.
 - 2. Seismic Loads: As indicated on Drawings.
- C. Deflection of Framing Members:
 - 1. Deflection Normal to Wall Plane: Limited to L/175 of clear span for spans up to 13 feet 6 inches and to L/240 of clear span plus 1/4 inch for spans

greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.

2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.
- D. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E330 as follows.
1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity but not less than 10 seconds.
- E. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
 2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. Test High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
 - b. Test Low Exterior Ambient-Air Temperature: 30 deg F.
 - c. Test Interior Ambient-Air Temperature: 75 deg F.
- F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft.
- G. Water Penetration Under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

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- H. Water Penetration Under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
 - 1. Maximum Water Leakage: According to AAMA 501.1. Water controlled by flashing and gutters that is drained to exterior and cannot damage adjacent materials or finishes is not considered water leakage.
- I. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 53 when tested according to AAMA 1503.
- J. Average Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having average U-factor of not more than 0.69 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.
- K. Sound Transmission: Provide aluminum-framed systems with fixed glazing and framing areas having minimum STC 32 according to ASTM E413 and an OITC 26 according to ASTM E1332, as determined by testing according to ASTM E90.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. Certify that units are AAMA "Quality Certified".
- C. Source Limitations: Obtain aluminum-framed storefront system through one source from a single manufacturer.

1.5 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data:
 - 1. Manufacturer's specifications and other data showing compliance with all specified and code requirements.
 - 2. Shop drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.
 - 3. Maintenance manual with instructions for cleaning, repair, and glass replacement, at time of Project Closeout.
- C. Samples: Accompanying the shop drawings, submit the following for Architect's approval.

1. Sample of each exposed member, 12" length.
2. Samples of finish, showing complete range of color from darkest to lightest proposed for use on this Work.

1.6 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Provide protection during fabrication, shipment, site storage, and erection to prevent damage.

1.7 WARRANTY

- A. Upon completion of this portion of the Work, deliver to the Architect two copies of a written Warranty agreeing to replace work of this Section which fails due to defective materials or workmanship within five (5) years after Date of Substantial Completion.
- B. Failure due to defective materials or workmanship is deemed to include, but not to be limited to:
 1. Failures in operation of operating component or components.
 2. Leakage or air infiltration in excess of the specified standard.
 3. Deterioration of finish to an extent visible to the unaided eye.
 4. Defects which contribute to unsightly appearance, potential safety hazard, or potential untimely failure of the work of this Section or the Work as a whole.

PART 2 - PRODUCTS

2.1 ALUMINUM STOREFRONTS (CENTER GLAZED)

- A. Storefront System: Kawneer Trifab VG 450, 4-1/2" x 1-3/4" or equal products by Oldcastle Building Envelope.
- B. Entrance Doors: Kawneer Extra Duty 500 Wide Stile Entrance, 5" vertical stiles and top rail, 6-1/2" bottom rail, with square snap-in glazing stops and weather stripping on all four sides.
- C. Extrude all framing sections from ASTM B221 6063-T5 aluminum alloy, conforming to details, with straight, sharply-defined lines, free from defects impairing strength or durability. All fastening devices shall be aluminum, stainless steel, cadmium plate, or other corrosion-resistant material. Exposed screws will not be permitted. Provide "Shear Block" fabrication.
- D. Flashing: 16 gage sheet metal complying with pertinent provisions of Section 07 62 00 of these Specifications.

- E. Fasteners: Use nuts, screws, washers, bolts, clips, miscellaneous fastening devices, and internal components of aluminum, stainless steel, or non-corrosive materials sufficiently strong to perform their function, and in accordance with manufacturer's recommendations. Match exposed fasteners with aluminum finish. Exposed screws or rivets are not permitted.
- F. Sealants and Caulking: Conform to Section 07 92 00.

2.2 GLASS AND GLAZING

- A. As specified in Section 08 81 00 and as indicated on Drawings.
- B. Provide safety glazing as required by Building Code and as indicated on Drawings.
- C. Glazing shall be retained mechanically with gaskets on four sides.

2.3 ALUMINUM FINISHES

- A. General: Comply with NAAMM's Metal Finishes Manual for recommendations relative to applying and designating finishes.
- B. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- C. Storefront and Storefront Doors: Finish all exposed aluminum with dark bronze anodized aluminum finish AA-M10C21A44 Architectural Class I, 0.7-mil. thickness minimum, Kawneer #40.

2.4 FABRICATION

- A. Fabricate in strict accordance with the manufacturers' specifications and shop drawings as approved by the Architect.
- B. Provide hairline fit at joints, with smooth continuity of line and accurate relation of planes and angles. Securely fasten.
- C. Design units to resist vertical and lateral forces.
- D. Use "Shear Block" fabrication for storefront frames.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine openings, substrates, structural support, anchorage, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

1. Verify rough opening dimensions.

2. Verify levelness of sill plate.
3. Verify operational clearances.
4. Examine wall flashings, water and weather barriers, and other built-in components for proper water management.
5. Wood Frame Walls:
 - a. Wood frame walls must be dry, clean, sound, well nailed, free of voids, and without offsets at joints.
 - b. Ensure that nail heads are driven flush with surfaces in opening and within 3" of opening.

3.2 COORDINATION

- A. Coordinate as required with other trades and make field measurements to assure proper fit.

3.3 INSTALLATION

- A. Install the work of this Section in strict accordance with the original design, the approved shop drawings, pertinent requirements of governmental agencies having jurisdiction, and manufacturer's recommendations, anchoring all components firmly into position for long life.
- B. Erect all work plumb, level, square, in proper alignment and relationship to work of other trades. Make all finished aluminum work free of waves, buckles, dents, or other defects, and securely anchor. Furnish anchors, clips, bolts, reglets, etc., to secure all work in place. Do not use powder-driven fasteners. Omit all labels. Do not use exposed fasteners or screws.
- C. Caulking: Tightly and continuously caulk all joints with compounds specified. Conform to requirements of Section 07 92 00.
- D. Coat aluminum installed in contact with dissimilar metal, concrete, or masonry, with a heavy coat of bitumastic paint or separated with butyl tape.
- E. Responsibility: Assume responsibility for installation of aluminum sections, and caulking and sealing the assembly to produce a weatherproof installation. Examine the methods and materials to be used in glazing before any glass is installed.
- F. When glazing is performed under this Section, provide the types of glass required and glaze in accordance with pertinent provisions of Section 08 81 00 of these Specifications.

3.4 CLEANING UP

- A. Clean all surfaces inside and out and remove from the site all scraps and debris relating to this work.

1. Clean glass immediately after installation.
 - a. Comply with glass manufacturer's written recommendations for final cleaning and maintenance.
 - b. Remove non-permanent labels and clean surfaces.
 2. Clean all aluminum work before acceptance, removing all blemishes, finger marks, oxidation, etc., and leave in first-class condition. Use cleaning compound approved by aluminum manufacturer.
- B. Avoid damaging protective coatings and finishes.
- C. Remove excess sealants, glazing materials, dirt, and other substances.
- D. Repair or replace damaged installed products.
- E. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during the construction period.
- F. Remove construction debris from project site and legally dispose of debris.
- G. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 08 42 26.11
FOLDING GLASS WALLS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide thermally-broken, aluminum-framed folding glazed wall system, complete, where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 06 10 00: Rough Carpentry.
 - 2. Section 06 20 00: Finish Carpentry.
 - 3. Section 07 62 00: Sheet Metal Flashing and Trim.
 - 4. Section 07 65 26: Self-Adhering Sheet Flashing.
 - 5. Section 07 92 00: Joint Sealants.
 - 6. Section 08 41 13: Aluminum-Framed Entrances and Storefronts.
 - 7. Section 08 51 13: Aluminum Windows.
 - 8. Section 08 71 00: Door Hardware.
 - 9. Section 08 81 00: Glass Glazing.

1.2 REFERENCES

- A. AAMA - American Architectural Manufacturers Association.
- B. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard / Specification for Windows, Doors, and Skylights.
- C. AAMA 2400 - Standard Practice for Installation of Windows with a Mounting Flange in Wood-Frame Construction Using Exterior Barrier Methods.
- D. ANSI Z97.1 - For Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- E. ASCE/SEI 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- F. ASTM C1036 - Standard Specification for Flat Glass.

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- G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- H. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- I. ALI - Associated Laboratories, Inc.
- J. ASTM E2188 - Standard Test Method for Insulating Glass Unit Performance.
- K. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
- L. CPSC 16CFR 1201 - (Consumer Product Safety Commission) Safety Standard for Architectural Glazing Materials.
- M. FGIA - (Fenestration and Glazing Industry Alliance) AAMA Gold Label Certification Program.
- N. NFRC - National Fenestration Rating Council.
- O. NFRC 100 - Procedure for Determining Fenestration Product U-factors.
- P. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

1.3 QUALITY ASSURANCE

- A. Overall Standards: Comply with AAMA/WDMA/CSA 101/I.S.2/A440, except where noted herein.
- B. Regulatory Requirements:
 - 1. Title 24 compliant.
 - 2. Certifications for Insulated Glass Units: Insulated glass units shall be certified to ASTM E2188/E2190 per the ALI guidelines.
 - 3. Doors shall be Gold Label certified with label attached to frame per AAMA requirements.
 - 4. Doors shall be NFRC certified with temporary U-factor label applied to glass and an NFRC tab added to permanent AAMA frame label.
- C. Manufacturer Qualifications: Glass wall system shall be manufactured by a firm with a minimum of thirty (10) year experience in providing folding and sliding door systems for large openings in the North American market. Manufacturer shall be a current member of AAMA and NFRC.
- D. Installer Qualifications: A firm which has at least three (3) years documented experience in installation of manufacturer's products or similar products, and trained and certified by manufacturer.

1. Provide reference list of three (3) projects of similar scale and complexity successfully completed in the last three (3) years.
 2. Include project names, locations, completion dates, names and telephone numbers of General Contractor and Owner's contact person.
- E. Single Source Responsibility: Furnish complete, precision built, engineered, pre-fitted system materials from a single source manufacturer for entire Project.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including the following.
1. Preparation and installation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Independently tested data listing performance criteria.
 4. Product literature for systems incorporated in the Work. Performance test results and details of construction relative to materials, dimensions of individual components, profiles, and colors.
- C. Shop Drawings: Including but not limited to the following.
1. Indicate system component sizes, dimensions and framing R.O., configuration, swing panels, direction of swing, stacking layout, typical head jamb, side jambs and sill details, type of glazing material, handle height and field measurements.
 2. Elevations of rough opening requirements and details for field-applied components.
- D. Samples: Submit selection samples for verification, include the following.
1. Exterior Color: Minimum 1" x 4" color chips on aluminum substrate with anodized color.
 2. Glass, showing specified tint color.
- E. Quality Assurance Submittals:
1. Proof of manufacturer's qualifications.
 2. U-Factor and Structural Rating charts required for NFRC and AAMA labeling requirements.
 3. Installation Instructions: AAMA 2400.

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F. Closeout Submittals:

1. Temporary door labels to identify doors that labels were applied to.
2. Owner's Manual from manufacturer which includes installation instructions, operation and maintenance data. Identify Owner's Manual with project name, location and completion date, type and size of unit installed.
3. Warranties.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Comply with Manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- C. Deliver materials to Job site in sealed, unopened cartons or crates.
 1. Upon receipt, inspect shipment. Ensure it is complete, in good condition, and meets project requirements.
- D. Store products in manufacturer's unopened packaging until installation. Store materials off ground in an upright position, in well ventilated area, in no direct sunlight, in a clean and dry location. Protect units against weather and defacement or damage from construction activities, especially to panel edges.
- E. Follow Manufacturer's instructions on label applied to units.

1.6 PROJECT SITE CONDITIONS

- A. Mark field measurements on product drawing submittal. Field verify dimensions including but not limited to rough openings and inset components.
- B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.7 WARRANTY

- A. Upon completion of this portion of the Work, deliver to the Architect two copies of a written Warranty agreeing to replace work of this Section which fails due to defective materials or workmanship within ten (10) years after Date of Substantial Completion. Warranty includes costs for parts and skilled labor.
- B. Failure due to defective materials or workmanship is deemed to include, but not to be limited to:
 1. Failures in operation of operating component or components.
 2. Leakage or air infiltration in excess of the specified standard.

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3. Deterioration of finish to an extent visible to the unaided eye.
4. Defects which contribute to unsightly appearance, potential safety hazard, or potential untimely failure of the work of this Section or the Work as a whole.

PART 2 - PRODUCTS

2.1 THERMALLY BROKEN ALUMINUM-FRAMED FOLDING GLASS WALL SYSTEM

- A. Provide monumental thermally broken aluminum-framed, floor track supported folding glass wall system as manufactured by Milgard Manufacturing, Inc.
- B. Basis of Design: Milgard AX650 Series. Manufacturer's standard frame and panel profiles, with top track, side jambs and panels with dimensions as shown on Drawings.
 1. System Components: Aluminum frame, threshold, panels, sliding-folding and locking hardware, weather stripping, glass and glazing, and accessories as required for a complete working installation.
 2. Insect Screen: Fully retractable, ultra-strong, UV resistant fiberglass mesh housed in single cartridge riding on a single track.

2.2 SYSTEM DESCRIPTION

- A. General Performance Requirements: Products and systems provided must be manufactured, fabricated, and installed to the following performance criteria.
 1. Comply with AAMA/WDMA/CSA 101/I.S.2/A440, except as noted herein.
 2. Performance Class: Refer to Drawings.
 3. Performance Grade: Refer to Drawings.
 2. U-Factor (NFRC 100): Refer to Drawings.
 3. SHGC - Solar Heat Gain Coefficient (NFRC 200): Refer to Drawings.
 4. OITC - Outdoor-Indoor Transmission Class (ASTM E90): Refer to Drawings.
 5. STC - Sound Transmission Class (ASTM E90): Refer to Drawings.
- B. Structural Requirements: Products and systems provided must be capable of withstanding wind loads based on testing units representative of those indicated for Project that pass AAMA/WDMA/CSA 101/I.S.2/A440, Uniform Structural Load Test.
 1. Design Wind Loads: Determine design wind loads, according to ASCE 7, applicable to product from basic wind speeds (MPH) at 33 feet above grade, based upon mean roof heights indicated on Drawings.

- C. Door Type: Bi-Fold Door - Low Sill.
 - 1. Frame: 5-7/8" depth, aluminum profile.
 - 2. Panel: 2-1/4", aluminum with Polyamide 66 Strut.
 - 3. Sill: 5-7/8" depth with 1-1/4" low-height sill multi-track aluminum.

2.3 DOOR MATERIALS

- A. Aluminum: Comply with requirements of AAMA/WDMA/CSA 101/I.S.2/A440, 6063-T5 temper for strength, corrosion resistance and application of required finish.
- B. Extruded frame member shall be 0.125" in thickness for structural wall.
- C. Thermal struts shall be Polyamide 66 GF25.
- D. Weatherstripping:
 - 1. Fin seal polypropylene pile.
 - 2. Foam filled leaf.

2.4 GLASS AND GLAZING

- A. Safety Glazing per ASTM C1036, ASTM C1048, ANSI Z97.1 and CPSC 16CFR 1201. Tempered Insulated Glass Units:
 - 1. Glazing Type: Dual Cardinal 366 Low-E/Clear.
 - 2. Overall IG Unit Thickness (Specify): Dual Glazed 1".
 - 3. Spacer Type: Cardinal Endure.
 - 4. Gas Filled: Argon.
 - 5. Glass Thickness: Per manufacturer's specifications.

2.5 LOCKING HARDWARE AND HANDLES

- A. Handle and Lock: Interior and exterior lever handle with turn knob, dead bolt and multi-point lock.
- B. Twin Bolt Handle: Interior handle for shoot bolt operation with 90-degree activation.
- C. Hinges and Carriers: Centor E3 Carrier System.

2.6 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

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2.7 FABRICATION

- A. Fabricate frames and panels with straight joinery with proprietary corner joinery system.
- B. Factory exterior glaze with snap in glazing bead and wedge gasket. Insulated glass units shall be reglazable without dismantling sash framing.

2.8 FINISHES

- A. Frame and Sash Color: Dark Bronze Anodized, Class I. Interior and exterior must be same color.
- B. Hardware: Black. Interior and exterior must be same color.
- C. Screen Frame Color: Powder Coated Black.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Examine surfaces of openings and verify dimensions. Verify openings are level, plumb, and square, with no unevenness, bowing, or bumps on floor.
 - 1. Verify that framing complies with AAMA 2400.
 - 2. Verify that fasteners in framed walls are fully driven and will not interfere with door installation.
- B. Prepare openings using methods recommended by manufacturer for achieving the best result for the substrate under the project conditions.
 - 1. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
- C. Do not proceed with installation until substrates are prepared using methods recommended by manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

3.2 INSTALLATION

- A. Install per AAMA 2400, Drawings, submittals, and manufacturer's installation instructions.
 - 1. Properly flash, seal and waterproof around perimeter of opening.
 - 2. Attach anchorage devices in place, level, straight, plumb and square. Install frame in proper elevation, plane and location, and in proper alignment with other work.

3. Install panels, handles, lockset, screens and other accessories in accordance with manufacturer's recommendations and instructions.
 4. Do not remove temporary labels.
- B. Insect Screens: Install on operable doors per manufacturer's recommendations and installation instructions.

3.3 FIELD QUALITY CONTROL

- A. Inspect doors in accordance with Manufacturer's Quality Control Program as required by AAMA Gold Label.

3.4 CLEANING AND PROTECTION

- A. Protect installed products until completion of Project. Keep units closed and protect installation against damage from construction activities.
- B. Remove temporary labels and retain for Closeout Submittals. Use manufacturer recommended methods to clean surfaces.
- C. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 08 51 13
ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide thermally improved aluminum fixed and casement windows where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 07 65 26: Self-Adhering Sheet Flashing.
 - 2. Section 07 92 00: Joint Sealants.
 - 3. Section 08 41 13: Aluminum-Framed Entrances and Storefronts.
 - 4. Section 08 42 26.11: Folding Glass Walls.
 - 5. Section 08 81 00: Glass Glazing.
 - 6. Section 09 24 23: Cement Stucco.

1.2 REFERENCES

- A. AAMA 2400 - (American Architectural Manufacturers Association) Standard Practice for Installation of Windows with a Mounting Flange in Wood-Frame Construction Using Exterior Barrier Methods.
- B. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard / Specification for Windows, Doors, and Skylights.
- C. ASTM E588 - Standard Practice for Detection of Large Inclusions in Bearing Quality Steel by the Ultrasonic Method.
- D. NFRC 100 - (National Fenestration Rating Council) Procedure for Determining Fenestration Product U-factors.
- E. FGIA - (Fenestration and Glazing Industry Alliance) AAMA Gold Label Certification Program.

1.3 PERFORMANCE REQUIREMENTS

- A. Thermal Performance: Comply with NFRC 100.
- B. Air Leakage, Water Resistance, Structural Test: Comply with AAMA/WDMA/CSA 101/I.S.2/A440.

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- C. Forced-Entry Resistance: Comply with ASTM E588.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. Overall Standards: Comply with AAMA/WDMA/CSA 101/I.S.2/A440, except as otherwise noted herein.
- C. Manufacturer Qualifications: AAMA and NFRC member with minimum five (5) years experience in producing aluminum windows of the type(s) specified.
- D. Certifications for Insulated Glass Windows:
 - 1. Windows shall be Gold Label certified with label attached to frame per AAMA requirements.
 - 2. Windows shall be NFRC certified with temporary U-factor label applied to glass and an NFRC tab added to permanent AAMA frame label.

1.5 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Submit proof of manufacturer qualifications.
- C. Product Data:
 - 1. Manufacturer's specifications and other data showing compliance with all specified and code requirements. Include U-Factor and structural rating charts required for AAMA and NFRC labeling requirements.
 - 2. Installation Instructions: AAMA 2400.
 - 3. Maintenance manual with instructions for cleaning, repair, and glass replacement, at time of Project Closeout.
- D. Shop Drawings: In sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades. Include window schedule, window elevations, sections and details, and multiple window assembly details.
- E. Samples: Accompanying the shop drawings, submit the following for Architect's approval.
 - 1. Sample of each exposed member, 12" length.
 - 2. Color Samples: Minimum 1 x 4 inch samples of anodized aluminum.

3. Glass sample, showing specified tint color.

1.6 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Follow manufacturer's instructions on label applied to windows.

1.7 WARRANTY

- A. Upon completion of this portion of the Work, deliver to the Architect two copies of a written Warranty agreeing to replace work of this Section which fails due to defective materials or workmanship within ten (10) years after Date of Substantial Completion. Warranty includes costs for parts and skilled labor.
- B. Failure due to defective materials or workmanship is deemed to include, but not to be limited to:
 1. Failures in operation of operating component or components.
 2. Leakage or air infiltration in excess of the specified standard.
 3. Deterioration of finish to an extent visible to the unaided eye.
 4. Defects which contribute to unsightly appearance, potential safety hazard, or potential untimely failure of the work of this Section or the Work as a whole.

PART 2 - PRODUCTS

2.1 FIXED AND CASEMENT WINDOWS

- A. TIE Aluminum Windows Series (A250 Windows), as manufactured by Milgard Manufacturing, Inc.
 1. Casement: 920 Series, 1 5/16" nail fin setback.
 2. Frame: 920 Series, 2 1/4".
 3. Sash: Depth of 1 1/2", solid aluminum extrusion.

2.2 MATERIALS

- A. Aluminum: Comply with requirements of AAMA/WDMA/CSA 101/I.S.2/A440, 6063-T5 temper for strength, corrosion resistance and application of required finish.
- B. Extruded frame members are to be 0.060" in thickness for structural walls.
- C. Insulated Glass Units: Class A, 1 inch thick overall.
 1. Glazing Type: Clear/SunCoatMAX™ Low-E, argon gas filled.

2. Refer to Drawings for U-Value and SHGC.
3. Spacer Bar: As selected by Architect.
- D. Divided Lite Grids: 5/8 inch wide flat, grids between the glass that are color matched to frame and sash.
- E. Hardware:
 1. Cam style locking mechanism with latch on jamb.
 2. Tension adjustable hinge.
- F. Weatherstripping: Dual durometer vinyl bulb seal.
- G. Caulking and Sealants: Conform to Section 07 92 00 as required.
- H. Insect Screens: Provide tight-fitting screen for operating sash with hardware to allow easy removal.
 1. Screen Cloth: Charcoal colored fiberglass mesh.
 2. Frame:
 - a. Cambered formed aluminum with rigid plastic corner keys.
 - b. Pull tabs for removal.

2.3 FABRICATION

- A. Fabricate frames and sash with mechanically joined corners. Fasten corners with corrosion resistant screws and seal with acrylic sealant.
- B. Exterior glaze all fixed glass and marine glaze all sashes with flexible PVC glazing. The fixed glazing shall be removed without disassembly of a sash. The vents will need to be disassembled to replace the glazing.

2.4 FINISHES

- A. Frame and Sash Color: Bronze Anodized Exterior Finish. Provide AA-C22-A32 Class II Bronze, minimum 0.4 mils thick, electrolytically deposited color anodized finish.
- B. Color match screen frame to window frame and sash color.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

1. Verify that framing complies with AAMA 2400.
2. Verify that fasteners in framed walls are fully driven and will not interfere with window installation.

3.2 COORDINATION

- A. Coordinate as required with other trades and make field measurements as required to assure proper fit.
- B. Commencement of work by installer is acceptance of substrate conditions.

3.3 INSTALLATION

- A. Install the work of this Section in strict accordance with the original design, the approved shop drawings, pertinent requirements of governmental agencies having jurisdiction, and manufacturer's recommendations, anchoring all components firmly into position for long life.
- B. Install windows in framed walls in accordance with AAMA 2400.
- C. Do not remove temporary labels.
- D. Install insect screens on operable sash.
- E. When glazing is performed under this Section, provide the types of glass required and glaze in accordance with pertinent provisions of Section 08 81 00 of these Specifications.

3.4 PROTECTION AND CLEANING

- A. After installation, clean metal and glass surfaces, on both interior and exterior, of all mortar, paint and other contaminants. Use no abrasives. Use a mild detergent and warm water solution with soft, clean cloths.
- B. Remove temporary labels and retain for Closeout Submittals.
- C. After cleaning, protect all work against damage until date of Substantial Completion.
- D. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 08 71 00**DOOR HARDWARE****PART 1 - GENERAL****1.1 DESCRIPTION****A. Work Included:**

1. Furnish door hardware for wood doors, steel doors, aluminum framed entrance doors, all glass entrance doors, and miscellaneous hardware items required to complete the Work as shown on the Drawings and as specified herein.
2. Provide hardware not described herein but otherwise required for proper completion of the Project, conforming to size, function, quality, and finish of other specified hardware.
3. Furnish trim attachments and fastenings, specified or otherwise required, for proper and complete installation.

B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
2. Installation of finish hardware is described in other Sections of these Specifications.

C. Definitions: "Hardware Sets" described in the Hardware Schedule in Part 3 of this Section are as shown on the Door Schedule.**D. General Requirements:** While the following hardware list is intended to cover all doors and other movable parts of the building, and establish a type and standard of quality, the finish hardware supplier must examine the Drawings and Specifications and furnish proper hardware for all openings, whether listed or not. If there are any omissions in hardware sets in regard to regular doors or openings, call them to the attention of the Architect before bid opening. Otherwise, consider the list to be complete.**1.2 REFERENCES**

- A. ADAAG - (Americans with Disabilities Act Accessibility Guidelines) for Buildings and Facilities.
- B. ANSI A117.1 - (American National Standards Institute) Accessible and Usable Buildings and Facilities.
- C. Builders Hardware Manufacturers Association (BHMA):
 1. ANSI/BHMA A156.1 - Butts and Hinges.

2. ANSI/BHMA A156.2 - Bored and Preassembled Locks and Latches.
 3. ANSI/BHMA A156.3 - Exit Devices.
 4. ANSI/BHMA A156.4 - Door Controls - Closers.
 5. ANSI/BHMA A156.5 - Auxiliary Locks and Associated Products.
 6. ANSI/BHMA A156.6 - Architectural Door Trim.
 7. ANSI/BHMA A156.7 - Template Hinge Dimensions.
 8. ANSI/BHMA A156.8 - Door Controls - Overhead Stops and Holders.
 9. ANSI/BHMA A156.13 - Mortise Locks and Latches.
 10. ANSI/BHMA A156.15 - Release Devices - Closer Holder, Electromagnetic and Electromechanical.
 11. ANSI/BHMA A156.16 - Auxiliary Hardware.
 12. ANSI/BHMA A156.18 - Materials & Finishes.
 13. ANSI/BHMA A156.21 - Thresholds.
 14. ANSI/BHMA A156.22 - Door Gasketing and Edge Seal Systems.
 15. ANSI/BHMA A156.25 Electrified Locking Devices.
 16. ANSI/BHMA A156.26 - Continuous Hinges.
 17. ANSI/BHMA A156.28 - Recommended Practices for Mechanical Keying Systems.
 18. ANSI/BHMA A156.31 - Standard for Electric Strikes and Frame Mounted Actuators.
 19. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors with Steel Frames.
 20. ANSI/BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames.
- D. C.B.C. - (California Building Code) 2022 Edition.
- E. Door and Hardware Institute (DHI):
1. ANSI/DHI A115.IG - Installation Guide for Doors and Hardware.
 2. DHI Keying Systems and Nomenclature.
 3. DHI Sequence and Format for the Hardware Schedule.

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- F. National Fire Protection Association (NFPA):
 - 1. NFPA 80 - Fire Doors and Other Opening Protectives.
 - 2. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives.
 - 3. NFPA 252 - Fire Tests of Door Assemblies.
- G. OSFM - Office of the State Fire Marshal.
- H. UL Solutions Inc. (UL):
 - 1. UL 305 - Panic Hardware.
 - 2. UL 1034 - Burglary-Resistant Electric Locking Mechanisms.

1.3 QUALITY ASSURANCE

- A. Single Source for Items:
 - 1. Except as specifically otherwise approved in advance by the Architect, furnish for each item only the product of a single manufacturer.
 - 2. To the maximum extent practicable, furnish similar items only as the product of a single manufacturer.
- B. Manufacturers, hardware supplier, and installer shall have no less than five (5) years experience in the provision of door hardware for projects similar in size, complexity and type to this Project.
- C. Hardware schedule and keying schedule submittals shall be prepared by a hardware consultant holding the credentials of Architectural Hardware Consultant (AHC) issued by the Door and Hardware Institute. Hardware Consultant shall have no less than five (5) years experience in the scheduling of door hardware for projects similar in size, complexity and type to this Project and shall be available, at no additional cost, during the course of the Work to consult with Contractor, Architect, and Owner regarding door hardware and keying.
- D. Pre-Installation Conference: Arrange conference at job site to coordinate door, frame, hardware and electronic security hardware installation; to be attended by the Architect, Owner, Contractor and representative personnel of firms involved in the provision and installation of said items.
- E. Keying Conference: Arrange conference with Owner, or designated representative, and Manufacturer's/ Hardware Supplier's Architectural Hardware Consultant to establish keying requirements. Incorporate keying conference decisions into Keying Schedule.

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1.4 DESIGN REQUIREMENTS

- A. Comply with all applicable ordinances of local government and the OSFM.
- B. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with all applicable regulations, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. At rated doors with panic exit devices, provide devices labeled as "Fire Exit Device."
- C. Comply with all applicable accessibility regulations as set forth in ADAAG, ANSI A117.1, and CBC Chapters 11A and 11B as applicable.
- D. Latching and locking doors that are hand-activated and that are in a path of travel shall be operable with a single effort by lever-type hardware, panic bars, push-pull activating bars, or other hardware designed to be easy to grasp with one hand, not requiring tight grasping, tight pinching or twisting of the wrist; from egress side shall not require the use of a key, tool, or special knowledge for operation.
 - 1. All hand-activated hardware shall be mounted between 34 inches and 44 inches above finished floor.
- E. Door closing devices shall comply with the following maximum opening-force requirements:
 - 1. Interior Hinged Doors: 5 lbf applied perpendicular to door at latch.
 - 2. Exterior Hinged Doors: 5 lbf applied perpendicular to door at latch.
 - 3. Fire Rated Doors: 5 lbf applied perpendicular to door at latch. To assure latching, may be increased to the minimum force allowable by the appropriate administrative authority, not to exceed 15 lbf.
- F. Where door closers are provided, adjust sweep speed so that from an open position of 70 degrees the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
- G. Thresholds shall be maximum 1/2 inch height above floor and landing on both sides of openings. Bevel raised thresholds with a slope of not more than 1:12.

1.5 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Products other than those designated herein must be approved as substitutions prior to submittals.
- C. Before delivery of hardware, submit six (6) copies of the following for Architect's approval:

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1. Door Hardware Schedule: Vertical format conforming to DHI "Sequence and Format for the Hardware Schedule". Horizontal format schedules will be rejected without review. Format shall be 8-1/2 by 11 inch page size. Organize Schedule into headings, grouping doors to receive same hardware items, indicating quantity and complete designations of every item required for each door opening. The schedule shall include:
 - a. Cover sheet indicating name and location of Project; name of Architect; name of Contractor; name, address and phone of hardware supplier, name of hardware consultant preparing the schedule; date of submittal or revised submittal.
 - b. A list of abbreviations used in schedule.
 - c. An index of door openings, listed in numerical order, with hardware heading identification cross-referenced to Architect's set identification.
 - d. Hardware headings shall be listed in numerical order corresponding, as closely as possible, with numerical order of Architect's set numbers.
 - e. Each hardware heading shall have each door listed in numerical order according to door numbers in the Architect's door schedule, and denoting location, configuration (single, pair, etc.), type (elevation, etc.), door and frame size(s), door and frame material(s), handing, fire rating, and key set identification.
 - f. Type, complete model number, style, function, size, hand, and finish of each door hardware item.
 - g. Manufacturer of each item.
 - h. Fastenings and other pertinent information.
2. Manufacturer's Technical Product Data / Catalog Cut Sheets: Clearly marked for each hardware item, including installation details, material descriptions, dimensions of individual components and profiles, and finishes. Format shall be 8-1/2 by 11 inch page size.
3. Wiring Diagrams: No later than 14 days after receipt of reviewed hardware schedule submittal, submit detailed wiring diagrams for power, signaling, monitoring, and control of the access control system electrified hardware; identified by door number(s), and detailed specifically for each type and function of electrified door opening. Format shall be 8-1/2 by 11 inch page size. Include the following.
 - a. System Description of Operation. Include description of component functions including, but not limited to, the following situations: normal secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized

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egress; fire alarm and loss of power conditions, and interfaces with other building control systems.

- b. Elevation single-line diagram, showing interface between electrified door hardware and fire alarm, power, access control, and security systems as applicable.
- c. Point-to-point wiring diagram for field-installed wiring.
- 4. Keying Schedule: In accordance with Owner's final keying instructions for locks. Conform to DHI "Keying Systems and Nomenclature". Format shall be 8-1/2 by 11 inch page size.
- 5. Operation and Maintenance Data: Provide complete operating and maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides.
- 6. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- 7. Warranties: Special warranties specified in this Section.
- 8. Fire Door Assembly Inspection and Testing: Submit a written report of the results of functional testing and inspection for fire door assemblies, in compliance with current NFPA 80 requirements. Written report shall be provided to the Owner to be made available to the Authority Having Jurisdiction (AHJ). Report shall include the door number for each fire door assembly, door location, door and frame material, fire rating, and summary of deficiencies.

1.6 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Deliver to the Job site those items of finish hardware scheduled to be installed at the Job site, and deliver to other points of installation those items of finish hardware scheduled to be factory installed.
- C. Each article of hardware shall be delivered individually packaged in the manufacturer's standard commercial carton or container, and shall be properly marked or labeled to be readily identifiable with the approved hardware schedule.
- D. Manufacturer's printed installation instructions, fasteners, and special tools shall be included in each package.
- E. Hardware shall be stored in a dry, secure locked area, complete with shelving for unpacking and sorting of the door hardware.
- F. Ship permanent change keys and master keys via Registered Restricted Security Shipment-AOD to Consolidated Fire Protection District of Los Angeles County.

1.7 COORDINATION

- A. Provide hardware templates to the parties involved for doors, frames, and other work specified to be factory prepared for door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. When required by door or frame fabricator, furnish physical samples of each mortised and recessed hardware item required.
- C. Electrical System Rough-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, and security system as applicable.

1.8 WARRANTY

- A. In addition to, and not precluding other warranty requirements in the Contract Documents, the following hardware items shall carry extended minimum warranties as indicated:
 - 1. Hinges: Ten (10) years from date of Substantial Completion.
 - 2. Locks: Five (5) years from date of Substantial Completion.
 - 3. Exit Devices: Three (3) years from date of Substantial Completion.
 - 4. Door Closers: Ten (10) years from date of Substantial Completion.

1.9 EXTRA MATERIALS

- A. Upon completion of the work of this Section, deliver to the Consolidated Fire Protection District of Los Angeles County six (6) key blanks for each lock installed.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements herein, provide products by one of the following manufacturers for each type of hardware:
 - 1. Butt Hinges: Hager (HAG), Ives/Allegion (IVE), McKinney/ASSA ABLOY (MCK), PBB (PBB), Stanley/Dormakaba (STA).
 - 2. Continuous Pinned Hinges: Architectural Builders Hardware (ABH), Hager (HAG), Ives/Allegion (IVE), Markar/ASSA ABLOY (MAR), National Guard Products (NGP), Select (SEL), Stanley/Dormakaba (STA).
 - 3. Continuous Geared Hinges: Hager (HAG), Ives/Allegion (IVE), Legacy (LEG), National Guard Products (NGP), Pemko/ASSA ABLOY (PEM), Select (SEL), Stanley/Dormakaba (STA).

4. Cylinders and Keying: Schlage/Allegion (SCH). No substitution allowed.
5. Heavy-Duty Grade 1 Mortise Locksets and Latchsets: Schlage/Allegion L9000 Series (SCH).
6. Heavy-Duty Grade 1 Cylindrical Locksets and Latchsets: Schlage/Allegion ND Series (SCH).
7. Exit Devices: Von Duprin/Allegion 98 Series (VON).
8. Electric Strikes: Adams Rite/ASSA ABLOY (ADR), Folger Adam/ASSA ABLOY (FOL), Hanchett Entry Systems/ASSA ABLOY (HES), Rutherford Controls Intl. (RCI), Security Door Controls (SDC), Von Duprin/Allegion (VON).
9. Electrical Power Transfers: Adams Rite/ASSA ABLOY (ADR), Architectural Builders Hardware (ABH), Command Access (CAT), Inox (INO), Security Door Controls (SDC), Von Duprin/Allegion (VON).
10. Door Position Switches: George Risk Industries (GRI), G.E. Security (GES), Security Door Controls (SDC).
11. Flush Bolts and Door Coordinators: Architectural Builders Hardware (ABH), Door Controls International (DCI), Inox (INO), Ives/Allegion (IVE), Rockwood/ASSA ABLOY (ROC), Townsteel (TOW), Trimco (TRI).
12. Wide Stile Hardware for Aluminum/Glass Storefront Doors: Adamsrite/ASSA ABLOY (ADR), Ilco/Dormakaba (ILC).
13. Heavy-Duty Grade 1 Cast Iron Surface Door Closers: LCN/Allegion 4040XP Series (LCN).
14. Overhead Holders and Stops: Architectural Builders Hardware (ABH), Glynn-Johnson/Allegion (GLY), Rixson/ASSA ABLOY (RIX), Rockwood/ASSA ABLOY (ROC).
15. Electromagnetic Holder / Releases: Architectural Builders Hardware (ABH), Inox (INO), LCN/Allegion (LCN), Rixson/ASSA ABLOY (RIX).
16. Architectural Door Trim: Architectural Builders Hardware (ABH), Ives/Allegion (IVE), Markar/ASSA ABLOY (MAR), National Guard Products (NGP), Rockwood/ASSA ABLOY (ROC), Townsteel (TOW), Trimco (TRI).
17. Auxiliary Hardware: Inox (INO), Ives/Allegion (IVE), Rockwood/ASSA ABLOY (ROC), Townsteel (TOW), Trimco (TRI).
18. Door Bottoms, Metal Thresholds, Weatherstripping and Gaskets: KN Crowder (KNC), Legacy (LEG), National Guard Products (NGP), Pemko/ASSA ABLOY (PEM), Reese (RSE), Zero/Allegion (ZER).

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19. Key Storage System: Lund (LUN), MMF Industries (MMF), Telkee (TEL).

2.2 MATERIALS AND FABRICATION

- A. Requirements for grade, materials, size, and other distinctive qualities of each type of door hardware are indicated herein. Furnish items in types, sizes or weight, in accordance with manufacturer's standards, appropriate for the conditions of installation and service, unless otherwise indicated.
- B. Products named or identified by make or model number, or other designation and described herein are base products. Base products establish the standards of type, in-service performance, physical properties, appearance, warranty, cost, and other characteristics required by the Project.

2.3 FASTENERS

- A. Provide fasteners which harmonize with the hardware as to finish and material.
- B. Provide concealed fasteners for hardware items on exterior doors which are exposed when door is closed.
- C. Combination machine screws and expansion shields shall be used for attaching hardware to concrete or masonry.
- D. Fasteners exposed to the weather in the finished work shall be of brass, bronze, or stainless steel.
- E. Through-Bolt attachments will not be allowed. Coordinate with door manufacturers to provide the proper reinforcement or blocking to prevent the use of through-bolts.

2.4 BUTT HINGES

- A. Butt hinges shall meet ANSI/BHMA A156.1 requirements.
- B. Hinge dimensions shall conform to ANSI/BHMA A156.7.
- C. Base Metal shall be steel plated for fire-rated doors; bronze or stainless steel for exterior outswinging doors; bronze or plated steel elsewhere as scheduled.
- D. Provide hinges with antifriction bearings for doors with closers.
- E. Unless otherwise indicated for 1-3/4 inches (4 cm) thick doors, provide hinges in heights and gauges as follows:
 - 1. Doors to 36 inches wide: Standard Weight 4-1/2 inches.
 - 2. Doors over 36 inches to 42 inches wide: Standard Weight 5 inches.
 - 3. Doors over 42 inches to 48 inches wide: Heavy Weight 5 inches.
 - 4. Doors over 48 inches wide: 6 inches or continuous hinge.

5. Doors over 1-3/4 inches thick shall be per hinge manufacturers published listings or recommendations.
- F. Provide in minimum width sufficient to clear trim when door swings 180 degrees, whether or not shown on Drawings to swing 180 degrees.
- G. Number of hinges per leaf shall be as follows:
 1. Doors to 60 inches in height: 2 hinges.
 2. Doors over 60 to 90 inches in height: 3 hinges.
 3. Doors over 90 to 120 inches in height: 4 hinges.
 4. For doors over 120 inches in height: 4 hinges plus 1 hinge for every 30 inches, or fraction thereof, door height greater than 120 inches.
- H. Screws: Flat head wood screws not less than 1-1/2 inches long for hinges for wood doors; flat head machine screws elsewhere.
- I. Hinges for reverse bevel doors with locks shall have pins that are made non-removable when the door is in the closed position by means of a set screw in the hinge pin barrel.
- J. Electrified hinges:
 1. Coordinate number and size of wires for electrified hardware served.
 2. Provide junction box/ mortar shield for each electrified hinge.

2.5 CONTINUOUS PINNED HINGES

- A. Continuous hinges shall meet ANSI/BHMA A156.26 requirements.
- B. Type: Pin and barrel construction; 1/4 inch (6 mm) diameter stainless steel pin; split nylon or stainless steel bearings. Fabricated from 14 gauge cold-rolled steel or 304 stainless steel as indicated.
- C. Provide in minimum width sufficient to clear trim when door swings 180 degrees, whether or not shown on Drawings to swing 180 degrees.
- D. Hole pattern for fasteners shall be symmetrical and located to template dimensions.

2.6 CONTINUOUS GEARED HINGES

- A. Continuous hinges shall meet ANSI/BHMA A156.26 requirements.
- B. Type: Heavy duty assembly of 3 interlocking aluminum extrusions. Door leaf and jamb leaf shall be continuously geared together the full hinge length; secured together with full length cover channel permitting 180 degree operation. Vertical

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door loads carried on integrated thrust bearings spaced no more than 3 inches apart.

- C. Hinges shall have non-removable cap at hinge top to prevent foreign material from becoming lodged in hinge gear mechanism.
- D. Unless otherwise noted, provide factory finished to match door and frame finish.
- E. Hole pattern for fasteners shall be symmetrical and located to template dimensions.

2.7 CYLINDERS, KEYING AND KEY STORAGE

- A. Cylinders and Keying: Schlage/Allegion 6-Pin IC 4 Keyway. No substitution allowed.
 - 1. Lock cylinders shall meet ANSI/BHMA A156.5 requirements.
 - 2. All cylinders shall be interchangeable core type.
 - 3. Cylinders shall be keyed according to approved Keying Schedule.
 - 4. Keying system shall meet ANSI/BHMA A156.28 requirements.
 - 5. A new great grand master keying system shall be provided.
- B. Provide a temporary keying system for interim use during construction.
- C. Provide change keys in individual envelopes for each cylinder delivered. Envelopes shall be marked with respective door identification numbers.
- D. Key set symbol, and inscription "Do Not Duplicate" shall be stamped on all keys.
- E. Keys shall be supplied as follows:
 - 1. Locks: 3 change keys each lock.
 - 2. Master keyed sets: 2 keys each set.
 - 3. Grand master keys: 5 total.
 - 4. Great Grand master keys: 5 total.
 - 5. Interchangeable Core control keys: 2 total.
 - 6. Construction keys: 10 total.
- F. Provide Key Storage / Control System conforming to ANSI/BHMA A156.5, including key-holding hooks, labels, two sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers. Contain system in metal cabinet with baked-enamel finish and key locking door.

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1. Key tags and holders shall be inscribed with key-change number and key-control to conform with approved hardware schedule for identification.
2. Key Storage System shall be large enough to accommodate 150 percent of the facility.

2.8 LOCKSETS AND LATCHSETS

- A. Mortise Locks and Latches shall meet ANSI/BHMA A156.13 Grade 1 requirements.
- B. Cylindrical Locks and Latches shall meet ANSI/BHMA A156.2 Series 4000 Grade 1 requirements.
- C. Auxiliary Locks shall meet ANSI/BHMA A156.5 requirements.
- D. Electrified Locks shall also meet ANSI/BHMA A156.25 requirements.
- E. Operating trim shall be lever type by Schlage Rhodes.
- F. Lock functions which include thumb turn trim shall be provided with thumb turns compliant with accessibility code requirements.
- G. Lock Throw: Comply with requirements for length of latch bolts to comply with labeled fire door requirements.
- H. Lock backset shall be 2-3/4 inches unless otherwise indicated.
- I. Provide curved-lip strike with dust box for each latch or lock bolt, with lip extended to protect frame, finished to match door hardware set, unless otherwise indicated.
- J. Electromechanical locksets utilized at fire rated openings shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction, and shall maintain door in positive latched position when power is off.

2.9 EXIT DEVICES

- A. Exit devices and exit device accessories shall meet ANSI/BHMA A156.3, Grade 1 requirements.
- B. Electromechanical exit devices shall also meet ANSI/BHMA A156.25 requirements.
- C. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
 1. In full compliance with UL 305 Section 4.3, the ends of crossbar or push pad shall be curved, guarded, or otherwise designed to prevent catching of clothing of persons during exit.

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- D. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- E. Outside Trim: Design, material and finish to match locksets, unless otherwise indicated.
- F. Adjustable strikes shall be provided for rim type and vertical rod devices.
- G. All fire-rated and non-rated concealed vertical rod (CVR) devices with bottom rods to receive floor strikes installed into floor or threshold.
- H. Fire Exit Removable Mullions: Where indicated, provide removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions shall be used only with exit devices for which they have been tested.
- I. Electromechanical exit devices utilized at fire rated openings shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction, and shall maintain door(s) in positive latched position when power is off.

2.10 ELECTRIC STRIKES

- A. Electric strikes shall meet ANSI/BHMA A156.31 Grade 1 requirements, and be listed and labeled under UL 1034 Burglary Resistant Electric Locking Equipment.
- B. Electric strikes for fire rated openings shall be listed and labeled for such use by a testing agency acceptable to authorities having jurisdiction. Fail Secure (fail locked) strikes shall be used at all fire rated openings.

2.11 ELECTRICAL POWER TRANSFERS

- A. Electrical power transfers shall be capable of transferring sufficient electrical current to properly operate electrified hardware in door.
- B. Electrical power transfers used on fire rated doors shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

2.12 DOOR POSITION SWITCHES

- A. Door position switches used on fire rated doors shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

2.13 POWER SUPPLIES FOR ELECTRIFIED HARDWARE

- A. Power supplies shall be UL listed for applicable use; shall be housed in an approved enclosure; and provide both Class 1 and Class 2 outputs.
- B. Output shall be filtered and regulated. Relay, timer, and logic modules shall be provided as required for interface to related security components; and shall be assembled, connected, and fully contained within the power supply enclosure. A

fire alarm emergency release input terminal shall be provided for connection to fire / life safety system at fire-rated openings.

- C. Power supplies shall provide sufficient power capacity for the worst-case condition that could occur in the operating environment without any loss or degradation of operation.

2.14 FLUSH BOLTS

- A. Automatic flush bolts shall meet ANSI/BHMA A156.3.
- B. Manual flush bolts shall meet ANSI/BHMA A156.16 requirements.
 - 1. Bottom bolt shall have 12 inch long operating rod. Top bolt operating rod shall be determined by door height, assuring the operator is located less than 72 inches above the floor.
 - 2. Manual Flush Bolts are not to be utilized except where a pair of non-rated doors serving a room not normally occupied is needed for the movement of equipment.
- C. Provide dust proof strikes for bottom bolts. Dust proof strikes shall meet ANSI/BHMA A156.16 requirements.

2.15 DOOR COORDINATORS

- A. Door coordinators shall meet ANSI/BHMA A156.3 requirements.
- B. Door coordinators shall be flat bar type; stop mounted with all necessary filler bars and mounting brackets to accommodate required hardware.
- C. Provide carry bar at each pair of doors equipped with an overlapping astragal, except when automatic or self-latching bolts are used.

2.16 SURFACE DOOR CLOSERS

- A. Door closing devices shall meet ANSI/BHMA A156.4, Grade 1 requirements.
- B. Surface closers shall be fully adjustable with sweep speed, latch speed and back check position valves.
- C. Provide closers size adjusted in accordance with ANSI/BHMA A156.4; sized as required to insure closing and latching of doors.
- D. Arm selection shall follow the requirements of the manufacturer's recommendations with brackets, drop plates and miscellaneous accessories provided as necessary.
- E. Provide closers with arms designed to permit openings of doors as far as job conditions will permit; unless otherwise indicated closers with arms restricting opening of door will not be acceptable.

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2.17 OVERHEAD HOLDERS AND STOPS

- A. Overhead holders and stops shall meet ANSI/BHMA A156.8 requirements.
- B. Overhead door holders and stops shall be adjustable from 90 to 110 degrees dead stop or hold open position, as applicable.
- C. Overhead door stops shall have shock absorbers providing 5 to 7 degrees compression before dead stop.
- D. Overhead stops shall not be provided with hold open function when used at fire rated doors.

2.18 ELECTROMAGNETIC HOLDER / RELEASES

- A. Electromagnetic holders shall meet ANSI/BHMA A156.15 requirements.
- B. Size and configuration shall provide degree of swing and hold open position as indicated on the Drawings.

2.19 ARCHITECTURAL DOOR TRIM

- A. Architectural door trim shall meet ANSI/BHMA A156.6 requirements.
- B. Door Protection Plates: Kick, mop, and armor plates shall be 0.050 inch thick brass, bronze, or stainless steel depending on finish indicated. Plates shall have beveled edges, and shall be provided with countersunk mounting holes and No. 6 oval head screw fasteners. Width of kick and armor plates shall be 2 inches less than door width for single doors and 1 inch less for pairs of doors. Width of mop plates shall be 1 inch less than door width. Unless otherwise indicated, height shall be 10 inches for kick and mop plates, and 34 inches for armor plates.
 - 1. At all fire-rated and non-rated doors, provide UL labeled protection plates in sizes, types, fasteners and materials only in accordance with door manufacturer's listings for respective ratings. UL label must be an embossed stamp into metal; no surface applied Mylar or any other material will be acceptable.
- C. Door Edging and Astragals: Fabricated from 18 gauge cold-rolled steel or 304 stainless steel as indicated; factory prepared for all mortise hardware; countersunk screw mounting.
 - 1. At fire rated doors, provide UL labeled edge protection in sizes, types, fasteners and materials only in accordance with door manufacturer's listings for respective ratings.
- D. Push and pull plates shall be 0.050 inch thick brass, bronze, or stainless steel depending on finish indicated. Plates shall have beveled edges, and shall be furnished with countersunk mounting holes and No. 6 oval head screw fasteners. Pull plates shall also be furnished with flat-head through bolts for pull grip.

- E. Push and pull bars and grip handles shall be brass, bronze, or stainless steel depending on BHMA finish indicated.

2.20 AUXILIARY HARDWARE

- A. Auxiliary hardware shall meet ANSI/BHMA A156.16 requirements.
- B. Door Stops: Stops shall be of heavy duty construction, provided in finish indicated. Wall bumpers shall have no visible fasteners. Floor stops shall be of height required by floor conditions. Unless otherwise indicated, provide stops at all doors as follows.
 - 1. At exterior outswinging doors, provide Rockwood 481H or Trimco 1214H heavy duty floor stop, unless stop function is indicated in door closer.
 - 2. At all other doors, provide Rockwood 441CU or Trimco 1211 floor stop, and Rockwood 409 or Trimco 1270CV wall bumper.
 - 3. Where it is not possible to properly place a floor or wall type stop, provide heavy duty concealed overhead type stop, or when door closer is indicated, provide heavy-duty dead stop function in closer.
- C. Silencers: Gray rubber, non-marring configured for metal or wood frames as scheduled. Provide 3 per single door and 2 per pair of doors. Silencers shall be tamper resistant once installed in door frame.

2.21 DOOR BOTTOMS

- A. Door bottoms shall be of aluminum or extruded bronze of the type and finish indicated and shall provide proper clearance and an effective seal with specified thresholds.
- B. Door bottom shall have a vinyl, neoprene, silicone rubber, polyurethane or brush seal as indicated.
- C. The door bottom shall exclude light when the door is in the closed position and shall inhibit the flow of air through the unit.

2.22 METAL THRESHOLDS

- A. Thresholds shall meet ANSI/BHMA A156.21 requirements.
- B. Thresholds shall be heavy-gauge aluminum or bronze of the configuration and finish indicated, and shall provide an effective seal with door bottom.
- C. Provide thresholds at doors where indicated. Refer to Door Schedule and Drawing details for type and configuration required. Additionally, where combustible flooring passes under doors, provide fire door thresholds in accordance with applicable regulatory requirements.

2.23 METAL HOUSED TYPE WEATHERSTRIP

- A. Metal Housed Type Weatherstrip shall meet ANSI/BHMA A156.22 requirements.
- B. Metal Housed Type Weatherstrip shall be aluminum or bronze of the type and finish indicated, comprised of metal retainers with vinyl, neoprene, silicone rubber, polyurethane or brush inserts as indicated.

2.24 GASKETING

- A. Gasketing shall meet ANSI/BHMA A156.22 requirements.
- B. Shall be a compression type product for use with wood or steel doors; labeled for use on smoke-control and fire-rated doors where required.

2.25 CABINET HARDWARE

- A. Provide hardware as required for architectural woodwork, including cabinet hardware and miscellaneous items. Provide satin stainless steel finish or nearest match available.
- B. Materials:
 - 1. Hinges: Louis & Company SHHT 1592 dull chrome.
 - 2. Butts: Stanley 1585 or National Mfg. V471.
 - 3. Drawer Slides: Knappe & Vogt 1100 or Grant 329, full extension with 100 lb. capacity.
 - 4. Magnetic Cabinet Door Catches: Stanley 46 ALD or Knappe & Vogt 916.
 - 5. Cabinet Door/Drawer Pulls: Stanley 4477(AL).
 - 6. Cabinet Drawer/Door Lock: Pin tumbler dead lock - Yale 5591, Knappe & Vogt 986/987, or Russwin 1686R.
 - 7. Adjustable Metal Shelf Standards: Grant 120 or KV255, with Grant 21 supports.
 - 8. Hang Rods: Steel tubing with satin chrome finish and matching flanges. Garey Corp., Knappe & Vogt, or Builder's Brass Works.
 - 9. Louvered Vents: Washington 12, to match hardware finish.
 - 10. Sliding Door Hardware: Grant 1230 and 1201 track with Grant 118A floor guide. Provide one hardware set and full width track for each door. Provide aluminum fascia cover.
 - 11. Sliding Door Plunger Lock: Pin tumbler dead lock, Yale 5531.

2.26 FINISHES

- A. Provide hardware in finishes as indicated.
- B. Unless otherwise indicated, finishes shall conform to those identified in ANSI/BHMA A156.18. Comply with base material and finish requirements indicated by the following:
 - 1. BHMA 600: Primed for painting, steel base metal.
 - 2. BHMA 613: Dark-oxidized satin bronze, oil-rubbed, bronze base metal.
 - 3. BHMA 640: Dark-oxidized satin bronze plated over copper plate, oil-rubbed, steel base metal.
 - 4. BHMA 695: Dark bronze painted, any base material.
 - 5. BHMA 710: Dark-oxidized satin bronze anodized, aluminum base metal.
 - 6. BHMA 719: Mill finish aluminum, uncoated, aluminum base metal.

2.27 TOOLS AND MANUALS

- A. With the delivery of permanent keys, deliver to the Consolidated Fire Protection District of Los Angeles County one complete set of adjustment tools and one set of maintenance manuals for locksets, latchsets, closers, and panic devices.
- B. Furnish six (6) closer wrenches and adjusting keys. Ship with regular keys.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine rough-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Steel doors shall be factory prepared for hardware per ANSI/BHMA A156.115.
- B. Wood doors shall be factory prepared for hardware per ANSI/BHMA A156.115W.
- C. Installation shall be in accordance with DHI A115.IG.

- D. Hardware for fire door assemblies shall be installed conforming with NFPA 80, and all other applicable building codes and regulations.
- E. Hardware for smoke door assemblies shall be installed conforming with NFPA 105, and all other applicable building codes and regulations.
- F. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division 09 Sections. Do not install surface-mounted items until finishes have been completed on the substrate.
- G. Set units level, plumb and true to line and location, adjust and reinforce the attachment substrate as necessary for proper installation and operation.

3.3 DOOR CLOSING DEVICES

- A. Surface closers on doors opening to or from halls and corridors shall be mounted on the room side of the door.
- B. Surface closers on doors opening into stairs or stair vestibules shall be mounted on the stair or stair vestibule side of the door.
- C. Surface closers on exterior doors shall be mounted on the interior side of building utilizing regular arm, or parallel arm mounting as required.
- D. Door closing devices with adjustable spring power shall be adjusted for proper door operation, and compliance with all applicable codes and regulations.
- E. Cutting of gasketing or weatherstripping to accommodate closer installation is not acceptable.
- F. Through-Bolt attachments will not be allowed. Coordinate with door manufacturers to provide the proper reinforcement or blocking to prevent the use of through-bolts.

3.4 PUSH-PULL PLATES

- A. Pull plate grip handles shall be through bolted through the door. When push plate is indicated on opposite door side, through bolts shall be countersunk with push plate mounted to conceal through bolts.

3.5 KEY CONTROL STORAGE SYSTEMS

- A. Key control storage system shall be installed where directed by the Architect.
- B. Place keys on markers and hooks in key control system cabinet, as determined by final keying schedule.

3.6 THRESHOLDS

- A. Thresholds shall be secured with a minimum of 3 fasteners per single door width and 6 fasteners per double door width with a maximum spacing of 12 inches; with a minimum of 1 inch thread engagement into the floor or anchoring device used. Thresholds over 6 inches in width shall be secured with a double row of fasteners.
- B. Exterior thresholds shall be installed in a bed of sealant with combination expansion anchors and stainless steel machine screws, except that bronze or anodized bronze thresholds shall be installed with expansion anchors with brass screws.

3.7 ASTRAGALS

- A. Unless otherwise indicated install overlapping astragals as follows:
 - 1. At out-swing pairs of doors, mount astragal on active leaf.
 - 2. At in-swing pairs of doors, mount astragal on inactive leaf.

3.8 HARDWARE LOCATIONS

- A. Hardware Mounting Locations: Door and Hardware Institute recommended locations, and to meet CBC Accessibility requirements. Install hardware as follows, unless shown otherwise on Drawings:
 - 1. Bottom Hinge: 10 inches from door bottom to bottom of hinge.
 - 2. Top Hinge: 5 inches from door top to top of hinge.
 - 3. Center Hinge(s): Spaced equidistantly between top and bottom hinges.
 - 4. Lockset / Latchset: 38 inches from finished floor to center of lever.
 - 5. Exit Device: 38 inches from finished floor to device centerline.
 - 6. Deadlock: Maximum height of 44 inches from finished floor to center key cylinder / thumb turn.
 - 7. Push Plate/ Pull Plate: 42 inches from finished floor to center of pull.
 - 8. Wall Bumper: Centered at point on wall where lever, or other operating trim, first makes contact with wall.
 - 9. Floor Stop: Adjacent to wall; not to exceed 4 inches from face of wall; located 3 inches from latch edge of door; in any case never more than 50 percent of door width from latch edge of door.

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3.9 ADJUSTING

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- C. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.
- D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

3.10 FIELD INSPECTIONS

- A. Fire Door Assembly Inspection and Testing: Provide functional testing and inspection of fire door assemblies in accordance with current NFPA 80. Inspections shall be performed by individuals certified by Intertek as a Fire Door Assembly Inspector (FDAI), using reporting forms provided by the Door and Hardware Institute (DHI). Alternatively, inspections may be performed by individuals acceptable to the Architect, who have knowledge and understanding of the operating components of the applicable door type, and who have experience in preparing written reports of testing and inspection results.
 - 1. Schedule fire door assembly inspection within 90 days of Substantial Completion of the Project.
 - 2. Submit a signed, written final report as specified in Subparagraph 1.5.C.8.
 - 3. Contractor shall correct all deficiencies and schedule a reinspection of fire door assemblies which were noted as deficient on the inspection report.
 - 4. Inspector shall reinspect fire door assemblies after repairs are made.
 - 5. Additional reinspections which are required due to incomplete repairs will be performed by the inspector at the expense of the Contractor.

3.11 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant:
 - 1. Engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

2. Independent Architectural Hardware Consultant shall inspect door hardware and prepare written report whether installed work complies with or deviates from requirements, whether door hardware is properly installed and adjusted, and prepare a specific list of any deficiencies, a copy of which shall be provided to Architect.
3. Contractor shall correct all deficiencies noted in above report.
4. Independent Architectural Hardware Consultant shall re-inspect door hardware and prepare a report certifying correction of deficiencies and compliance with requirements.

3.12 COMPLETION

- A. When complete all hardware shall be properly secured in place and all exposed surfaces shall be clean and free from scratches, paint, and other defects and damages.
- B. Contractor shall demonstrate that all keys properly operate the locks as identified in the approved Keying Schedule.

3.13 CLEANING UP

- A. Clean all surfaces and remove from the site all scraps and debris relating to this work.
- B. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

3.14 DOOR HARDWARE SETS

- A. The following is a general listing of hardware requirements. Provide hardware items required by established standards and practices to meet state and local codes, whether or not specifically indicated in the following sets.
- B. Silencers and gasketing, where listed in Hardware Sets, may be omitted at openings where door frames are provided with integral seals if integral seals satisfy all applicable Codes and Regulations.
- C. Refer to Door Schedule and/ or Drawings for door opening information, hardware set assignment, and related requirements.
- D. Door protection items -- mop plates, kick plates, armor plates, and edge guards -- are not indicated in Hardware Sets. Refer to Door Schedule and/ or Drawings for required locations.

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HW 01 Exterior Single Storefront - Card Reader - Electrified Fail-Secure Lockset - Surface Closer**Each Opening to Receive:****Door(s): 102A**

<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>
1 Ea.	Continuous Hinge	SL11HD EPT	710	SEL
1 Ea.	Electrified Lockset	ND80EU-RX-IC RHO 24VDC	613	SCH
1 Ea.	Closer	4040XP-SCUSH 18PA	695	LCN
1 Ea.	Lock Astragal (at outswing doors)	5000T	613	TRI
1 Ea.	Overhead Rain Drip	346D (as required)	710	PEM
1 Ea.	Threshold	To Suit Sill Condition	710	PEM
1 Ea.	Door Sweep	3452DNB	710	PEM
1 Ea.	Electric Power Transfer	CEPT Series	613	SEC
1 Ea.	Door Position Switch	180-12	---	GRI

Note: Remote Release - Wiring and Interface by Security. Free egress at all times.

Note: Fail Secure - Upon loss of power door remains latched. Secure side remains unlocked for egress. Unsecure side remains locked.

Note: Alum/ Glass Door - Perimeter and door bottom seals by door manufacturer.

HW 02 Interior Single - Privacy Lockset/Occupancy Indicator - Surface Closer**Each Opening to Receive:****Door(s): 104A, 114A**

<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>
As Req	Hinges	AB700	640	HAG
1 Ea.	Privacy Indicator Lock	ND40 IS-LOC x OS-OCC RHO	613	SCH
1 Ea.	Closer	4041-DEL	695	LCN
1 Ea.	Door Stop	7280	613	TRI
1 Ea.	Kick Plate	K0050 10" x 2" LDW	613	TRI
1 Ea.	Mop Plate	KM050 6" x 1" LDW	613	TRI
1 Set	Gasketing	S88	---	PEM

HW 03 Interior Single - Card Reader - Electrified Fail-Secure Lockset - Surface Closer**Each Opening to Receive:****Door(s): 105A**

<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>
As Req	Hinges	AB700	640	HAG
1 Ea.	Electrified Hinge	AB700 ETW	640	HAG
1 Ea.	Electrified Lockset	ND80EU-RX-IC RHO 24VDC	613	SCH
1 Ea.	Closer	4040XP	695	LCN
1 Ea.	Door Stop	7280	613	TRI
1 Set	Gasketing	S88	---	PEM

Note: Controlled Opening - Wiring, Controls, Power, Card Reader, and other components by Security. Free egress at all times.

Note: Fail Secure - Upon loss of power door remains latched. Secure side remains unlocked for egress. Unsecure side remains locked.

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HW 04 Interior Single - Classroom Lockset - Surface Closer**Each Opening to Receive:****Door(s): 105B**

<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>
As Req	Hinges	AB850	640	HAG
1 Ea.	Classroom Lockset	ND70-IC RHO	613	SCH
1 Ea.	Closer	4040XP	695	LCN
1 Ea.	Overhead Stop	8HD Series	613	RIX
1 Ea.	Kick Plate	K0050 10" x 2" LDW	613	TRI
1 Ea.	Threshold	To Suit Sill Condition	710	PEM
1 Ea.	Door Sweep	29326DNB	710	PEM
1 Set	Gasketing	S88	---	PEM

HW 05 Interior Single - Passage Latchset - Surface Closer**Each Opening to Receive:****Door(s): 108A, 113A**

<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>
As Req	Hinges	AB700	640	HAG
1 Ea.	Passage Latchset	ND10 RHO	613	SCH
1 Ea.	Closer	4040XP	685	LCN
1 Ea.	Door Stop	7280	613	TRI
1 Ea.	Kick Plate	K0050 10" x 2" LDW	613	TRI
1 Set	Gasketing	S88	---	PEM

HW 05A Interior Single Storefront - Passage Latchset - Surface Closer**Each Opening to Receive:****Door(s): 143A**

<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>
1 Ea.	Continuous Hinge	SL11HD EPT	710	SEL
1 Ea.	Passage Latchset	ND10 RHO	613	SCH
1 Ea.	Closer	4040XP	695	LCN
1 Ea.	Door Stop	7280	613	TRI

Note: Alum/ Glass Door - Perimeter and door bottom seals by door manufacturer.

HW 05B Interior Single - Passage Latchset**Each Opening to Receive:****Door(s): 143B, 143C**

<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>
As Req	Hinges	AB700	640	HAG
1 Ea.	Passage Latchset	ND10 RHO	613	SCH
1 Ea.	Door Stop	7280	613	TRI
3 Ea.	Silencer	1229	---	TRI

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HW 06 Interior Single - Storeroom Lockset - Surface Closer**Each Opening to Receive:****Door(s): 117A**

<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>
As Req	Hinges	AB850	613	HAG
1 Ea.	Storeroom Lockset	ND80-IC RHO	613	SCH
1 Ea.	Closer	4040XP	695	LCN
1 Ea.	Door Stop	1214CK	613	TRI
1 Ea.	Kick Plate	K0050 10" x 2" LDW	613	TRI
1 Ea.	Threshold	To Suit Sill Condition	710	PEM
1 Ea.	Door Sweep	29326DNB	710	PEM
1 Set	Gasketing	S88	---	PEM

HW 07 Interior Single - Classroom Lockset - Surface Closer**Each Opening to Receive:****Door(s): 115A, 116A, 121A**

<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>
As Req	Hinges	AB850	613	HAG
1 Ea.	Classroom Lockset	ND70-IC RHO	613	SCH
1 Ea.	Closer	4040XP	695	LCN
1 Ea.	Door Stop	1214CK	613	TRI
1 Ea.	Kick Plate	K0050 10" x 2" LDW	613	TRI
1 Ea.	Threshold	To Suit Sill Condition	710	PEM
1 Ea.	Door Sweep	29326DNB	710	PEM
1 Set	Gasketing	S88	---	PEM

HW 08 Exterior Pair Storefront - Card Reader - Elec Exit Devices/Pulls - Surface Closers**Each Opening to Receive:****Door(s): 110A, 111A (for Alum Door)**

<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>
1 Ea.	Continuous Hinge	SL11HD	710	SEL
1 Ea.	Continuous Hinge-Power transfer	SL11HD EPT	710	SEL
1 Ea.	CVR Device-EO-QEL-RX	RX-QEL-PA-9847-EO	710	VON
1 Ea.	CVR Device-NLOP-QEL-RX	RX-QEL-PA-9847-NLOP-CON	710	VON
1 Ea.	Cylinder	Per Project	613	---
2 Ea.	Offset Pull	8190HD O	613	IVE
2 Ea.	OH Surface Closer-Hold Open	4040XP-SHCUSH 18PA	695	LCN
1 Ea.	Threshold	To Suit Sill Condition	710	PEM
1 Ea.	Electric Power Transfer	CEPT Series	613	SEC
2 Ea.	Door Position Switch	180-12	---	GRI

Note: Controlled Opening - Wiring, Controls, Power, Card Reader, and other components by Security. Free egress at all times.

Note: Fail Secure - Upon loss of power door remains latched. Secure side remains unlocked for egress. Unsecure side remains locked.

Note: Alum/ Glass Door - Perimeter and door bottom seals by door manufacturer.

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<u>HW 09</u>		Interior Single - Classroom Lockset - Surface Closer			
		Each Opening to Receive:		Door(s): 125A 140A 149A	
<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>	
As Req	Hinges	AB850 x NRP	613	HAG	
1 Ea.	Classroom Lockset	ND70-IC RHO	613	SCH	
1 Ea.	Closer	4040XP-EDA	695	LCN	
1 Ea.	Door Stop	1214CK	613	TRI	
1 Ea.	Kick Plate	K0050 10" x 2" LDW	613	TRI	
1 Ea.	Threshold	To Suit Sill Condition	710	PEM	
1 Ea.	Door Sweep	29326DNB	710	PEM	
1 Set	Gasketing	S88	---	PEM	

HW 10 **Exterior Four Fold Apparatus Room Doors**
Door(s): 119A, 119B, 119C, 119D,
150A, 150B, 150C, 143B

Note: All hardware by door manufacturer.

<u>HW 11</u>		Interior Single - Exit Device/Classroom Lever - Surface Closer			
		Each Opening to Receive:		Door(s): 125B 140B	
<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>	
As Req	Hinges	AB850 x NRP	613	HAG	
1 Ea.	Exit Device-Classroom	PA-XP98L L996-17	710	VON	
1 Ea.	Cylinder to Suit Device	Per Specification	613	SCH	
1 Ea.	Closer	4040XP-EDA	695	LCN	
1 Ea.	Door Stop	1209HA	613	TRI	
1 Ea.	Kick Plate	K0050 10" x 2" LDW	613	TRI	
1 Ea.	Auto Door Bottom	4301 PKL	719	PEM	
2 Ea.	Acoustic Corner Pad	ACP112	---	PEM	
1 Ea.	Threshold	To Suit Sill Condition	710	PEM	
1 Ea.	Door Sweep	3452DNB	710	PEM	
1 Set	Gasketing	S88	---	PEM	
1 Ea.	Door Position Switch	180-12	---	GRI	

HW 11A Exterior Single - Card Reader - Elec Exit Device/Storeroom Lever - Surface Closer				
Each Opening to Receive:		Door(s): 142A		
<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>
As Req	Hinges	AB850 x NRP	613	HAG
1 Ea.	Electrified Hinge	AB850 ETW	613	HAG
1 Ea.	Elec Rim Exit Device/Storeroom Lever	RX-QEL-PA-XP98L-NL 996-06	710	VON
1 Ea.	Cylinder to Suit Device	Per Specification	613	SCH
1 Ea.	Closer	4040XP-EDA	695	LCN
1 Ea.	Door Stop	1209HA	613	TRI
1 Ea.	Kick Plate	K0050 10" x 2" LDW	613	TRI
1 Ea.	Overhead Rain Drip	346D(As Req)	710	PEM
1 Ea.	Threshold	To Suit Sill Condition	710	PEM
1 Ea.	Door Sweep	3452DNB	710	PEM
1 Set	Weatherstrip	290DS x 2891DS	710	PEM
1 Ea.	Door Position Switch	180-12	---	GRI

Note: Controlled Opening - Wiring, Controls, Power, Card Reader, and other components by Security. Free egress at all times.

Note: Fail Secure - Upon loss of power door remains latched. Secure side remains unlocked for egress. Unsecure side remains locked.

HW 12 Interior Single - Privacy Lockset/Occupancy Indicator - Surface Closer				
Each Opening to Receive:		Door(s): 120A, 124A, 126A, 141A		
<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>
As Req	Hinges	AB800	613	HAG
1 Ea.	Privacy Indicator Lock	ND40 IS-LOC x OS-OCC RHO	613	SCH
1 Ea.	Closer- Delayed Action	4041-DEL	695	LCN
1 Ea.	Door Stop	7280	613	TRI
1 Ea.	Kick Plate	K0050 10" x 2" LDW	613	TRI
1 Ea.	Mop Plate	KM050 6" x 1" LDW	613	TRI
1 Ea.	Threshold	To Suit Sill Condition	710	PEM
1 Ea.	Door Sweep	29326dNB	710	PEM
1 Set	Gasketing	S88	---	PEM

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HW 13		Interior Pair - Classroom Lock - Automatic Flushbolts/Coordinator - Surface Closers			
		Each Opening to Receive:		Door(s): 123A	
<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>	
2 Ea.	Continuous Hinge	HG-315-MB	695	MAR	
1 Ea.	Classroom Lockset	ND70-IC RHO	613	SCH	
2 Ea.	Closer-Hold Open	4040XP-HEDA	695	LCN	
1 Set	S-Auto Flush Bolts	3820/3825	613	TRI	
1 Ea.	DP Strike	3910	613	TRI	
1 Ea.	Coordinator x Filler Bar x Brackets	3094 Series	695	TRI	
2 Ea.	Door Stop	1209HA	613	TRI	
2 Ea.	Kick Plate	K0050 10" x 1" LDW	613	TRI	
1 Ea.	Overlapping Astragal	357SP TB	600	PEM	
1 Ea.	Threshold	To Suit Sill Condition	710	PEM	
2 Ea.	Door Sweep	29326DNB	710	PEM	
1 Set	Gasketing	S88	---	PEM	

HW 14		Interior Single - Privacy Lock/Occupancy Indicator - Surface Closer - Acoustic Seals			
		Door(s): 127A, 128A, 129A, 130A, 132A, 133A, 134A, 135A, 136A, 137A			
		Each Opening to Receive:			
<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>	
As Req	Hinges	AB700	640	HAG	
1 Ea.	Privacy Indicator Lock	ND40 IS-LOC x OS-OCC RHO	613	SCH	
1 Ea.	Door Stop	7280	613	TRI	
1 Ea.	Kick Plate	K0050 10" x 2" LDW	613	TRI	
1 Ea.	Auto Door Bottom	PDB411AE	719	PEM	
2 Ea.	Acoustic Corner Pad	ACP112	---	PEM	
1 Ea.	Threshold	To Suit Sill Condition	710	PEM	
1 Set	Gasketing	S773	---	PEM	

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HW 15 Exterior Single - Card Reader - Electrified Fail-Secure Lockset - Surface Closer
Each Opening to Receive: Door(s): 144A 145A 147A, 148A

<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>
As Req	Hinges	AB850 x NRP	613	HAG
1 Ea.	Electrified Hinge	AB850 ETW	613	HAG
1 Ea.	Electrified Lockset	ND80EU-RX-IC RHO 24VDC	613	SCH
1 Ea.	Closer-Hold Open	4040XP-SHCUSH	695	LCN
1 Ea.	Kick Plate	K0050 10" x 2" LDW	613	TRI
1 Ea.	Lock Astragal (at outswing doors)	5000T	613	TRI
1 Ea.	Overhead Rain Drip	346D(As Req)	710	PEM
1 Ea.	Threshold	To Suit Sill Condition	710	PEM
1 Ea.	Door Sweep	3452DNB	710	PEM
1 Set	Weatherstrip	290DS x 2891DS	710	PEM
1 Ea.	Door Position Switch	180-12	---	GRI

Note: Controlled Opening - Wiring, Controls, Power, Card Reader, and other components by Security. Free egress at all times.

Note: Fail Secure - Upon loss of power door remains latched. Secure side remains unlocked for egress. Unsecure side remains locked.

HW 16 Exterior Pair - Card Reader - Elec Fail-Secure Lock - Flushbolts - Overhead Stop/Holders

<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>
1 Ea.	Continuous Hinge	HG-315-MB	695	MAR
1 Ea.	Continuous Hinge-Power Transfer	HG-315-MB PT	695	MAR
1 Ea.	Electrified Lockset	ND80EU-RX-IC RHO 24VDC	613	SCH
2 Ea.	OH Concealed Stop & Holder	1ADJ Series	613	RIX
2 Ea.	Flush Bolt	3917/3913	613	TRI
1 Ea.	DP Strike	3910	613	TRI
1 Ea.	Overlapping Astragal	357SP TB	600	PEM
1 Ea.	Threshold	To Suit Sill Condition	710	PEM
2 Ea.	Door Sweep	3452CNB	710	PEM
1 Ea.	Overhead Rain Drip	346D(As Req)	710	PEM
1 Set	Weatherstrip	290DS x 2891DS	710	PEM
1 Ea.	Electric Power Transfer	EL-CEPT	613	PEM
2 Ea.	Door Position Switch	180-12	---	GRI

Note: Controlled Opening - Wiring, Controls, Power, Card Reader, and other components by Security. Free egress at all times.

Note: Fail Secure - Upon loss of power door remains latched. Secure side remains unlocked for egress. Unsecure side remains locked.

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HW 17 Interior Single - Card Reader - Electrified Fail-Secure Lockset - Surface Closer**Each Opening to Receive:****Door(s): 122A**

<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>
As Req	Hinges	AB850	613	HAG
1 Ea.	Electrified Hinge	AB850 ETW	613	HAG
1 Ea.	Electrified Lockset	ND80EU-RX-IC RHO 24VDC	613	SCH
1 Ea.	Closer	4040XP	695	LCN
1 Ea.	Door Stop	1214CK	613	TRI
1 Ea.	Kick Plate	K0050 10" x 2" LDW	613	TRI
1 Ea.	Threshold	To Suit Sill Condition	710	PEM
1 Ea.	Door Sweep	29326DNB	710	PEM
1 Set	Gasketing	S88	---	PEM

Note: Controlled Opening - Wiring, Controls, Power, Card Reader, and other components by Security. Free egress at all times.

Note: Fail Secure - Upon loss of power door remains latched. Secure side remains unlocked for egress. Unsecure side remains locked.

HW 18 Exterior Single - Card Reader - Elec Exit Device/Storeroom Lever - Surface Closer**Each Opening to Receive:****Door(s): 131A, 138A**

<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>
As Req	Hinges	AB850 x NRP	613	HAG
1 Ea.	Electrified Hinge	AB850 ETW	613	HAG
1 Ea.	Exit Device-QEL-LNL	PA-RX-QEL-XP98L-NL L-NL996-17	710	VON
1 Ea.	Cylinder to Suit Device	Per Specification	613	SCH
1 Ea.	Closer	4040XP-EDA	695	LCN
1 Ea.	Door Stop	1209HA	613	TRI
1 Ea.	Kick Plate	K0050 10" x 2" LDW	613	TRI
1 Ea.	Overhead Rain Drip	346D (As Req)	710	PEM
1 Ea.	Threshold	To Suit Sill Condition	710	PEM
1 Ea.	Door Sweep	3452DNB	710	PEM
1 Set	Weatherstrip	290DS x 2891DS	710	PEM
1 Ea.	Door Position Switch	180-12	---	GRI

Note: Controlled Opening - Wiring, Controls, Power, Card Reader, and other components by Security. Free egress at all times.

Note: Fail Secure - Upon loss of power door remains latched. Secure side remains unlocked for egress. Unsecure side remains locked.

HW 19 Exterior Pair - Exit Devices/Storeroom Lever/Removable Mullion - Surf CIs/Stop-Arm					
Each Opening to Receive:			Door(s): 153A		
<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>	
As Req	Hinges	AB850 NRP	613	HAG	
1 Ea.	Rim Exit Device/Exit Only	PA-XP98EO	710	VON	
1 Ea.	Rim Exit Device/Storeroom Lever	PA-XP98L-NL L-NL996-17	710	VON	
1 Ea.	Key Removable Mullion	KR4954	695	VON	
1 Ea.	Cylinder To Suit Mullion	Per Specification	613	---	
1 Ea.	Cylinder to Suit Device	Per Specification	613	---	
2 Ea.	Closer	4040XP-SCUSH	695	LCN	
1 Ea.	Mullion Seal	5110N	BLK	PEM	
1 Ea.	Overhead Rain Drip	346D (Omit at overhang)	710	PEM	
1 Ea.	Threshold	To Suit Sill Condition	710	PEM	
2 Ea.	Door Sweep	3452CNB	710	PEM	
1 Set	Weatherstrip	290DS x 2891DS	710	PEM	
HW 20 Exterior Single - Storeroom Lockset - Surface Closer					
Each Opening to Receive:			Door(s): 150D, 150E, 151A		
<u>Quantity</u>	<u>Description</u>	<u>Model Number</u>	<u>Finish</u>	<u>Manf</u>	
As Req	Hinges	AB850	613	HAG	
1 Ea.	Storeroom Lockset	ND80-IC RHO	613	SCH	
1 Ea.	Closer	4040XP	695	LCN	
1 Ea.	Door Stop	1214CK	613	TRI	
1 Ea.	Kick Plate	K0050 10" x 2" LDW	613	TRI	
1 Ea.	Threshold	To Suit Sill Condition	710	PEM	
1 Ea.	Door Sweep	3452CNB	710	PEM	
1 Set	Weatherstrip	290DS x 2891DS	710	PEM	

END OF SECTION

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SECTION 08 81 00**GLASS GLAZING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide glazing and glazing accessories where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 08 11 13.13: Standard Hollow Metal Doors and Frames.
 - 2. Section 08 35 13.12: Electric Four-Fold Apparatus Doors.
 - 3. Section 08 41 13: Aluminum-Framed Entrances and Storefronts.
 - 4. Section 08 42 26.11: Folding Glass Walls.
 - 5. Section 08 51 13: Aluminum Windows.

1.2 REFERENCES

- A. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- C. ASTM C1036 - Standard Specification for Flat Glass.
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- E. CPSC 16 CFR 1201 - (Consumer Product Safety Commission) Safety Standard for Architectural Glazing Materials.
- F. GANA (Glass Association of North America) - Sealant Manual.
- G. I.B.C. (International Building Code) 2024 Edition.
- H. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- I. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- J. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies.
- K. NGA - (National Glass Association) NGA's GANA Glazing Manual.

- L. SCAQMD (South Coast Air Quality Management District) Rule 1168 - Adhesive and Sealant Applications.
- M. UL 9 - Standard for Fire Tests of Window Assemblies.
- N. UL 10B - Standard for Fire Tests of Door Assemblies.
- O. UL 10C - Positive Pressure Fire Tests of Door Assemblies.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, comply with 16 CFR 1201 and pertinent recommendations contained in:
 - 1. NGA's GANA Glazing Manual.
 - 2. GANA Sealant Manual.
- C. Fire Protective Rated Glass: Each lite shall bear permanent, non-removable label of UL certifying it for use in tested and rated fire protective assemblies.
- D. Fire Protective Glazing Products for Door Assemblies: Products identical to those tested per UL 10B, classified and labeled by UL.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Submit manufacturer's specifications, installation procedures and other data for each type of glass and glazing material required.
- C. Submit samples of each type of glass and gasket proposed to be used.
- D. Product Test Listings: From UL indicating fire-rated glass complies with requirements, based on comprehensive testing of current product.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Deliver materials to specified destination in manufacturer or distributor's packaging, undamaged, complete with installation instructions.
- C. Store off ground, under cover, protected from weather and construction activities.

- D. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.6 WARRANTY

- A. Warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Provide manufacturers' limited warranties under provision of Owner's administrative requirements.

PART 2 - PRODUCTS

2.1 GLASS

- A. General:
 - 1. For all glass, provide the type and thickness shown on the Drawings or specified herein.
 - 2. Where type or thickness, or both, are not shown on the Drawings or specified herein, provide type and thickness as required by the IBC.
 - 3. Provide dual glazing where indicated.
- B. Plate or Float Glass: Comply with ASTM C1036, Type I, Class 1, Quality q3.2.
- C. Sheet Glass: Provide Type II, Class 1, Quality q5.
- D. Insulating Glass: Factory fabricated units with 2 sheets of glass and dry air space with hermetically sealed edge construction.
- E. Tempered Glass:
 - 1. Provide tempered or heat-strengthened glass for all glazed panels within 48" of a door and where glazed panels are less than 18" above any floor or any walking surface, where indicated on the Drawings, in the window schedule, and elsewhere as required by governmental agencies having jurisdiction.
 - 2. Fully Tempered Glass:
 - a. Comply with ASTM C1048 and ANSI Z97.1.
 - b. Provide glass which is free of tong marks, with minimum warpage.
 - 3. Heat-Strengthened Glass: Comply with ASTM C1048.

4. Clear Mirror: 1/4" tempered plate glass with one coat of applied electroplated silver, one coat electroplated copper, and multiple coats of opaque paint to the back surface of glass.
- F. Specific Glass Types: As manufactured by Vitro Architectural Glass.
1. Clear Float Glass: Double glazed.
 2. Tempered Clear Plate Glass: Double-glazed.
 3. Laminated Glass: Double-glazed, low-E type.
 4. Translucent Laminated Glass: Double-glazed, low-E type.
 5. Low-E Clear Insulating Glass: SOLARBAN® 70 Solar Control Low-E Glass.
 - a. Insulating Glass Unit Construction: 1/4 inch clear glass, low-e Solarban 70 solar control (sputtered) on second surface (2) + 1/2 inch air space + 1/4 inch Clear float glass at aluminum storefront and windows.
 - a. U-Value: Refer to Drawings.
 - b. SHGC: Refer to Drawings.
- G. Fire-Rated, Safety-Rated Glass: FireLite Plus® as manufactured by Nippon Electric Glass Company, Ltd., and distributed by Technical Glass Products, www.fireglass.com, tgp.sales@allegion.com, (800) 426-0279, 8107 Bracken Place SE, Snoqualmie, WA 98065. No substitutions allowed.
1. Fire-rated glass ceramic clear and wireless glazing material listed for use in impact safety-rated locations.
 2. Thickness: 5/16 inch overall.
 3. Weight: 4 lbs./sq. ft.
 4. Approximate Visible Transmission: 85 percent.
 5. Approximate Visible Reflection: 9 percent.
 6. Fire Rating: 45 minutes. Classified and labeled by UL for fire rating scheduled at opening locations on Drawings, when tested in accordance with NPFA 252 and NFPA 257, and UL 9, UL 10B and UL 10C.
 7. Impact Safety Resistance: ANSI Z97.1 and CPSC 16 CFR 1201 (Cat. I and II).
 8. STC Rating: Approximately 38 dB.
 9. Surface Finish: Standard grade.

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2.2 OTHER MATERIALS

- A. All adhesives and sealants must not exceed the VOC limits set by the SCAQMD Rule 1168.
- B. Provide single-component silicone glazing sealants complying with ASTM C920.
 - 1. Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- C. Provide other materials, not specifically described but required for a complete and proper installation, subject to the approval of the Architect.

2.3 FABRICATION

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.
- B. Labeling for Fire-Rated, Safety-Rated Glass: Permanently label each piece of FireLite Plus® with the FireLite Plus® logo, UL logo and fire rating in sizes up to 3,325 sq. in., and with the FireLite Plus® label only for sizes that exceed the listing (as approved by the local authority having jurisdiction).

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.
- B. Clean glazing channels, stops, and rabbets to receive the glazing materials, making free from obstructions and deleterious substances which might impair the work.
 - 1. Remove protective coatings which might fail in adhesion or interfere with bond of sealants.
 - 2. Comply with manufacturers' instructions for final wiping of surfaces immediately prior to application of primer and glazing compounds or tapes.

- C. Sizes on Drawings are approximate. Determine actual sizes by measuring in the field.

3.2 INSTALLATION

- A. General: Perform no work below 40 degrees F. Check dimensions of openings to be sure that adequate clearances are maintained on all sides. Shop out all glass with clean, straight edges, free from chips and fissures.
- B. Inspect each piece of glass immediately prior to start of installation.
 - 1. Do not install items which are improperly sized, have tong marks, have damaged edges or are scratched, abraded, or damaged in any other manner.
 - 2. Do not remove labels from glass until inspection and final clean up.
- C. Locate setting blocks at sills one quarter of the width of the glass in from each end of the glass, unless otherwise recommended by the glass manufacturer.
 - 1. Use blocks of proper size to support the glass in accordance with the manufacturer's recommendations.
 - 2. Provide spacers for all glass sizes larger than 50 united inches, to separate glass from stops, except where continuous glazing gaskets or felts are provided.
 - a. Locate spacers no more than 24" apart, and no closer than 12" to a corner.
 - b. Place spacers opposite one another.
 - c. Make bite of spacer on glass 1/4" or more.
- D. Set glass in a manner which produces the greatest possible degree of uniformity in appearance, and tight fit.
- E. Fire-Rated, Safety-Rated Glass:
 - 1. Glaze vertically into labeled fire-rated metal frames with same fire rating as glass and push against tape for full contact at perimeter of pane or unit.
 - 2. Install in vision panels in fire-rated doors to requirements of NFPA 80.
 - 3. Install so that appropriate UL and FireLite Plus® markings remain permanently visible.
- F. Miter-cut and bond the joints of glazing gaskets in accordance with the manufacturer's recommendations, to provide watertight and airtight seal at corners and other locations where joints are required.

3.3 REPLACEMENT AND CLEANING

- A. Upon completion of the glazing work and after the Architect has approved the glass installation, thoroughly clean all glass surfaces and remove paint spots and other defacements. Do not let cleaning solution etch or stain aluminum, painted or finished surfaces, or affect the glazing compound. Replace cracked, broken, and imperfect glass at no additional cost.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Remove any such substances by method approved by glass manufacturer.
- C. Wash glass on both faces not more than four (4) days prior to date scheduled for inspections intended to establish date of Substantial Completion. Wash glass by method recommended by glass manufacturer.
- D. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 08 91 19**FIXED LOUVERS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide fixed formed metal louvers and accessories where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 07 92 00: Joint Sealants.
 - 2. Section 08 11 13.13: Standard Hollow Metal Doors and Frames.
 - 3. Section 08 14 16: Flush Wood Doors.

1.2 REFERENCES

- A. ANSI/AMCA 500-L - Laboratory Methods of Testing Louvers for Rating.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- D. ASTM A924/A924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- E. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
- F. I.B.C. (International Building Code) 2024 Edition.
- G. NAAMM AMP 500 - (National Association of Architectural Metal Manufacturers) Metal Finishes Manual.
- H. SMACNA - (Sheet Metal & Air Conditioning Contractors' National Association) Architectural Sheet Metal Manual.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Provide louvers capable of withstanding the effects of earthquake motions determined according to IBC 2024 seismic design provisions.
- B. Thermal Movements: Provide louvers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures

by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

- C. Air-Performance, Water-Penetration, Air-Leakage, and Wind-Driven Rain Ratings: Provide louvers complying with performance requirements indicated, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to ANSI/AMCA 500-L.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain louvers through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.
- B. SMACNA Standard: Comply with recommendations in SMACNA's Architectural Sheet Metal Manual for fabrication, construction details, and installation procedures.

1.5 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings: Indicate profile of frame, details, relation to adjacent construction, flashing, blade configuration, screens, and percentage of free air opening.
- D. Samples: Furnish samples of each type of metal finish required.

1.6 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Deliver metal louver assemblies, frames, screens and fasteners in manufacturer's unopened containers with manufacturer's labels intact and legible.
- C. Adequately provide protection for all metal louvers and screens against damage during shipping to the jobsite, handling and installation operations. All work showing defects or damage of any kind will not be accepted.

1.7 SITE CONDITIONS

- A. Take site dimensions affecting louvers prior to fabrication.
- B. Ensure openings are properly prepared and flashings are correctly located to divert moisture to exterior. Protect adjacent surfaces, finishes and materials from damage during installation of louvers.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.
 - 1. The Airolite Company LLC.
 - 2. Construction Specialties, Inc.
 - 3. Ruskin Company.

2.2 MATERIALS

- A. Galvanized Steel Sheet: Minimum 16 gage steel, ASTM A924 and ASTM A653, G90 (Z275) zinc coating, mill phosphatized.
- B. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.
 - 1. Use types and sizes to suit unit installation conditions.
 - 2. Use Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
- C. Anchors and Inserts: Of type, size, and material required for type of loading and installation indicated. Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

2.3 FABRICATION, GENERAL

- A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
- D. Include supports, anchorages, and accessories required for complete assembly.
- E. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches o.c., whichever is less. At horizontal

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joints between louver units, provide horizontal mullions except where continuous vertical assemblies are indicated.

- F. Provide sill extensions and loose sills made of same material as louvers where indicated, or required for drainage to exterior and to prevent water penetrating to interior.
- G. Join frame members to one another and to fixed louver blades as standard with louver manufacturer, unless otherwise indicated.
- H. Secure screens to interior side of louver assemblies with stainless-steel machine screws, spaced at each corner and at intermediate locations noted on the approved shop drawings.

2.4 HORIZONTAL, DRAINABLE-BLADE LOUVERS

- A. Products: Manufacturer's standard metal fabrication for types specified and configurations indicated on Drawings, with free area as required.

2.5 LOUVER SCREENS

- A. Provide insect screening at each exterior louver.
- B. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
 - 1. Metal: Same kind and form of metal as indicated for louver to which screens are attached.
 - 2. Finish: Same finish as louver frames to which louver screens are attached.
 - 3. Type: Rewirable frames with a driven spline or insert for securing screen mesh.
- C. Insect Screening for Galvanized Steel Louvers: Stainless steel, 18-by-18 mesh, 0.009-inch wire.

2.6 GALVANIZED STEEL SHEET FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.
- B. Finish louvers after assembly.
- C. Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Clean welds, mechanical connections, and abraded areas and repair galvanizing according to ASTM A780. Apply a conversion coating suited to the organic coating to be applied over it.
- D. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of manufacturer's recommended primer and silicone polyester melamine resin (50% silicone in resin solids), with a minimum dry film thickness of 1 mil for top coat.

1. Color and Gloss: As selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Install louvers in accordance with manufacturer recommendations and installation instruction, properly aligned and level.
- B. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- C. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- D. Form closely fitted joints with exposed connections accurately located and secured.
- E. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- F. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- G. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
- H. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 92 00 for sealants applied during louver installation.

3.3 ADJUSTING AND CLEANING

- A. Clean exposed surfaces of louvers that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

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- C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
- D. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide gypsum drywall and accessories, and access doors where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 06 10 00: Rough Carpentry.
 - 2. Section 09 65 13: Resilient Base and Accessories.
 - 3. Section 09 90 00: Painting and Coating.

1.2 REFERENCES

- A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- B. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
- C. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
- D. GA 214 - Levels of Finish for Gypsum Panel Products.
- E. GA 216 - Application and Finishing of Gypsum Panel Products.
- F. SCAQMD (South Coast Air Quality Management District) Rule 1168 - Adhesive and Sealant Applications.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. Comply with GA 214 and GA 216.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.

- B. Submit manufacturer's specifications and other data needed to prove compliance with the specified requirements. Include printed statement of VOC content.
- C. Submit sample of gypsum board finish for Architect's approval.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 GUARANTEE

- A. Guarantee the work of this Section for a minimum of one year.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers: National Gypsum Company, Georgia-Pacific Gypsum LLC, United States Gypsum Corporation.
- B. General: All gypsum board shall be 5/8" thick, Type X, standard taper. Provide gypsum board complying with ASTM C1396/C1396M in 48" widths and in such lengths as will result in a minimum of joints.
- C. Fire-Retardant Board: Provide where indicated and where required for fire resistance rating indicated.
- D. Impact Resistant Gypsum Board: Gold Bond® brand Hi-Impact XP® Gypsum Board with Sporgard™, consisting of fire-resistant gypsum core encased in heavy, abrasion and mold/mildew/moisture resistant, 100% recycled, purple paper on the face side and heavy, abrasion and mold/mildew/moisture resistant, 100% recycled, gray paper on the back side, and meeting performance level 3 criteria identified in ASTM C1629. A fiberglass mesh is embedded into the core, close to the back of the board to provide additional impact/penetration resistance.
- E. Moisture Resistant Gypsum Board: Gold Bond® brand XP® Gypsum Board with Sporgard™, consisting of a specially treated, fire-resistant gypsum core encased in a heavy mold/mildew/moisture resistant, 100% recycled purple paper on the face side and a heavy, mold/mildew/moisture resistant 100% recycled gray paper on the back side.
- F. Shaft Walls: Where so indicated on the Drawings, provide gypsum board system specifically designed for encasing shafts of the required fire-resistivity.

2.2 ACCESS DOORS

- A. In partitions and ceilings installed under this Section, provide doors where required for access to mechanical installations and electrical installations. Types:

1. Unless otherwise required, provide 24" x 24" metal access doors with concealed hinges to metal frame, and with Allen key lock.
2. For piercing fire-rated surfaces, provide access doors having the same fire rating as the surface being pierced.
3. For tile surfaces and toilet rooms, provide stainless steel access doors and frames, with satin finish.
4. For other installations, provide prime-coated steel access doors and frames for finish painting to be performed at the Job site under Section 09 90 00 of these Specifications.

2.3 RELATED MATERIALS

- A. All adhesives and sealants must not exceed the VOC limits set by the SCAQMD Rule 1168.
- B. Metal Trim: Galvanized steel drywall trim and corner bead. Use metal corner bead for all external corners and angles and unequal leg channel-type metal edge trim at all junctions of gypsum board and walls of other materials.
- C. Joint Tape: ASTM C475, perforated.
- D. Joint Compound: ASTM C475, ready-mixes type. Provide for 3 courses of compound application.
- E. Fastening Devices: Use type recommended by gypsum board manufacturer and complying with code.
- F. Acoustical Sealant: Latex or acrylic-latex type, permanently elastic and paintable.
- G. Provide other materials not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. General:
 1. Install the gypsum board in accordance with the Drawings minimizing the number of end joints.

2. Install the gypsum board with the long dimension of the board at right angles to the supporting members.
 3. Make end joints, where required, over framing or furring members.
- B. Access Doors: By careful coordination with the trades involved, install the specified access doors where required. Install flush with the finished surface.

3.3 JOINT TREATMENT AND FINISHING

- A. Inspect areas to be joint treated, verifying that the gypsum board fits snugly against supporting framework.
- B. Finish Levels: Achieve the following finish levels in accordance with GA 214 recommendations.
1. Plenum and Concealed Areas: Level 1.
 - a. All joints and interior angles shall have tape embedded in joint compound. Excess joint compound and tool marks are acceptable; fastener heads need not be covered.
 2. Substrate for Acoustical Tile: Level 2.
 - a. All joints and interior angles shall have tape embedded in joint compound and wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. If joint compound is applied over the body of the tape and smoothed at the time of embedment in Level 1, it shall satisfy the conditions of this level. Fastener heads and accessories shall be covered with one (1) coat of joint compound. Surface shall be free of excess joint compound. Tool marks are acceptable.
 3. Substrate for Heavy Textured Finish or Heavy-Duty Wall Coverings: Level 3.
 - a. All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. One (1) separate coat of joint compound shall be applied over all joints and interior angles. Fastener heads and accessories shall be covered with two (2) separate coats of joint compound. The surface shall be smooth and free of tool marks.
 4. Substrate for Light Texture Wall Covering and Eggshell Paint over Light Texture: Level 4.
 - a. All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Two (2) separate coats of joint compound shall be applied

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over all flat joints and one (1) separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three (3) separate coats of joint compound. The surface shall be smooth and free of tool marks. Where glass mat and/or fiber reinforced gypsum panels are installed, refer to the gypsum panel or finishing product manufacturers for specific finishing recommendations.

5. Substrate for Semi-Gloss and Eggshell: Level 5.

- a. All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin consistent coating of joint compound over all joints and interior angles. Two (2) separate coats of joint compound shall be applied over all flat joints and one (1) separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three (3) separate coats of joint compound. A skim coat of joint compound or a material manufactured especially for this purpose shall be applied to the entire surface. The surface shall be smooth and free of tool marks. Where glass mat and/or fiber reinforced gypsum panels are installed, refer to the gypsum panel manufacturer for specific finishing recommendations.

3.4 CLEANING UP

- A. In addition to other requirements for cleaning, use necessary care to prevent scattering gypsum board scraps and dust, and, at completion, pick up and remove from the site all scrap, debris, and surplus material of this Section.
- B. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 09 24 23**CEMENT STUCCO****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide exterior lath and plaster where indicated on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to the following.

1. Metal lath.
2. Portland cement plaster.

- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.

1. Section 04 22 00: Concrete Unit Masonry.
2. Section 06 10 00: Rough Carpentry.
3. Section 07 65 26: Self-Adhering Sheet Flashing.
4. Section 09 90 00: Painting and Coating.

1.2 REFERENCES

- A. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
- D. ASTM C150/C150M - Standard Specification for Portland Cement.
- E. ASTM C206 - Standard Specification for Finishing Hydrated Lime.
- F. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster.
- G. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- I. FS UU-B-790A - Building Paper, Vegetable Fiber: (Kraft, Waterproofed, Water Repellent, and Fire Resistant).

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- J. I.B.C. (International Building Code) 2024 Edition.
- K. PCA (Portland Cement Association) - Portland Cement Plaster/Stucco Manual.
- L. UL - Underwriters Laboratories.

1.3 QUALITY ASSURANCE

- A. Applicator: Company specializing in performing the work of this Section with minimum five (5) years documented experience, and certified in writing by materials manufacturer.
- B. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction perform work in accordance with ASTM C926 and PCA's Portland Cement Plaster/Stucco Manual.
- C. Coordinate with related work to provide backing support for items mounted on finished surfaces and to provide allowances for pipes and other items in wall cavities.
- D. Exterior Lath: Where lath is fastened to horizontal wood supports, comply with IBC requirements.
- E. Design Requirements: Provide pre-formulated products that require only addition of clean water for mixing.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Samples: Submit samples of the proposed finish, 8"x12" minimum, for Architect's approval. Samples shall be representative of texture, color, and proposed workmanship. Maintain reviewed samples on Project site for reference.
- C. Shop Drawings: Submit elevations and details indicating locations and types of components, splices, connections and accessory items. Indicate locations and types of framing substrates.
- D. Product Data: Submit manufacturer's catalog data for each material and component proposed for installation.
- E. Certificates: Furnish manufacturer's certification that materials meet or exceed Specification requirements.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Protect metal lathing and plastering materials before, during and after installation. In event of damage immediately provide required repairs and replacements.

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- C. Deliver and store portland cement materials on the Project site in a manner to provide protection from exposure and damage by moisture. Pile materials to permit easy access for proper inspection and identification of each shipment. Stockpile adequate supplies of sand on the Project site to permit sampling and testing before installation. Store to avoid inclusion of foreign material.
- D. Deliver stucco to the Project site in manufacturer's sealed and labeled packages.
- E. Each bundle of lath shall be sealed with a metal tag bearing the lath designation, weight and manufacturer's name.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Expanded Metal Lath:
 - 1. ASTM C1063, small diamond mesh expanded metal lath, 3.4 pounds per square yard, expanded from steel sheets with hot-dip galvanized coating G60 in accordance with ASTM A653.
 - 2. Lath shall be self-furring type for installation over sheathing, flat type for installation over spaced framing, and 3/8 inch ribbed lath for soffits.
- B. Backing for Metal Lath:
 - 1. Reinforced, laminated water resistant paper backing conforming to FS UU-B-790A (1), Super Jumbo Tex manufactured by Fortifiber Corp.
 - 2. Paper backings shall provide flame spread rating of 25 or less when tested according to ASTM E84 and shall bear UL label.
 - 3. Furnish for exterior plastering (except on soffits), and for mortar-set ceramic wall tile.
 - 4. Furnish paper Grade D, 60-minute rating, on wood studs without sheathing, and on plywood sheathing.
- C. Corner and Strip Reinforcing Lath: Flat or shaped lath reinforcing units, galvanized metal or wire lath types, no less than 2.5 pounds per square yard, outstanding legs minimum of 2 inches for wire lath and 3 inches for metal lath when formed for angle reinforcing. Furnish galvanized type for installation with galvanized metal lath.
- D. Plastering Accessories: Minimum 26 gage galvanized steel with expanded wings. PVC and zinc alloy are not permitted. Furnish casing beads, expansion screeds, foundation screeds, ventilating screeds and other items as indicated or required.
 - 1. Exterior Expansion Screeds: Sizes and profiles indicated or required, furnished with expanded wings unless otherwise indicated or required by installation.

2. Drip Screed: Minimum 26 gage galvanized steel with ground and holes to allow for drainage, No. 10 Drip.
 3. Casing Beads: Milcor, CEMCO, or ClarkDietrich, similar to Milcor Type 66 by 7/8 inch high for exterior plaster.
 4. Exterior Corner Reinforcement: Woven wire type with longitudinal wires, galvanized.
 5. Ventilating Screeds: Alabama Metal Industries soffit vent screed, perforated web type, with integral plaster grounds.
 6. Foundation Weep Screeds: Alabama Metal Industries integral plaster ground and weep screed.
- E. Screws: Type S and Type S12, "ClimaSeal" finish.
- F. Wire for fastening lath together and fastening corner beads, metal grounds and base screeds to lath and framing shall be 18 gage, galvanized conforming to ASTM A641.
- G. Nails: 11 gage roofing nails, 7/16 inch head, barbed, diamond point, zinc-coated, 1-1/2 inch long for horizontal application; 1 inch long for vertical application. Furnish watered furring nails for fastening lath to wood framing.

2.2 PLASTER MATERIALS

- A. Exterior Stucco: As manufactured by California Stucco, LaHabra, or Merlex Stucco, Inc. Furnish formulations requiring only addition of water for installation. Sand shall pass the No. 20 sieve. Mix and sand shall provide the specified finish. Furnish integral colored stucco in color as selected by Architect.
- B. Sand: Washed natural sand conforming to ASTM C144, except gradation of sand shall be as follows.

Percentage retained, each sieve, by weight:

<u>Sieve Size</u>	<u>Maximum</u>	<u>Minimum</u>
No. 4	0	0
No. 8	10	0
No. 16	40	10
No. 30	65	30
No. 50	90	70
No. 100	100	95

- C. Portland Cement: ASTM C150, Type II, low alkali.
- D. Hydrated Lime: ASTM C206, Type S.

- E. Bonding Agent: Type recommended for bonding plaster to concrete masonry surfaces.
- F. Finish Coat Plaster: LaHabra "Cementitious Exterior Stucco", factory formulated blend of portland cement, hydrated lime, aggregates and color, requiring addition of water only at the Project site. Color as selected by Architect.
- G. Water: Clean, potable and from domestic source.

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
- B. Verify that overhead or concealed work is finished, completed, tested and inspected as required before starting work of this Section.
- C. Before installing any plaster, thoroughly protect other adjacent work.

3.2 LATH INSTALLATION

- A. General: Where exterior lath is fastened to horizontal wood supports, the current edition of the IBC shall be complied with.
- B. Exterior Lathing, General:
 - 1. Application of Metal Lath: Metal lath or wire fabric lath shall be installed in accordance with the provisions of IBC current edition. Lath shall be furred out from vertical supports or backing not less than 1/4 inch.
 - 2. Self-furring lath meets furring requirements. Furring of expanded metal lath is not required on supports providing a bearing surface width of 1-5/8 inch or less.
 - 3. Where external corner reinforcement is not installed, lath shall be furred out and carried around corners, extending and fastened to at least one support.
 - 4. A weep screed shall be provided at or below foundation plate line on exterior stud walls. Screed shall be installed a minimum of 4 inches above grade and shall be of a type permitting water to drain to exterior of building. Weather-resistant barrier and exterior lath shall cover and terminate on attachment flange of screed.

3.3 PLASTER APPLICATION - GENERAL

- A. Install plaster in conformance with ASTM C926.
- B. Install each plaster coat to an entire wall without interruption to avoid cold joints and abrupt changes in uniform appearance of succeeding coats. Wet plaster shall abut existing plaster at naturally occurring interruptions in plane of plaster (such as corner angles, openings and control joints) wherever possible. Cut joining, where necessary, square and straight and at least 6 inches away from a joining in preceding coat.
- C. Provide sufficient moisture in plaster mix or by curing methods to permit continuous and complete hydration of cementitious materials, considering climatic and Project site conditions.
- D. Provide sufficient time between coats to permit each coat to cure or develop enough rigidity to resist cracking or other damage when next coat is installed.

3.4 EXTERIOR PLASTERING

- A. Preparation of Surfaces: Verify that lath has been installed securely and that grounds, screeds, casing beads and other accessories are straight, in correct position, and securely fastened in place.
- B. Proportions:
 - 1. Proportion ingredients for Portland cement. Calibrated boxes are required to determine the accuracy of proportioning. Proportions shall adhere to current edition of IBC.
 - 2. Dash Bond Coat: Mixed in the proportion of 1 cubic foot of standard portland cement to 1-1/2 cubic feet of sand.
 - 3. Stucco Finish: Stucco shall be factory prepared, exterior type, colored stucco containing a portland cement base, required aggregates and mineral pigments.
- C. Mixing: Provide stucco mix, plaster and aggregate in proportions specified, furnishing only sufficient water to obtain proper consistency before installation. Do not mix any more material at any time than can be installed within 1/2 hour after mixing. Do not allow material to remain in mixer or mixing boxes overnight. Maximum allowable slump shall be 2-1/2 inch, based on a 2 inch x 4 inch x 6 inch slump cone.
- D. Apply exterior cement plaster (stucco) in three-coat work to a minimum of 7/8" thickness and finish texture matching the approved sample.
 - 1. Scratch Coat: Apply to a minimum of 3/8" thick, completely embedding the lath. Cure and dry a minimum of 3 days before applying brown coat. Keep scratch coat moist a minimum of 4 days.

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2. Brown Coat: Apply brown coat to scratch coat or masonry substrate, bringing out to grounds, flat to true surface, and free of imperfections which would reflect in finish coat. Apply to a minimum thickness of 1/4" to 3/8" in two applications and bring to a true, even plane by rodding and floating. Leave rough ready to receive finish coat. Dampen scratch coat before applying brown coat. Dry brown coat a minimum of 7 days. Keep brown coat moist a minimum of 48 hours.
 3. Machine-Applied Integral Color Finish Coat: Lay out to permit completion of entire surface in one operation. Provide sand finish.
- E. Curing Exterior Plaster: Adhere to current edition of IBC for curing requirements.

3.5 QUALITY CONTROL

- A. Finish exterior plaster to a uniform texture, free of imperfections and flat within 1/8 inch in 5 feet. Form a suitable foundation for paint and other finishing materials. Avoid joining marks in finish coats.

3.6 CLEANING AND PROTECTION

- A. Protect adjacent surfaces of the building from spattering or staining. Thoroughly clean any spattered or stained surfaces to Architect's approval.
- B. Protect all plaster from subsequent construction and finishing activities, and maintain protection until acceptance of building.
- C. Remove rubbish, debris and waste material and legally dispose of off the Project site.
- D. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 09 30 13**CERAMIC TILING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide ceramic tile where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including the following.
 - 1. Stone thresholds.
 - 2. Waterproofing and crack isolation membrane.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 03 30 00: Cast-In-Place Concrete.
 - 2. Section 07 92 00: Joint Sealants.
 - 3. Section 09 21 16: Gypsum Board Assemblies.
 - 4. Section 09 24 23: Cement Stucco.
 - 5. Section 10 28 13: Toilet Accessories.
 - 6. Section 10 28 19.16: Shower Doors.

1.2 REFERENCES

- A. ANSI A108/A118/A136.1 - American National Specifications for the Installation of Ceramic Tile.
- B. ANSI A108.5 - Setting of Ceramic Tile with Dry-Set Cement Mortar, Modified Dry-Set Cement Mortar, EGP (Exterior Glue Plywood) Modified Dry-Set Cement Mortar, or Improved Modified Dry-Set Cement Mortar.
- C. ANSI A108.10 - American National Specifications for the Installation of Grout in Tilework.
- D. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation.
- E. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar.
- F. ANSI A136.1 - American National Standard Specifications for Organic Adhesives for Installation of Ceramic Tile.

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- G. ANSI A137.1 - American National Standards Specifications for Ceramic Tile.
- H. ASTM C241/C241M - Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic.
- I. ASTM C503/C503M - Standard Specification for Marble Dimension Stone.
- J. ASTM C1353/C1353M - Standard Test Method for Abrasion Resistance of Dimension Stone Subjected to Foot Traffic Using a Rotary Platform Abraser.
- K. SCAQMD (South Coast Air Quality Management District) Rule 1168 - Adhesive and Sealant Applications.
- L. TCNA (Tile Council of North America) - Handbook for Ceramic, Glass, and Stone Tile Installation.

1.3 QUALITY ASSURANCE

- A. Source Limitations for Tile:
 - 1. Obtain all tile of same type and color or finish from one source or producer.
 - 2. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain stone thresholds specified in this Section through one source from a single manufacturer.
- D. Pre-installation Conference: Conduct conference at Project site to comply with Owner's administrative requirements.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: For each type of product indicated.
 - 1. Manufacturer's specifications and installation instructions.
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements. Include printed statement of VOC content.
- C. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

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D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Assembled samples with grouted joints for each type and composition of tile and for each color and finish required, at least 12 inches square and mounted on rigid panel. Use grout of type and in color or colors approved for completed work.
3. Full-size units of each type of trim and accessory for each color and finish required.
4. Stone thresholds in 6-inch lengths.

1.5 PRODUCT HANDLING

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

1.6 PROJECT CONDITIONS

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

1.7 WARRANTY

- A. Provide a lifetime system warranty for manufacturer's surface prep and tile setting products, including materials, tile and labor to repair in the event of a defect.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Tile and Trim Units: Furnish fifty (50) pieces of full-size units for each type, composition, color, pattern, and size indicated.

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PART 2 - PRODUCTS

2.1 CERAMIC TILE, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with standard grade requirements, unless otherwise indicated.
- B. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials matching Architect's samples.
- C. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.2 CERAMIC TILE

- A. Provide ceramic tile and accessories complying with ANSI A137.1, in colors and patterns selected by the Architect from standard colors and patterns of the approved manufacturers.
- B. Include stops, returns, trimmers, caps, and special shapes required to produce complete and neatly finished installations. Provide cove trim at intersection of walls and floors and surfaces, bullnose top at base and wainscot.
- C. Shower Wall Tile: Glazed ceramic tile, 6" x 6", radiused edges where noted, manufactured by Dal-Tile, or equal products approved in advance by the Architect. Price Group 3, 2 colors / random pattern.
- D. Bathroom Floors: Provide unglazed 1" x 1" ceramic mosaic tile, manufactured by Dal-Tile, or equal products approved in advance by the Architect. Price Group 3, 2 colors.
- E. Base Tile: 6" high coved based type.
- F. Soap Dish: Provide one ceramic tile soap dish at each shower.

2.3 THRESHOLDS

- A. Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
- B. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.

- C. Marble Thresholds: ASTM C503 with a minimum abrasion resistance of 10 per ASTM C1353 or ASTM C241 and with honed finish. Provide uniform, fine- to medium-grained white stone with gray veining.

2.4 WATERPROOFING AND CRACK ISOLATION MEMBRANE

- A. At shower walls and floors, provide liquid applied elastomeric waterproofing and crack prevention material that cures to form a monolithic membrane.
 - 1. Provide Custom Building Products RedGard Waterproofing and Crack Prevention Membrane, where indicated on the Drawings, and elsewhere as required for thin-set tile installations and complying with ANSI A118.15 for waterproof membranes.

2.5 SETTING MATERIALS

- A. All adhesives and sealants must not exceed the VOC limits set by the SCAQMD Rule 1168.
- B. Comply with pertinent recommendations contained in the TCNA "Handbook for Ceramic, Glass, and Stone Tile Installation".
- C. Improved Modified Dry-Set Mortars: Provide a commercially prepared mixture of dry-set portland cement mortar or latex portland cement mortar for use as a bond coat for setting tile as specified by ANSI A108.5, complying with ANSI A118.15.
 - 1. Provide a project specific product recommended by manufacturer to qualify for a lifetime system warranty.
 - 2. Provide nonsagging mortar for wall applications.
- D. Organic Adhesive: Comply with ANSI A136.1.
- E. Sealant: Refer to Section 07 92 00.

2.6 GROUT

- A. Comply with pertinent recommendations contained in the TCNA "Handbook for Ceramic, Glass, and Stone Tile Installation" in colors selected by the Architect from standard colors available from the approved manufacturers.
- B. Polymer-Modified Portland Cement Grout: Provide a commercially prepared mixture of calcium Aluminate cement based, latex polymer-modified formula producing a water-resistant, dense, uniformly colored material, as required for filling the joints between tiles, conforming to ANSI A108.10. Color as approved by Architect.
 - 1. Provide Custom Building Products Custom Building Products Prism® Ultimate Performance Grout, ANSI A118.7, for joints 1/8 inch - 1/2 inch.

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2.7 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected and approved.
- B. Waterproofing and Crack Prevention Membrane: Ambient and surface temperatures must be above 40°F at time of installation and for 72 hours after application.

3.2 INSTALLATION

- A. General:
 - 1. Comply with ANSI A108/A118/A136.1 and the "Handbook for Ceramic, Glass, and Stone Tile Installation" of TCNA.
 - 2. Comply with manufacturer's instructions for installation and application of materials.
 - 3. Provide mortar bed for all wall and floor tile.
- B. Waterproofing and Crack Prevention Membrane:
 - 1. Install membrane waterproofing in strict accordance with manufacturer's printed instructions.
 - 2. Coordinate the work so the complete membrane is installed in a continuous operation.
 - 3. Install over a mortar bed sloped to drain.
- C. Limits of Tile:
 - 1. Extend tile into recesses and under equipment and fixtures to form a complete covering without interruptions.
 - 2. Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment.
- D. Joining Pattern:
 - 1. Lay tile in grid pattern unless otherwise indicated on the Drawings or directed by the Architect.

2. Align joints when adjoining tiles on base, trim, and walls are the same size.
 3. Layout tile work, and center the tile fields both directions in each space or on each wall area.
 4. Adjust to minimize tile cutting.
 5. Provide uniform joint widths.
- E. Provide expansion and control joints where shown on the Drawings, and where otherwise recommended by the "Handbook for Ceramic, Glass, and Stone Tile Installation" of the TCNA, sealing in accordance with Section 07 92 00 of these Specifications.

3.3 CLEANING AND PROTECTION

- A. Upon completion of placing and grouting, clean the work of this Section in accordance with recommendations of the manufacturers of the materials used.
- B. Protect metal surfaces, cast iron, and vitreous items from effects of acid cleaning.
- C. Flush surfaces with clean water before and after cleaning.
- D. Provide tile surfaces clean and free from cracked, broken, chipped, unbonded, and otherwise defective units.
- E. Provide required protection of tile surfaces to prevent damage and wear prior to acceptance of the work by the Owner.
- F. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 09 51 13
ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide acoustical ceilings where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 07 21 16: Blanket Insulation.
 - 2. Section 23 00 00: Heating, Ventilation and Air Conditioning.
 - 3. Section 26 50 00: Lighting.
 - 4. Section 26 60 01: Ceiling Fans.

1.2 REFERENCES

- A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- C. UL - Underwriters Laboratories, Inc.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data:
 - 1. Manufacturer's specifications and shop drawings in sufficient detail to show suspension, layout, lateral restraint, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.
 - 2. Samples of panels and suspension system for Architect's approval.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.

1.6 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and ceiling fans.

1.7 EXTRA MATERIALS

- A. Deliver to the Owner for use in future modifications, an extra stock of two (2) sealed unopened boxes of each type of acoustical tile installed, packaged, marked, and adequately protected against deterioration.

PART 2 - PRODUCTS

2.1 "T" GRID SYSTEM

- A. Provide a complete system of supporting members, anchors, wall cornices, adapters for light fixtures, ceiling fans and grilles, and accessories of every type required for a complete suspended "T" grid system of the arrangements shown on the Drawings, in color or colors selected by the Architect from standard colors of the approved manufacturer, and complying with pertinent UL requirements and governmental agencies having jurisdiction.
- B. Acceptable Products: Silhouette XL 9/16" Bolt-Slot grid system with 1/8" reveal as manufactured by Armstrong. ASTM C635 heavy-duty main beam classification, commercial-quality hot dipped galvanized steel. Entire surface shall be chemically cleansed and prefinished in baked polyester paint.

2.2 ACOUSTICAL CEILING PANELS

- A. Acceptable Products: 24" x 24" Dune Tegular Fine Texture as manufactured by Armstrong.

2.3 OTHER MATERIALS

- A. Provide other materials not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION, GENERAL

- A. Install "T" grid suspension system and acoustical ceiling panels in accordance with ASTM C636 and the pertinent UL design requirements, providing lateral bracing as required by pertinent codes and regulations.
- B. Install suspension system with joints accurately aligned, flush and tight, producing rigid support for the acoustical units and other items mounted in the system.
- C. Provide visual continuity between adjacent rooms or areas for "T" grid system, as shown on the Drawings.
- D. Make grid level within a tolerance of one in 1000 and straight within a tolerance of one in 1000.
- E. Pattern Direction: One-Way throughout.

3.3 CLEANING UP

- A. In addition to other stipulated requirements for cleaning, completely remove fingerprints and traces of soil from the surfaces of grid and acoustical materials, using only those cleaning materials recommended for the purpose by the manufacturer of the material being cleaned.
- B. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 09 65 13**RESILIENT BASE AND ACCESSORIES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide vinyl cove base and accessories where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 03 30 00: Cast-In-Place Concrete - Concrete floor substrate surface.
 - 2. Section 09 21 16: Gypsum Board Assemblies.

1.2 REFERENCES

- A. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
- D. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
- E. ASTM F1861 - Standard Specification for Resilient Wall Base.
- F. RFCI - (Resilient Flooring Covering Institute) FloorScore® IAQ Certification.
- G. SCAQMD (South Coast Air Quality Management District) Rule 1168 - Adhesive and Sealant Applications.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. Product Performance Requirements:
 - 1. Hardness: ASTM D2240, 85 Shore A.

2. Flexibility: Will not crack, break, or show any signs of fatigue when bent around a 1/4" diameter cylinder.
3. Dimensional and Performance Requirements: Meets or exceeds the dimensional and performance requirements for light/heat aging, chemical resistance and dimensional stability when tested in accordance with ASTM F1861.
4. Fire Resistance:
 - a. ASTM E648 (Critical Radiant Flux) - Class 1.
 - b. ASTM E84 - Class C.
 - c. ASTM E662 (Smoke Density) - 450 or less.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: For each type of product indicated. Include printed statement of VOC content of adhesives.
- C. Samples: For each type of product indicated, in manufacturer's standard-size samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Deliver and store materials in manufacturer's cartons or wrappings, keeping products clean, dry and protected from physical damage.
- C. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer.
- B. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

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1. Vinyl Base and Accessories: Furnish not less than fifty (50) linear feet of vinyl base and no less than ten (10) outside and ten (10) inside corners, for each type, color, and size indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide Mercer® Vinyl Wall Base Type TV as manufactured by Burke Flooring.
 1. Thermoplastic Vinyl: Homogeneous composition of polyvinyl chloride (PVC), high quality additives, and colorants to meet the performance and dimensional requirements of ASTM F1861, Type TV, Group I (solid).
 2. Colors and Patterns: As selected by Architect from manufacturer's full range.
 3. Style: Cove (with top-set toe).
 4. Dimensions: 0.125 inch minimum thickness, 48 inches long or manufacturer's standard length coils, height as indicated on Drawings.
 5. Inside and Outside Corners: Premolded.
 6. Surface: Matte Finish.
- B. Vinyl base products must comply with RFCI's "FloorScore" program.
- C. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated. All adhesives must not exceed the VOC limits set by the SCAQMD Rule 1168.
- D. Provide other materials not specifically described but required for a complete and proper installation, subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Do not begin vinyl wall base installation until the work of all other trades has been completed, especially overhead trades.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to assure adhesion of resilient products.

3.3 RESILIENT WALL BASE INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- D. Do not stretch wall base during installation.
- E. Premolded Corners: Install premolded corners before installing straight pieces.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil. Do not wash surfaces until after time period recommended by manufacturer.
- B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
- C. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 09 65 66
RESILIENT ATHLETIC FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide exercise room flooring where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 03 30 00: Cast-In-Place Concrete.
 - 2. Section 09 21 16: Gypsum Board Assemblies.

1.2 REFERENCES

- A. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Submit materials list, manufacturer's specifications and other data needed to prove compliance with the specified requirements.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.

1.6 COORDINATION

- A. Coordinate with other trades as required for a timely and smooth execution of work.
- B. Verify all dimensions for proper fit and attachment of all parts.

1.7 EXTRA MATERIALS

- A. Provide an additional two (2) unopened boxes of each color of tile for Owner's use in flooring maintenance.

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- B. Furnish extra materials identified with labels clearly describing contents.

PART 2 - PRODUCTS

2.1 RUBBER EXERCISE ROOM FLOORING

- A. Manufacturer: Mitchell Rubber Products, Inc., Mira Loma, CA, Tel (951) 681-5655, mitchellrubber.com.
- B. Shape Fitness Flooring interlocking gymnasium tile, pebble finish, free lay with visible interlock, color as selected by Architect from manufacturer's full range of colors.
- C. Material: Solid vulcanized virgin rubber-base top to bottom.
- D. Size: 24" x 24" x 7/16" thick.

2.2 ACCESSORIES

- A. Border Tiles: Interlocking, beveled tiles that transition from the face of flooring surface to the surface below it with a straight outside edge and for use where flooring corners and edges do not abut vertical surfaces.
- B. Include all center, corner and border pieces as required for complete installation, cut to fit, including 24" vertical up wall.
- C. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by flooring manufacturer.
- D. Provide other materials not specifically described but required for a complete and proper installation, subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
- B. Moisture Testing:
 - 1. Perform anhydrous calcium chloride test using the ASTM F1869 method, after allowing concrete to dry for a minimum of 90 days. Schedule testing no less than 1 or more than 3 weeks prior to scheduled flooring installation.
 - 2. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - 3. Proceed with installation only after substrates pass testing.

4. Schedule testing to be witnessed by Owner's representative.

3.2 INSTALLATION

- A. Install the work of this Section in strict accordance with the manufacturer's recommendations as approved by the Architect, using only the approved materials, and locating all components firmly into position, level and plumb.

3.3 CLEANING AND PROTECTION

- A. Upon completion of installation, clean the work of this Section in accordance with recommendations of the manufacturer.
- B. Provide required protection of flooring surfaces to prevent damage and wear prior to acceptance of the work by the Owner.
- C. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 09 90 00
PAINTING AND COATING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Paint and finish the exterior and interior exposed surfaces listed on the Painting Schedule in Part 3 of this Section, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
- C. Work Not Included:
 - 1. Unless otherwise indicated, painting is not required on surfaces in concealed areas such as furred spaces, and duct shafts.
 - 2. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze, and similar finished materials will not require painting unless specified.
 - 3. Do not paint moving parts of operating units; mechanical or electrical parts such as valve operators; linkages; sensing devices; and motor shafts, unless otherwise indicated.
 - 4. Do not paint over required labels or equipment identification, performance rating, name, or nomenclature plates.
- D. Definitions: "Paint," as used herein, means coating systems materials including primers, emulsions, epoxy, enamels, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

1.2 REFERENCES

- A. SCAQMD (South Coast Air Quality Management District) Rule 1113 - Architectural Coatings.
- B. SSPC - Society for Protective Coatings.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A company specializing in the installation of specified products for at least five (5) years, and approved by the manufacturer.
- B. Paint Coordination:
 - 1. Provide finish coats which are compatible with the prime coats actually used, assuring compatibility of the total coating system for the various substrata.

2. Provide barrier coats over noncompatible primers, or remove the primer and reprime as required.
- C. Regulatory and Code Requirements:
 1. Provide and install coatings in accordance with requirements of local, regional, state and federal air quality standards.
 2. Provide coatings that comply with regulatory requirements for flame spread and smoke developed.
 3. Paints and coatings must meet the requirements of SCAQMD Rule 1113.
- D. Prepare substrates in accordance with recommendations of the SSPC, as a minimum requirement.
- E. Source Limitations: Obtain products or materials through one source from a single manufacturer where indicated to be of same type of finish.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements. Include location (interior/exterior) each paint is used with each submittal.
- B. Submit materials list, manufacturer's specifications and other data needed to prove compliance with the specified requirements. Include product data for paints, including printed statement of VOC content and chemical components.
- C. Samples:
 1. Following the selection of colors and glosses by the Architect, submit samples for the Architect's review.
 - a. Provide three 8"x10" samples of each color and each gloss for each material on which the finish is specified to be applied.
 - b. Submit samples during progress of the work of actual application of the approved materials on actual surfaces to be painted, as directed by the Architect.
 2. Resubmit samples as requested until the required gloss, color, and texture is achieved.
 3. Do not commence finish painting until approved samples are on file at the Job site.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Deliver manufacturer's unopened containers to the Work Site. Packaging shall bear the manufacturer's name, label, and the following list of information:

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1. Product name, and type (description).
 2. Application and use instructions.
 3. Surface preparation.
 4. VOC content.
 5. Environmental handling.
 6. Batch date.
 7. Color number.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
- D. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.
- E. Maintain a clean, dry storage area to prevent contamination or damage to the coatings.

1.6 JOB CONDITIONS

- A. Comply with manufacturer's printed instructions for acceptable air temperature and surface temperature conditions for paint application.
- B. Comply with manufacturer's printed instructions regarding weather conditions and humidity for paint application.

1.7 WARRANTIES

- A. Provide for repairing paint which fails due to adhesion to substrate, moisture in substrates, material quality and installation. Include coverage for abrasion resistance, adhesive failure, fading, chalking, color change or degradation of finish appearance.
- B. Warranty Period: Five (5) years from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Upon completion of the work of this Section, deliver to the Owner an extra stock equaling five (5) gallons of each color, type, and gloss of paint used in the Work, tightly sealed in unopened containers.
- B. Clearly label each container with project name, gloss, type of paint, color formula and Architect's color number or designation indicated on Drawings.
- C. Paint top of paint cans with color of contents.

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PART 2 - PRODUCTS

2.1 PAINT MATERIALS

- A. Architectural Opaque Finishes: Provide finishes as scheduled by Frazee (Sherwin-Williams), Dunn Edwards, or Pratt & Lambert.
 - 1. The Painting Schedule in Part 3 of this Section is based on products of the Frazee Paint Company (Sherwin-Williams).
 - 2. Paints shall be top quality, meeting or exceeding appropriate federal specification and satisfying all Owner requirements.
 - 3. All paint work shall be minimum 3 coats after proper preparation as recommended by manufacturer.
- B. Protective Coatings: Provide products by Frazee (Sherwin-Williams), Dunn Edwards or Pratt & Lambert.
- C. Undercoats and Thinners: Provide coordination between paint coats and, insofar as practicable, use under coat, finish coat, and thinner materials as parts of a unified system of paint finish, produced by the same manufacturer.

2.2 APPLICATION EQUIPMENT

- A. For application of the approved paint, use equipment recommended by the manufacturer, verifying compatibility with the material and desired finish.

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 MATERIALS AND SURFACE PREPARATION

- A. Mix, prepare and store paint materials in strict accordance with the manufacturer's recommendations.
- B. General:
 - 1. Perform preparation and cleaning procedures in strict accordance with the paint manufacturer's recommendations for each substrate condition.

2. Remove items which are not scheduled to receive paint finish; or provide surface-applied protection. Reinstall the removed items following completion of painting.
3. Verify that all surfaces are completely dry before painting.
- C. Prepare wood surfaces exposed to view, using the proper sandpaper to produce a uniformly smooth wood surface.
- D. Preparation of Metal Surfaces:
 1. Thoroughly clean surfaces until free from dirt, oil, and grease.
 2. Apply an acid each wash to galvanized surfaces to be painted.

3.3 PAINT APPLICATION

A. General:

1. Paint schedule indicates the minimum number and thickness of coatings required. Provide additional coats if required to produce proper adhesion or full coverage.
2. Provide paint sheens and stains per Finish Schedule.
3. Apply paint in accordance with manufacturer's directions, using applicators and techniques best suited for materials and surfaces to which applied.
4. On metal and wood surfaces, sand and dust between coats to remove defects visible to the unaided eye from a distance of five feet.
5. On removable panels and hinged panels, paint the back sides and jambs to match the exposed sides.
6. Allow sufficient drying time between coats, as recommended by the material manufacturer.
7. Paint all exposed surfaces of every member. Prime all sides, edges and cut ends.
8. Cloudiness, spotting, brush marks, runs, sags, and other surface imperfections will not be acceptable.
9. Match the approved Samples as to texture, color, and coverage. Remove, refinish, or repaint work not in compliance with the specified requirements.

B. Miscellaneous Surfaces and Procedures:

1. Exposed Mechanical Items:

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- a. Finish electric panels, access doors, conduits, pipes, ducts, grilles, registers, vents, and items of similar nature to match the adjacent wall and ceiling surfaces, or as directed.
 - b. Paint visible duct surfaces behind vents, registers, and grilles flat black.
 - c. Wash metal with solvent, prime, and apply two coats of alkyd enamel.
2. Exposed Pipe and Duct Insulation: Apply one coat of latex paint on insulation which has been sized or primed under other Sections; apply two coats on such surfaces when unprepared, matching color of adjacent surfaces.
3. Hardware: Paint prime coated hardware to match adjacent surfaces.
4. Wet Areas:
 - a. In toilet rooms and contiguous areas, add an approved fungicide to paints.
 - b. For oil base paints, use 1% phenolmercuric or 4% tetrachlorophenol.
 - c. For water emulsion and glue size surfaces, use 4% sodium tetrachlorophenate.
5. Interior: Use "smooth" finish where enamel is specified.
6. Exposed Vents: Apply two coats of heat-resistant paint approved by the Architect.

3.4 MASONRY WALL SEALER

- A. Apply masonry wall sealer in strict accordance with manufacturer's recommendations.
- B. Avoid contact of this product with glass or aluminum during application.

3.5 PROTECTION AND CLEAN UP

- A. Protect the work and adjacent surfaces with suitable coverings.
- B. Remove all paint spills or spatters immediately.
- C. Broom clean all surfaces, removing from the site all scraps and other debris from this work.
- D. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

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3.6 PAINTING SCHEDULE

A. Exterior Paint Systems:

1. Concrete Masonry - Siloxane Water Repellent Sealer:
 - a. 1st Coat: Monochem Aquaseal HD by Monopole, Inc.
2. Exterior Cement Plaster, Concrete Masonry and Concrete - Flat Finish:
 - a. 1st Coat: S-W Loxon Concrete and Masonry Primer Sealer
 - b. 2nd Coat: S-W ConFlex XL Elastomeric High Build Coating
 - c. 3rd Coat: S-W ConFlex XL Elastomeric High Build Coating
3. Ferrous Metal - Acrylic Semi-Gloss:
 - a. 1st Coat: S-W Pro Industrial Pro-Cryl Universal Acrylic Primer (touch up bare metal only if surface is shop primed)
 - b. 2nd Coat: S-W Pro Industrial Acrylic Semi-Gloss
 - c. 3rd Coat: S-W Pro Industrial Acrylic Semi-Gloss
4. Galvanized Metal - Acrylic Semi-Gloss:
 - a. 1st Coat: S-W Pro Industrial Acrylic Semi-Gloss
 - b. 2nd Coat: S-W Pro Industrial Acrylic Semi-Gloss
5. Wood - Latex Flat:
 - a. 1st Coat: S-W Exterior Latex Wood Primer
 - b. 2nd Coat: S-W A-100 Exterior Latex Flat
 - c. 3rd Coat: S-W A-100 Exterior Latex Flat

B. Interior Paint Systems:

1. Ferrous Metal - Acrylic Semi-Gloss:
 - a. 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer (touch up bare metal only if surface is shop primed)
 - b. 2nd Coat: S-W Pro Industrial Acrylic Semi-Gloss
 - c. 3rd Coat: S-W Pro Industrial Acrylic Semi-Gloss
2. Ferrous Metal - Pigmented Epoxy Semi-Gloss:
 - a. 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer (touch up bare metal only if surface is shop primed)
 - b. 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss

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- c. 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss
- 3. Gypsum Drywall - Pigmented Epoxy Gloss:
 - a. 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer
 - b. 2nd Coat: S-W Pro Industrial Waterbased Catalyzed Epoxy Gloss
 - c. 3rd Coat: S-W Pro Industrial Waterbased Catalyzed Epoxy Gloss
- 4. Gypsum Drywall - Eggshell Latex High Performance:
 - a. 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer
 - b. 2nd Coat: S-W ProMar 200 HP Zero VOC Latex Eg-Shel
 - c. 3rd Coat: S-W ProMar 200 HP Zero VOC Latex Eg-Shel
- 5. Wood - Eggshell:
 - a. 1st Coat: S-W Premium Wall and Wood Primer
 - b. 2nd Coat: S-W Scuff Tuff Int. Waterbased Enamel, Eg-Shel
 - c. 3rd Coat: S-W Scuff Tuff Int. Waterbased Enamel, Eg-Shel
- 6. Wood - Clear Satin Finish:
 - a. 1st Coat: S-W Minwax Professional Formula Sanding Sealer
 - b. 2nd Coat: S-W Minwax Waterbased Oil-Modified Polyurethane
 - c. 3rd Coat: S-W Minwax Waterbased Oil-Modified Polyurethane
 - d. 4th Coat: S-W Minwax Waterbased Oil-Modified Polyurethane

3.7 INSPECTION

- A. Upon completion of the work of this Section, accompany the Architect and Owner for a detailed inspection of the completed work, correcting any deficiencies to their approval.

END OF SECTION

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SECTION 10 11 00
VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide visual display products where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to the following.
 - 1. Chalkboards.
 - 2. Magnetic marker boards.
 - 3. Tack boards.
 - 4. Map boards.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data:
 - 1. Submit materials list, manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 - 2. Submit details of installation and anchorage sufficient to enable proper interface of the work of this Section with the work of other trades.
- C. Samples: Submit samples of chalkboard and tack board and trim for color selection by Architect.

1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.

1.5 COORDINATION

- A. Coordinate with other trades as required for a timely and smooth execution of work.
- B. Verify all dimensions for proper fit and attachment of all parts.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Provide visual display products as manufactured by Polyvision Corp.

2.2 PORCELAIN-ON-METAL CHALKBOARDS

- A. Laminated 3-ply construction; facing sheet of 24 gage enameling grade steel sheet with P3 matte porcelain enamel white finish, for use with liquid chalk markers, unless otherwise indicated on Drawings. Provide seamless surface.
- B. 1/2" thick particleboard core; and 0.005" thick aluminum foil or 0.015" thick aluminum sheet.
- C. Provide fixed and sliding units as indicated on Drawings.

2.3 MAGNETIC DRY MARKER BOARDS

- A. Marker boards shall be manufactured in accordance with Porcelain Enamel Institute's specification. Porcelain enamel finish shall be fusion bonded to a steel substrate for use with liquid chalk markers, unless otherwise indicated on Drawings. Provide seamless surface.
- B. Face Sheet: 24-gauge enameling grade steel sheet.
- C. Core Material: 1/2" particle board.
- D. Panel Backing: 0.015" aluminum sheet panel.
- E. Panel Size: Provide fixed and sliding units as indicated on Drawings.
- F. Panel Color: White.

2.4 TACK BOARDS

- A. "Burlap Pattern" Vinyl Cork. Provide burlap pattern vinyl, machine-laminated under high pressure to 7/32" thick cork on 1/4" fiberboard.
- B. Adhesive to be guaranteed non-staining. Vinyl must carry California Fire Marshal's seal of approval. Provide seamless surface.
- C. Provide sizes indicated on Drawings.

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2.5 MAP BOARDS (Refer to Drawings)

2.6 TRIM AND ACCESSORIES

- A. Manufacturer's standard satin anodized aluminum units, as follows:
 - 1. Provide "narrow" trim units.
 - 2. Chalk Troughs: Continuous, for each chalkboard unit. Solid extrusion, ribbed section with integral chalk tray.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install the work of this Section in strict accordance with the manufacturer's recommendations as approved by the Architect, using only the approved mounting materials, and locating all components firmly into position, level and plumb.
- B. Install complete with all necessary clips, grounds, backing materials and anchors as required.

3.3 CLEANING UP AND PROTECTION

- A. Remove the refuse to the area of the job site set aside for its storage.
- B. Waste Management: Refer to Owner's administrative requirements for recycling requirements.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure visual display units are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

BID SET - MARCH 25, 2026

SECTION 10 14 00**SIGNAGE****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide identifying devices where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to the following.
 - 1. Building identification signs.
 - 2. Dedication plaque.
 - 3. Toilet room signs.
 - 4. Accessibility symbols.
 - 5. Room identification signs.
 - 6. Parking area signs.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Civil Drawings: Painted Pavement Markings.
 - 2. Civil Drawings: Cast-In-Place Tactile Warning Surfacing.

1.2 REFERENCES

- A. ADAAG - ADA (Americans with Disabilities Act) Accessibility Guidelines.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. SCAQMD (South Coast Air Quality Management District) Rule 1168 - Adhesive and Sealant Applications.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. Installer Qualifications: An employer of workers trained and approved by signage manufacturer.

- C. Source Limitations: Obtain each sign type through one source from a single manufacturer, unless otherwise approved by the Architect.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data:
 - 1. Submit materials list, manufacturer's specifications and other data.
 - 2. Submit product data highlighting the VOC (Volatile Organic Compound) content of all adhesives and sealants used in this work per the SCAQMD Rule #1168.
 - 3. Submit details of installation and anchorage sufficient to enable proper interface of the work of this Section with the work of other trades.
 - 4. Submit sample letter, full size, showing finish and mounting method proposed. Approved sample will be returned and may be used in the building. Submit letter spacing template for Architect's approval.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- C. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
- D. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.
- E. Handle products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Standard products manufactured by one of the following:
 - 1. ASI Sign Systems, Inc., Tel (424) 522-1967, Los Angeles, California.
 - 2. Gemini Incorporated, Cannon Falls, Minnesota.

2.2 BUILDING IDENTIFICATION SIGNS

- A. Provide sizes and layout as shown on the Drawings for building signs.
- B. Consult the Architect in advance and secure the official street address number.

- C. Provide solid cast aluminum numbers and letters, raised 1/2 inch, with dark bronze anodized finish and concealed mount. Use "TT Norms Pro" letter style.

2.3 STATION DEDICATION PLAQUE

- A. Provide cast bronze plaque as follows:
 - 1. 18" x 18" cast bronze plaque.
 - 2. Leatherette dark bronze background satin finish.
 - 3. 2 coats of acrylic lacquer.
 - 4. 1/2" single line border.
 - 5. Helvetica medium type style.
 - 6. Concealed Mount: Threaded rods, mounted on back of tablet, to fit into cement filled holes.
- B. Provide plaque with Project Name, LA County Board of Supervisors names, Fire Chief's name, Architect's name, and date of dedication as shown on the Drawings. Plaque text to be provided and approved by L. A. County.

2.4 TOILET ROOM ACRYLIC SIGNS

- A. Provide toilet room signs for latch side of door with the following attributes:
 - 1. Size 6" x 6".
 - 2. Type Style: "Futura".
 - 3. Plaque Color: Black.
 - 4. Type Color: White.
 - 5. Frame Finish: Black.
 - 6. Margins: Center/Center.
 - 7. Mounting: Adhesive.
 - 8. Messages: RESTROOM MEN and RESTROOM WOMEN as required.
 - 9. Braille.
- B. Provide toilet room door signs with the following attributes:
 - 1. Blue, 1/4" thick acrylic with international male (12" equilateral triangle) and female (12" diameter circle) symbols (white) and handicap symbols (white), subsurface silkscreen graphics, backpainted.

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2. Mounting: Adhesive.
3. Message: RESTROOM (unisex pictogram with accessibility symbol).

2.5 ACCESSIBILITY SYMBOLS

A. Provide accessibility symbols with the following attributes:

1. Size 6" x 6".
2. Plaque Color: Blue.
3. Wheelchair Symbol Color: White.
4. Margins: Center/Center.
5. Mounting: Adhesive.
6. Thickness: 0.125 matte finished acrylic.

2.6 ROOM IDENTIFICATION SIGNS

A. Provide ASI InTouch or equal by Gemini Incorporated, ADA-Ready interior rated panels with the following attributes:

1. Panels: Photomechanically produced, monolithic, stratified, polyamid resin tactile panel bonded to inert carrier.
2. Braille: Tactile lettering, graphics and Braille shall be integral to the face. Provide contracted, Grade 2 Braille conforming to relevant ADAAG requirements.
3. Panel Size: 4-1/2" W x 4-1/2" H.
4. Mounting Panel Size: Same as face.
5. Mounting Type: Silicone adhesive (SA) wall mount.
6. Thickness: 0.125 matte finished acrylic.
7. Background Color: As selected by Architect from manufacturer's standard colors.
8. Text and Graphics Color: As selected by Architect from manufacturer's standard colors.
9. Face Finish: Matte, non-glare face.

B. Provide sizes, colors and type styles indicated on Drawings. Provide graphically precise, uniformly opaque characters to conform to relevant ADAAG requirements indicated for size, style, spacing, content, position and color and contrast.

2.7 PARKING AREA SIGNS

- A. Van Accessible Signs: Minimum 16 gage steel sheets with reflectorized porcelain white beaded baked enamel, International Symbol of Accessibility on blue background.
 - 1. Refer to Drawings for dimensions and details.
- B. Reserved Parking Signs: For electric vehicle parking signs, minimum 63 mil thick 3M diamond grade reflective aluminum.
 - 1. Refer to Drawings for dimensions and details.
- C. Parking Lot Entrance Signs: An additional sign shall also be posted, in a conspicuous place, at each entrance to off-street parking facilities, or immediately adjacent to and visible from each stall or space.
 - 1. The sign shall be not less than 17 inches by 22 inches in size lettering not less than 1 inch in height, (helvetica medium) which clearly and conspicuously states the following:

 "Unauthorized vehicles parked in designated accessible spaces not displaying distinguished placards or license plates issued for persons with disabilities may be towed away at owner's expense. Towed vehicles may be reclaimed at _____ or by telephoning _____,"

 Blank spaces shall be filled in with appropriate information as permanent part of the sign.
- D. Posts: Secure post-mounted signs to 1-5/8" x 1-5/8" x 10' x 12 gage wall thickness, perforated square tubing, cold-formed carbon steel galvanized (conforming to ASTM A653), Telestrut Tubing P9000 as manufactured by Unistrut.
 - 1. Perforated pre-punched holes are to be 9/16" diameter, spaced 1-7/8" on center.
 - 2. Provide anchors and anchor sleeves for a complete installation.
- E. Pavement Symbols: Refer to Civil Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
- B. Install the work of this Section in strict accordance with the manufacturer's recommendations as approved by the Architect, using only the approved

mounting materials, and locating all components firmly into position, level and plumb.

- C. Mount plaque at +60" a.f.f. to centerline of plaque.
- D. Exterior Parking Signage Installation:
 - 1. Posts: Insert posts minimum 1'-4" deep. Check each post for plumb, and vertical and top alignment. Surrounding paving shall be domed to shed water.
 - 2. Signs: Mount signs in accordance with Drawing Details. Mount handicapped signs at height to comply with accessibility codes.

3.2 CLEANUP

- A. Remove excess materials and waste from the Site.
- B. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 10 28 13
TOILET ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide toilet room accessories where indicated on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 06 10 00: Rough Carpentry.
 - 2. Section 09 21 16: Gypsum Board Assemblies.
 - 3. Section 09 30 13: Ceramic Tiling.

1.2 REFERENCES

- A. ADAAG - (Americans with Disabilities Act Accessibility Guidelines) for Buildings and Facilities.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- F. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- G. ASTM C1036 - Standard Specification for Flat Glass.
- H. C.B.C. (California Building Code) 2022 Edition.
- I. FS A-A-3002 - Mirrors, glass.

1.3 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide products or materials from the same manufacturer.

B. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum five (5) years documented experience.
2. Installer: Company specializing in performing the work of this Section with minimum three (3) years documented experience, and approved by the manufacturer.

1.4 REGULATORY REQUIREMENTS

- A. Conform to Part 2, Title 24, California Code of Regulations for access for the handicapped.

1.5 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Submit manufacturer's data, such as technical literature, brochures, specifications, material lists and product design criteria.
- C. Shop Drawings: Indicate locations and types of accessories with plans and elevations. Indicate mounting heights to accessible controls. Show relationship with adjacent finishes, such as grout joints and tile patterns.
- D. Samples: Minimum size: 4 inches x 4 inches, or 4 inches in length. Submit Samples of exposed finishes, such as face plates, exposed trim, knobs or levers.

1.6 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Deliver, store and handle in accordance with manufacturer's recommendations.

1.7 WARRANTY

- A. Warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Mirror Warranty: Written warranty, executed by manufacturer agreeing to replace welded stainless steel-framed mirrors that develop visible silver spoilage defects within fifteen (15) years from date of Substantial Completion.
- C. Manufacturer's Finish Warranty: Written warranty, executed by manufacturer agreeing to replace toilet accessories that develop corrosion or degradation of finish within five (5) years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 MATERIALS

- A. Keys: Provide 3 keys for each accessory.
- B. Stainless Steel Sheet: ASTM A666, type 304.
- C. Stainless Steel Tubing: ASTM A269, stainless steel.
- D. Galvanized Sheet Steel: ASTM A653, G60.
- E. Mirror Glass: Float glass, Type I, Class 1, Quality q2 (ASTM C1036), with silvering, copper coating, and suitable protective organic coating to copper backing in accordance with FS A-A-3002.
- F. Adhesive: Epoxy 2-component epoxy type, waterproof.
- G. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof.
- H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.2 SHOP FABRICATION

- A. Shop or factory fabricate and finish components, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters and anchor components for installation.
 - 1. Do not modify at the jobsite.
 - 2. Grind welded joints smooth.
 - 3. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

2.3 FINISHES

- A. Stainless Steel: No. 4 satin brushed finish.
- B. Chrome/Nickel Plating: ASTM B456, Type SC 2, Satin finish.
- C. Galvanizing for Ferrous Metal Items and Fastening Devices, Other Than Sheet: ASTM A123 to 1.25 ounces per square yard, hot-dip galvanized after fabrication.
- D. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.
- E. Back paint components where contact is made with building finishes to prevent electrolysis.

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2.4 TOILET ROOM ACCESSORIES

A. Provide the following products as manufactured by Bobrick Washroom Equipment Inc. Provide solid backing/blocking as required for each accessory.

1. Paper Towel Dispenser and Waste Receptacle:
 - a. Number: Bobrick, B-38032.
 - b. Size: 13" W x 55-1/8" H x 2-9/16" D.
 - c. Mount: Semi-recessed.
 - d. Finish: Satin stainless steel.
2. Toilet Tissue Dispenser for Two Rolls:
 - a. Number: Bobrick, B-6867.
 - b. Size: 12-1/2" wide x 3-15/16" deep x 2" high.
 - c. Mount: 19" for handicapped.
 - d. Finish: Satin stainless steel.
3. Toilet Seat Cover Dispenser:
 - a. Number: Bobrick, B-3013.
 - b. Size: 15" W x 11" H.
 - c. Mount: Recessed at 40"H.
 - d. Finish: Satin stainless steel.
4. Wheelchair Toilet Compartment Straight Grab Bars/Wheel Chair Shower Straight Grab Bar:
 - a. Number: Bobrick, B-5806 series.
 - b. Size: 1-1/4" diameter.
 - c. Mount: 33" with 1-1/2" wall clearance; handicapped toilet stalls and handicapped shower; as shown on the Drawings.
 - d. Finish: Satin stainless steel with peened grip.
5. Surface-Mounted Robe Hook:
 - a. Number: Bobrick, B-211.
 - b. Size: Flange 2-3/4"; hook 3".
 - c. Mount: As shown on the Drawings.
 - d. Finish: Satin nickel-plated brass casting.

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6. Vinyl Waterproof Shower Curtain, 1 ¼ Time Fullness:
 - a. Number: Bobrick, 204-2.
 - b. Size: 42" W x 72" H.
7. Door Bumper:
 - a. Number: Bobrick, B-687.
 - b. Size: 2" x 2".
 - c. Mount: 1 per restroom door.
 - d. Finish: Polished stainless steel.
8. Towel Bar:
 - a. Number: Bobrick, B-6747.
 - b. Size: 24" long x 3 1/4 " deep.
 - c. Mount: Surface mounted.
 - d. Finish: Satin finish stainless steel.
9. Reversible Solid Phenolic Folding Shower Seat:
 - a. Number: Bobrick, B-5181.
 - b. Size: 23" x 32".
 - c. Mount: 17" - 20".
 - d. Finish: Satin finish stainless steel with solid ivory phenolic slats.
10. Shower Curtain Rod:
 - a. Number: Bobrick, B-207.
 - b. Size: 72" long (verify).
 - c. Mount: Concealed.
 - d. Finish: Satin finish stainless steel.
11. Shower Curtain Hooks:
 - a. Number: Bobrick, 204-1.
 - b. Finish: Type 304 stainless steel.
12. Mirror with Stainless Steel Angle Frame:
 - a. Number: Bobrick, B-290 series.
 - b. Size: As shown on the Drawings.
 - c. Mount: Concealed wall mount.
 - d. Finish: Satin finish stainless steel.

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13. Soap Dispenser:
 - a. Number: Bobrick, B-822.
 - b. Size: 4" spout / 34 oz / verify with sink.
 - c. Mount: Lavatory counter.
 - d. Finish: Stainless steel.
14. Combination Toilet Tissue, Seat Cover and Napkin Disposal Unit (1 for each Public ADA Restroom):
 - a. Number: Bobrick, B-3091 (left hand unit) and Bobrick, B-3092 (right hand unit).
 - b. Size: 28" W X 14" H X 3/16".
 - c. Mount: Recessed at 31" to top of unit (handicap accessible).
 - d. Finish: Satin stainless steel.
15. Soap Dispenser (1 only, Public Restroom):
 - a. Number: Bobrick, B-306.
 - b. Size: 8 3/8" W x 4 3/8" H x 3 7/8" D.
 - c. Mount: Recessed.
 - d. Finish: Satin stainless steel.
16. Baby Changing Station (Vertical):
 - a. Number: Bobrick, KB311-SSRE.
 - b. Size: 26 7/32" W x 41 5/16" L.
 - c. Mount: Recessed.
 - d. Finish: Satin stainless steel.
17. Baby Changing Station Bag Hook:
 - a. Number: Bobrick, 310-54-KIT.
 - b. Size: 1 31/32" W x 2 9/16" D.
 - c. Mount: Surface mounted.
 - d. Finish: Satin stainless steel.
18. Utility Shelf with Mop/Broom Holders and Rag Hooks:
 - a. Number: Bobrick, B-224.
 - b. Size: 36" W x 6" H x 8" D.
 - c. Mount: Surface mounted.
 - d. Finish: Satin stainless steel.

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2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
- B. Install accessories in accordance with manufacturers' instructions and CBC requirements.
- C. Install each item in its proper location, firmly anchored into position, level and plumb, and in accordance with the manufacturer's recommendations.

3.3 CLEANING

- A. Clean and polish all exposed surfaces after removing protective coatings. Clean exposed surfaces of mirror units per manufacturer's recommendations.
- B. Broom clean and remove from the Site all scraps and other debris from this work.
- C. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 10 28 19.16**SHOWER DOORS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide safety glass shower doors where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 06 10 00: Rough Carpentry - Backing provisions.
 - 2. Section 07 92 00: Joint Sealants - Sealing of perimeter joints between shower door framing and surrounding finishes.
 - 3. Section 08 81 00: Glass Glazing - Requirements for glass cleaning.
 - 4. Section 09 30 13: Ceramic Tiling.
 - 5. Section 10 28 13: Toilet Accessories.

1.2 REFERENCES

- A. 16 CFR 1201.40 (Code of Federal Regulations Title 16, Chapter 2) - Interpretation concerning bathtub and shower doors and enclosures.
- B. IBC (International Building Code), Chapter 24 - Glass and Glazing.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. Regulatory Requirements: Comply with applicable glazing safety regulations, including IBC Chapter 24, and 16 CFR 1201.40.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Manufacturer's catalog cuts and data sheets, complete parts list, and installation requirements for each item specified.
- C. Shop Drawings: Show installation details and requirements for backing.

- D. Samples: As may be requested by Architect, will be returned following review.

1.5 SITE CONDITIONS

- A. Verify actual locations of shower enclosures, and other construction to which the enclosures must fit by accurate field measurements before installation.
- B. Verify with Architect exact dimension and location of enclosures.

1.6 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Protect from damage during delivery, handling, storage and installation.

1.7 COORDINATION

- A. Verify fastening requirements for substrate conditions and manufacturer's recommendations. Verify dimensions and quantities of required fasteners.
- B. Furnish backing information to trades performing carpentry.
- C. Coordinate installation schedule with construction progress to avoid delay of Work.

PART 2 - PRODUCTS

2.1 SHOWER DOORS AND FRAMES

- A. Manufacturers:
 - 1. American Shower Door, Inc. (323) 726-2478.
 - 2. Century Shower Door Co., Inc.
- B. American Shower Door, Inc. "851 Model" sliding door or equal by Century Shower Door Co., Inc., complete with pull.
 - 1. Glazed with 3/8" tempered clear glass.
 - 2. Extruded aluminum door frames with brushed nickel finish, continuous top and bottom rails.
 - 3. Sizes: As indicated on Drawings.
 - 4. Stainless Steel Fasteners: Screws as appropriate for substrate and as required for anticipated loads.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install glass shower doors after room finishes such as painting and tile work, and plumbing fixtures have been completed.
- B. Install glass shower doors in accordance with manufacturer's instructions and recommendations.
- C. Secure components to backing, blocking or framing. Hollow wall fasteners (toggle bolts and molly fasteners) will not be accepted. Use stainless steel fasteners only.
- D. Seal all edges of glass shower doors for watertight seal of enclosure. Use sanitary sealant as specified in Section 07 92 00 - Joint Sealants.

3.2 CLEANING

- A. Clean glass shower doors for Substantial Completion review.
 - 1. Remove labels and soiling.
 - 2. Clean and polish doors and frames.
 - 3. Refer to Section 08 81 00 - Glass Glazing for glass cleaning.
- B. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 10 44 00**FIRE PROTECTION SPECIALTIES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide portable fire extinguishers, cabinets and brackets where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 06 10 00: Rough Carpentry.
 - 2. Section 09 21 16: Gypsum Board Assemblies.

1.2 REFERENCES

- A. NFPA 10 - Standard for Portable Fire Extinguishers.
- B. UL - Fire Protection Equipment Directory.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Include rough-in dimensions, relationships of box to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.
- C. Provide manufacturer's Installation Instructions.
- D. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.

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PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHER CABINETS

- A. Semi-Recessed Mounted Cabinets: J.L. Industries Academy Model No. C1096F10, or equal products by Larsen's Manufacturing Company.
 - 1. Door and Trim Construction: Aluminum. Flush cabinet doors with a 5/8" door stop, attached by a continuous hinge and equipped with zinc-plated handle and roller catch.
 - 2. Finish: Factory-anodized finish in Dark Bronze color.
 - 3. Glazing Material: 0.090" clear acrylic.
 - 4. Wall Opening: 11-1/2" x 25" x 4-5/8".
 - 5. Trim Style and Depth for Semi-Recessed Cabinet: Square Edge, 1-1/4 inch.
 - 6. Box: Manufacturer's standard box, cold-rolled steel with electrostatically applied white polyester powder coating, thermally fused.
- B. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

2.2 FIRE EXTINGUISHERS

- A. General: Provide fire extinguisher for each cabinet. Conform to NFPA 10.
- B. Dry Chemical Type: J.L. Industries Model No. Cosmic 5E, or equal products by Potter Roemer or Larsen's Manufacturing Co., 5 lbs., 14-5/8" height x 4-1/4" diameter.
- C. UL Rating: 2A:10:B:C.

2.3 MOUNTING BRACKETS

- A. Brackets: Designed to prevent accidentally dislodging extinguisher, J.L. Industries Model No. MB818, or equal products by Potter-Roemer or Larsen's Manufacturing Co., 16-gauge glossy polyester coated steel. Provide brackets for extinguishers not located in cabinets.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

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1. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation.
2. Verify all fire extinguisher locations with Fire Department and Architect before installing.

3.2 INSTALLATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
- B. Install in accordance with manufacturer's directions for type of mounting required at height and locations indicated and in compliance with applicable regulations of governing authorities.
- C. Fasten mounting brackets and cabinets to structure, square and plumb.
- D. Identify bracket-mounted extinguishers with red letter decals spelling "FIRE EXTINGUISHER" applied to wall surface. Letter size, style and location selected by Architect.

3.3 CLEANING UP AND PROTECTION

- A. Remove the refuse to the area of the job site set aside for its storage.
- B. Waste Management: Refer to Owner's administrative requirements for recycling requirements.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure fire protection specialties are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

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SECTION 10 51 43**WIRE MESH STORAGE LOCKERS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide turn-out, open-grid-style lockers and accessories where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 03 35 43: Polished Concrete Finishing.
 - 2. Section 06 10 00: Rough Carpentry.
 - 3. Section 09 21 16: Gypsum Board Assemblies.

1.2 REFERENCES

- A. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel.
- B. ASTM A513/A513M - Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. Installer shall have experience in locker installation.
- B. Manufacturer shall have a minimum of fifteen (15) years experience in the direct manufacture of lockers.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Submit manufacturer's product data and installation instructions.
- C. Shop Drawings: Submit manufacturer's shop drawings for each individual run of lockers.
- D. Samples: Submit standard color samples selected by Architect.
- E. Owner's Manual: Provide maintenance manual at Project Closeout.

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- F. Warranty: Submit manufacturer's standard warranty.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for metal locker installation. Deliver materials to Site in manufacturer's original, unopened containers with labels identifying product and manufacturer's name.
- C. Storage: Store materials in a clean dry area.
- D. Handling: Protect materials and finish during installation and handling to prevent damage.

1.6 COORDINATION

- A. Coordinate with other trades as required for a timely and smooth execution of work.
- B. Verify all dimensions for proper fit and attachment of all parts.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below, before construction begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Full-size units of the following metal locker hardware items equal to ten (10) percent of amount installed for each type and finish installed, but no fewer than five (5) units:
 - a. Locks.
 - b. Identification plates.
 - c. Hooks.

PART 2 - PRODUCTS

2.1 MATERIAL REQUIREMENTS

- A. The design for metal lockers specified is based on GEARGRID Wall Mounted and Free-Standing Storage Systems manufactured by GearGrid LLC (www.geargrid.com). Subject to compliance with requirements, provide either the named products or comparable products by another manufacturer capable of providing specialized equipment intended for use as turn-out lockers for firefighters. Include tools required for assembly or disassembly and reconfiguration.

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- B. Wall-Mount Wire Storage System: 24" opening, 79" high x 25.25" wide x 20" deep overall dimension, with 22.75" clear opening width.
- C. Free-Standing Wire Storage System: Refer to Drawings for configuration, layout and quantity of lockers.
- D. Base Assembly: Base frame shall be manufactured from 1.25" x 11-gauge wall thickness ASTM A513 square steel tubing. Each unit to be supplied with four bolt-down pads per unit.

2.2 COMPONENTS

- A. Vertical Dividers:
 - 1. Outer frames made of 1.25" O.D. x 16-gauge wall thickness ASTM A513 steel tubing.
 - 2. Inner grid side panel and meshback panel fabricated from 0.25" diameter ASTM A510 cold drawn steel wire resistance welded to a 3" square pattern. Grid design to allow for attachment of accessories to complement maximum usage of unit.
- B. Top and Bottom Shelves:
 - 1. Both shelves manufactured from 0.25" diameter ASTM A510 cold drawn steel wire resistance welded. All bends to be cold formed.
 - 2. Top shelf to include a 20-gauge steel bracket for the mounting of 2" x 16" name placard.
 - 3. Shelves shall be adjustable in 3 inch increments.
- C. Supply three (3) apparel hooks with each individual system opening. Hook design shall allow placement on either grid side panels or meshback panel. Hooks shall be 0.192" diameter ASTM A510 cold drawn steel wire resistance welded and cold formed and powder coated, welded into a quick- detachable unit.

2.3 ACCESSORIES

- A. Provide helmet holder, 0.25" diameter ASTM A510 cold drawn steel wire resistance welded, powder coated finish in specified color.
- B. Provide glove drying hanger, 0.25" diameter 304 stainless steel wire cold formed and resistance welded, with black vinyl coating on hook end.
- C. Provide coat drying hanger, 0.25" diameter 304 stainless steel wire cold formed and resistance welded, with black vinyl coating on hook end. Include formed loops to prop open sleeves on jackets to promote better circulation throughout the garment.

- D. Provide secure box, 6" x 6" x 12" long 6061 Aluminum enclosure with hinged, lockable door at outer end. Design shall include an integrated mail slot. Powder coated finish in specified color.
- E. Provide a 2 inch x 16 inch custom interchangeable name plate for each locker, minimum 20 gage cold-rolled sheet steel. Provide plates custom fabricated for list of names provided by the County.
- F. Provide horizontal Hang Bar, 1.25" O.D. x 16-gauge 304 stainless steel tubing with powder coated brackets attached to side mesh.

2.4 CONSTRUCTION

- A. Units shall be welded at all applicable joints, forming of metal completed by standard cold-forming operations. Use fasteners only required to allow for knock down for shipping, to secure units to mounting surface and on applicable accessories.
- B. Inner Grid at Vertical Dividers and Back Panels: Wires must be full length and width of inside frame. Wires not running full length or width, thus creating exposed wire ends will not be acceptable. Inner grid wires must run horizontally and vertically creating a square or rectangular grid pattern only. Grid wires not creating a square or rectangular grid pattern will not be acceptable. Inner grid wires shall intersect and cross all perpendicular wires, and shall be welded at all intersections.

2.5 FINISH

- A. All system components excluding assembly and mounting hardware and stainless steel components are to receive the standard finish.
- B. Standard Finish: Components shall be cleaned using a phosphatized bath and clear water rinse, and coated electro-statically with a durable and UV-stable TGIC powder coating.
- C. Color: In standard color to match Architect's sample.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine areas to receive lockers. Notify Architect if areas are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

3.2 INSTALLATION

- A. Install the work of this Section in strict accordance with the manufacturer's recommendations as approved by the Architect, using only the approved mounting materials, and locating all components firmly into position, level and plumb.

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1. Mount lockers to wall with backing specified in Section 06 10 00.
2. Anchor to mounting surface with manufacturer's assembly hardware.

3.3 CLEANING UP

- A. Keep the premises in a neat, safe, and orderly condition at all times during execution of this portion of the Work.
- B. Remove the refuse to the area of the job site set aside for its storage.
- C. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 10 55 23**MAIL BOXES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide in-ground receiving mail boxes on pedestals where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.

1.2 REFERENCES

- A. ASTM A193/A193M - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
- B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- D. NAAMM AMP 500 - (National Association of Architectural Metal Manufacturers) Metal Finishes Manual.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum five (5) years documented experience.
- B. Installer Qualifications: An authorized representative of postal specialty manufacturer for installation of units required for this Project.
- C. Source Limitations: Obtain postal specialties through one source from a single manufacturer.
- D. Product Options: Drawings indicate size, profiles, and dimensional requirements of postal specialties and are based on the specific system indicated. Refer to Owner's administrative requirements.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- E. Regulatory Requirements: Provide products approved by USPS. Comply with USPS requirements for construction and installation of units served by USPS.

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1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of postal specialty.
- C. Shop Drawings: Submit shop drawings for each type of postal specialty. Include plans, elevations, details, and attachments to other work.
- D. Maintenance Data: For postal specialties and finishes to include in maintenance manuals.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.

1.6 COORDINATION

- A. Coordinate with other trades as required for a timely and smooth execution of work.
- B. Verify all dimensions for proper fit and attachment of all parts.
- C. Templates: Obtain and distribute to parties involved templates for installing postal specialties.

1.7 WARRANTY

- A. Provide warranty on manufacturer's standard form in which manufacturer agrees to repair or replace components of postal specialties that fail in materials or workmanship within five (5) years from date of Substantial Completion. Failures include, but are not limited to, the following:
 - 1. Structural failures.
 - 2. Faulty operation of hardware, except door locks.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers: Subject to compliance with requirements, provide products by Salsbury Industries www.mailboxes.com, or equal products by Florence Corporation.
- B. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, and as follows.

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1. Sheet and Plate: ASTM B209.
2. Extruded Shapes: ASTM B221.
- C. Stainless Steel Anchor Bolts, Nuts, and Washers: ASTM A193/A193M, Grade B8M, Type 316.

2.2 MAILBOXES

- A. Private, pedestal-mounted mail chest by Salsbury Industries or equal by Florence Corporation, with front and rear access locking door, an outgoing mail tray, a lock with two (2) keys on each door (keyed alike), and an adjustable red signal flag, approved for U.S.P.S. curbside mail delivery. Rear door equipped with concealed, continuous side hinge. Compartment enclosure fabricated from extruded aluminum or aluminum sheet with integral weather-protection hood. Pedestal fabricated from same material and finish as parcel locker and attached with theft-resistant fasteners.

1. Mail Chest:
 - a. Model: Salsbury #4350BRZ.
 - b. Size: 14 3/8" W x 17 1/4" H x 23" D.
 - c. Color: Bronze.
2. Pedestal:
 - a. Model: Salsbury #4385BRZ.
 - b. Size: 3 1/2" W x 3 1/2" D x 48" H.
 - c. Color: Bronze.
 - d. Mount: In-ground mounted.

- B. Locks: Salsbury #4390 lock set, 2 keyed alike, with 2 keys each. Deliver lock keys to Owner by registered mail or overnight package service with a record of each corresponding lock and key number.

2.3 METAL FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.
- B. Finish postal specialties after assembly.
- C. Powder-Coated Finish: Immediately after cleaning and pre-treating, electrostatically apply manufacturer's standard baked-polymer finish consisting of a thermosetting polyester or acrylic urethane powder topcoat. Comply with paint manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine mailbox areas and conditions for compliance with clearances affecting installation of postal specialties. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Refer to Drawings for exact configuration and quantity desired.

3.2 PREPARATION

- A. In addition to requirements of these Specifications, comply with manufacturer's written instructions and recommendations for preparing substrates, installing anchors, and applying postal specialty units.

3.3 INSTALLATION

- A. Install postal specialties level and plumb, according to manufacturer's written instructions, roughing-in drawings, original design, and referenced standards.
- B. Install in accordance with USPS regulations.
- C. Conceal fastenings where exposed to view.
- D. Fit trim accurately and tight to adjacent construction.
- E. Final acceptance depends on compliance with USPS requirements.

3.4 ERECTION TOLERANCES

- A. Maximum Variation from Plumb: 1/8 inch.
- B. Maximum Offset from True Dimensional Alignment: 1/4 inch.

3.5 CLEANING UP AND PROTECTION

- A. Remove the refuse to the area of the job site set aside for its storage.
- B. Waste Management: Refer to Owner's administrative requirements for recycling requirements.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure postal specialties are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 10 75 16
GROUND-SET FLAGPOLES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide ground-set aluminum flagpoles where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 03 30 00: Cast-In-Place Concrete.

1.2 REFERENCES

- A. AA DAF-45 - (Aluminum Association) Designation System for Aluminum Finishes
- B. AAMA 611 - Specification for Anodized Architectural Aluminum.
- C. NAAMM AMP 500 - (National Association of Architectural Metal Manufacturers) Metal Finishes Manual.
- D. NAAMM FP 1001 - Guide Specifications for Design of Metal Flagpoles.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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. Source Limitations: Obtain flagpole as a complete unit, including fittings, accessories, bases, and anchorage devices, from a single manufacturer.
- C. Structural Performance: Provide flagpole assemblies, including anchorages and supports, capable of withstanding the effects of wind loads determined according to NAAMM FP 1001.
 - 1. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.
 - 2. Basic Wind Speed: 100 mph; 3-second gust speed at 33 feet aboveground.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.

- B. Product Data: Submit materials list, manufacturer's specifications and other data, and Shop Drawings showing general layout, dimensions, base design and its connection to foundation, anchoring and support system, and grounding system.
- C. Shop Drawings: Include elevations and details showing general arrangement, jointing, fittings and accessories, grounding, and anchoring and supporting systems. Include details of foundation system for ground-set flagpoles. Provide a structurally designed concrete footing detail.
- D. Finish Samples for Verification: For each finished material used for flagpoles and accessories.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. American Flagpole and Flag Co.
- B. Eder Flag Manufacturing Company, Inc.

2.2 FLAGPOLES

- A. Provide ground set foundation assembly as standard with the approved manufacturer and as approved by governmental agencies having jurisdiction.
- B. Overall Dimensions:
 - 1. 30'-0" total exposed height.
 - 2. 6" butt diameter, 3" top diameter.
 - 3. 0.188" wall thickness minimum.
- C. Design:
 - 1. Uniform, straight line, cone tapered sections above cylindrical butt sections, manufactured from seamless aluminum tube of 6063-T6 alloy, heat-treated and age hardened.
 - 2. Taper 1" in 5' - 6".
 - 3. Provide internal splicing, self-aligning sleeve of same material as flagpole for snug fitting, precision field joints.

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2.3 FITTINGS AND ACCESSORIES

- A. Provide aluminum flash collar with satin anodized finish.
- B. Finial Ball: Aluminum 356 alloy die cast, 8 inches in diameter with flush seam. Stem to be aluminum alloy 6061 T 6 with 5/8" NC thread, gold anodized finish.
- C. Provide truck assembly on each flagpole consisting of cast aluminum assembly with ball bearing non-fouling, revolving double truck.
- D. Cast Aluminum Cleats: 9" long, two per flagpole, with aluminum fastenings.
- E. Halyards: Cotton braided #10 5/16" diameter government specification rope, bronze or bronze chrome plated snap hooks for two flags.
- F. Finish exposed surfaces to match the flagpole.

2.4 FINISHES

- A. Metal Finishes, General: Comply with NAAMM AMP 500 for recommendations for applying and designating finishes.
- B. Aluminum: Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
 - 1. Class I, Color Anodic Finish: AA-M12C22A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.7 mils or thicker) complying with AAMA 611.
 - 2. Finish for Exposed Aluminum Surfaces: Dark bronze.

2.5 FOUNDATIONS

- A. Provide engineered foundation to comply with pertinent requirements of governmental agencies having jurisdiction and in accordance with flagpole manufacturer's recommendations.
- B. Apply for, pay for and obtain deferred approval permit.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install the flagpoles and accessories in strict accordance with the manufacturer's recommendations as approved by the Architect, aligning plumb to a vertical

tolerance of one in 1000, and adjusting operating components for optimum smoothness of operation.

3.3 CLEANING UP AND PROTECTION

- A. Remove the refuse to the area of the job site set aside for its storage.
- B. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 10 80 00
OTHER SPECIALTIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide miscellaneous specialties where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to the following.

1. Hose room equipment.
2. Flammable liquids cabinet.
3. Storage shelving and hooks.
4. Oil drum spill pallet and ramp.

B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.

1. Section 06 10 00: Rough Carpentry.
2. Section 13 36 13.15: Steel Fire Hose Tower.

1.2 REFERENCES

A. 29 CFR 1910.106 - Flammable liquids (OSHA).

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen 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.

1.4 SUBMITTALS

A. Comply with pertinent provisions of the Owner's administrative requirements.

B. Product Data:

1. Submit materials list, manufacturer's specifications and other data needed to prove compliance with the specified requirements.
2. Submit details of installation and anchorage sufficient to enable proper interface of the work of this Section with the work of other trades.

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1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.

1.6 COORDINATION

- A. Coordinate with other trades as required for a timely and smooth execution of work.
- B. Verify all dimensions for proper fit and attachment of all parts.

PART 2 - PRODUCTS

2.1 HOSE ROOM EQUIPMENT

- A. Provide Model WB Small hose rack brackets by Super Vac (800) 525-5224 info@supervac.com, for use on 1-1/2" pipe.

2.2 FLAMMABLE LIQUIDS CABINET

- A. Provide flammable liquids cabinet, Model #1947XLEGS, 45-gallon capacity with 2 manual doors, 43" W x 18" D x 69" H, 282 lbs., as manufactured by Eagle Manufacturing Company (800) 798-9250, in conformance with 29 CFR 1910.106 regulations for storing paints, greases, oils, and solvents.

2.3 STORAGE ROOM SHELVING AND HOOKS

- A. Provide Tennsco Z-Line medium grey 5-shelf die rack steel shelving, Model RXHS-481872-MGY, 48" W x 18" D x 72" H. Mount shelving to wall with backing specified in Section 06 10 00.
- B. Hose Channel Hooks: Refer to Drawings for details.

2.4 OIL DRUM SPILL PALLET AND RAMP

- A. Provide "In-Line 4 Drum Poly Spill Pallet", Model 5102-YE as manufactured by Containment Corporation (800) 235-7421, for the Oil Room.
- B. Include Poly-Ramp, Model 5039-BK for walk-ups.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install the work of this Section in strict accordance with the manufacturers' recommendations as approved by the Architect, using only the approved

mounting materials, and locating all components firmly into position, level and plumb.

- B. Install complete with all necessary clips, grounds, backing materials and anchors as required. Mount hooks for air hose on wall with backing specified in Section 06 10 00.

3.3 CLEANING UP

- A. Keep the premises in a neat, safe, and orderly condition at all times during execution of this portion of the Work.
- B. Remove the refuse to the area of the job site set aside for its storage.
- C. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 11 30 13
RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide food service equipment and appliances where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 05 59 12: Stainless Steel Kitchen Fabrications.
 - 2. Section 06 40 00: Architectural Woodwork.
 - 3. Section 22 00 00: Plumbing - Services and connections to equipment.
 - 4. Section 23 00 00: Heating, Ventilation and Air Conditioning.
 - 5. Division 26: Electrical - Electrical characteristics and wiring connections.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data:
 - 1. Submit materials list, manufacturer's specifications and other data, and shop drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.
 - 2. Submit color charts showing colors available from the proposed manufacturer in the specified products.
 - 3. Submit samples of exposed finishes, minimum 8" square, for Architect's approval.

1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.

- B. Delivery and Storage: Deliver and store all items specified herein in dry, protected areas. Keep free of corrosion or other damage. Replace any damaged items, or parts thereof, at no cost to the Owner.

1.5 COORDINATION

- A. Coordinate with other trades as required for a timely and smooth execution of work.
- B. Verify all dimensions for proper fit and attachment of all parts.

1.6 GUARANTEE

- A. Submit manufacturer's standard warranties and guarantees.

PART 2 - PRODUCTS

2.1 FOOD SERVICE EQUIPMENT AND APPLIANCES

- A. General: Provide all new materials, free from defects, best of their respective kinds, as approved by the Architect. Provide all required accessories for a complete finished installation.
- B. Subject to compliance with requirements, provide the following appliances.
 - 1. Range: ZLINE RA-BR-60. Stainless steel freestanding natural gas range with eight burners and two convection ovens, 60 inches wide.
 - 2. Kitchen Exhaust Fan and Hood: ZLINE 667-60. Professional ducted wall mount range hood in stainless steel with LED lights and fan. 60 in. wide (verify).
 - 3. Microwave Oven: LG LMC2075ST. Stainless steel, 24" wide.
 - 4. Dishwasher: LG LDFN3432T. Stainless steel front panel with matching stainless steel side panels for exposed installation.
 - 5. Side-by-Side Refrigerator: LG LHSXS2706S, stainless steel.
 - 6. Ice Maker: VEVOR T38-13185.V1s, stainless steel. Minimum ice cube production of 440 lbs. per day with 250 lbs. of ice cube storage capacity.

2.2 MISCELLANEOUS KITCHEN ITEMS

- A. Food Waste Disposer: "In-sink-erator" Model 777ss with 1.0 HP motor, Auto-Reverse Grind System™, stainless steel grind chamber and components, and sound reduction insulated outer shell.
- B. Containers: Rubbermaid VENTED BRUTE® Round Containers, 32 gallons.
 - 1. One (1) blue for recycling, FG263200BLUE.

- 2. One (1) gray for trash, FG263200GRAY.
- C. Knife Rack: RSVP Endurance Magnetic Rod Knife Bar, 18" L x 2.4" W x 0.8" D in stainless steel.
- D. Drinking Water Faucet: "Everpure" Model EV9970-56 as manufactured by Pentair, in chrome finish, 0.5 GPM.
- E. Drinking Water Filter: "Everpure" Model H-104 EV926271 as manufactured by Pentair, installed under kitchen sink on cold water line.
- F. Soap Dispenser: Bobrick B-26617 Surface-Mounted Liquid Soap Dispenser, 1 L capacity, 3-3/4" W x 13-1/4" L x 6" D in brushed satin finish stainless steel.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which this work will be performed. Do not proceed with installation until unsatisfactory dimensions and conditions have been corrected in a manner acceptable to the installer.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations.
- B. Built-In Equipment: Securely anchor units to supporting cabinetry or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify clearances are adequate for proper operation of equipment.
- D. Utilities: Refer to Divisions 22 and 26 for plumbing and electrical requirements.
- E. Testing: Test each item of equipment to verify proper operation. Make necessary adjustments.
- F. Accessories: Verify that accessory items required have been furnished.
- G. Cleaning: Remove packing material from equipment items and leave units in clean condition, ready for operation.

3.3 CEANUP

- A. Broom clean and remove from the Site all scraps and debris from this work.
- B. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 12 24 13
ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide manually operated sunscreen and blackout roller shade systems where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 06 10 00: Rough Carpentry.
 - 2. Section 09 21 16: Gypsum Board Assemblies.
 - 3. Section 09 51 13: Acoustical Panel Ceilings.

1.2 REFERENCES

- A. ANSI/WCMA A100.1 - Standard for Safety of Window Covering Products.
- B. ASTM E2180 - Standard Test Method for Determining the Activity of Incorporated Antimicrobial Agent(s) In Polymeric or Hydrophobic Materials.
- C. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- D. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

1.3 QUALITY ASSURANCE

- A. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
- B. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty (20) years experience and minimum of five (5) projects of similar scope and size in manufacturing products comparable to those specified in this Section.
- C. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of ten (10) years experience in installing products comparable to those specified in this Section. Roller Shade Hardware, shade fabric and all related controls shall be furnished and installed as a complete assembly.
- D. Fire-Test-Response Characteristics: Passes NFPA 701 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.

- E. Anti-Microbial Characteristics: 'No Growth' per ASTM G21 and ASTM E2180 results for fungi ATCC9642, ATCC 9644, ATCC9645.
- F. Environmental Certification: Submit written certification from the manufacturer, including third party evaluation, recycling characteristics, and perpetual use certification as specified. Initial submittals, which do not include the Environmental Certification will be rejected. Materials that are simply 'PVC free' without identifying their inputs shall not qualify as meeting the intent of this specification and shall be rejected.
- G. Third Party Evaluation: Provide documentation stating the shade cloth has undergone third party evaluation for all chemical inputs, down to a scale of 100 parts per million, that have been evaluated for human and environmental safety. Identify any and all inputs, which are known to be carcinogenic, mutagenic, teratogenic, reproductively toxic, or endocrine disrupting. Also identify items that are toxic to aquatic systems, contain heavy metals, or organohalogens. The material shall contain no inputs that are known problems to human or environmental health per the above major criteria, except for an input that is required to meet local fire codes.
- H. Recycling Characteristics: Provide documentation that the shade cloth can, and is part of a closed loop of perpetual use and not be required to be down cycled, incinerated or otherwise thrown away. Scrap material can be sent back to the mill for reprocessing and recycling into the same quality yarn and woven into new material, without down cycling. Certify that this process is currently underway and will be utilized for this Project.
- I. Perpetual Use Certification: Certify that at the end of the useful life of the shade cloth, that the material can be sent back to the manufacturer for recapture as part of a closed loop of perpetual use and that the material can and will be reconstituted into new yarn, for weaving into new shade cloth. Provide information on each shade band indicating that the shade band can be sent back to the manufacturer for this purpose.
- J. Preinstallation Meeting: One week prior to commencing work related to this Section. Require attendance of all affected installers.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Submit materials list, manufacturer's specifications, installation instructions, and other data.
- C. Selection Samples: For each finish product specified, one set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns, for Architect's selection.
- D. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified

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requirements. Shadecloth sample and aluminum finish sample as selected. Mark face of material to indicate interior faces.

- E. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings.
- C. Handle and store shades in accordance with manufacturer's recommendations.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Coordinate with window installation and placement of concealed blocking to support shades.

1.7 WARRANTY

- A. Roller Shade Hardware and Chain Warranty: Manufacturer's standard non-depreciating, transferrable warranty for interior shading.
 - 1. Shade Hardware with Solar Shadecloth: Ten (10) year limited warranty.
 - 2. Shade Hardware with Classic Blackout Shadecloth: Twenty-five (25) year limited warranty.
- B. Solar Shadecloth: Manufacturer's standard (10) year warranty.
- C. Blackout Shadecloth: Manufacturer's standard twenty-five (25) year warranty.
- D. Roller Shade Installation: One (1) year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas, which are deemed Owner's responsibility.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers: MechoShade Systems LLC, Long Island City, NY. Telephone: (718) 729-2020.

2.2 SYSTEM DESCRIPTION

- A. Mecho/5 manually operated fabric window shade system.
 - 1. Shade Type: Double roller.
 - 2. Universal drive capability to offset drive chain for reverse or regular roll shades.
 - 3. Drop Position: As selected by Architect.
 - 4. Mounting: As selected by Architect.
 - 5. Size (WxH): Size to fit window.
 - 6. Fabric: As indicated in Article 2.4.

2.3 COMPONENTS

- A. Manual Operated Chain Drive Hardware and Brackets:
 - 1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
 - 2. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
 - 3. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
 - 4. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable.
 - 5. Provide shade hardware constructed of minimum 1/8-inch thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
 - 6. Drive Bracket / Brake Assembly:
 - a. Drive Bracket shall be fully integrated with all accessories, including, but not limited to fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades.
 - b. Drive sprocket and brake assembly shall rotate and be supported on a welded 3/8-inch steel pin.

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- c. The brake shall be an overrunning clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. in the stopped position.
 - d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
 - e. The entire assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade
- 7. Double Roller Brackets: Configured for light-filtering and room-darkening shades in one opening.
 - a. Light-Filtering Fabric: Room-side of opening.
 - b. Room-Darkening Fabric: Glass-side of opening.
 - c. Operating chain pulls for both fabrics configured for the same side of the window.
- 8. Drive Chain: Continuous loop #10 qualified stainless steel chain rated to 100 lb. minimum breaking strength. Nickel plate chain shall not be accepted. Provide upper and lower limit stops.
 - a. Chain Tensioner: Chain tensioning device complying with ANSI/WCMA A100.1.
 - b. Limit stops: Bead stops affixed to the chain maintain consistent shadeband alignment at the top and bottom of shade travel across multiple shades, and help prevent shade damage resulting from unmanaged user control.
- B. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
 - 1. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band and continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
 - a. Room-Darkening Shades: Slotted bottom bar with wool-pile light seal.

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2. Shade Band and Shade Roller Attachment:
 - a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch in diameter for manual shades are not acceptable.
 - b. Provide for positive mechanical engagement with drive / brake mechanism.
 - c. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
 - d. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
 - e. Any method of attaching shade band to roller tube that requires the use of adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

2.4 SHADE FABRIC

- A. Solar Shadecloth: Sunscreen roller shades in all exterior windows of rooms and spaces shown on the Drawings, and related mounting systems and accessories.
 1. Environmentally Certified PVC-Free Shadecloth: EcoVeil group, 1350 Series, fabricated from TPO for both core yarn and jacket, single thickness, opaque coated reinforced non-raveling yarn.
 2. Fabric Thickness: 0.034 inch.
 3. Mesh Weight: 12.68 oz./yd².
 4. Weave: 5 percent open, 2x2 basket weave.
- B. Blackout Shadecloth: Room darkening blackout fabric in all exterior windows of rooms and spaces shown on Drawings, and related mounting systems and accessories.
 1. Vinyl Room Darkening Shadecloth (Single-Fabric): 0700 Series blackout material, washable laminated and embossed vinyl coated fabric, with a minimum of 62 threads per square inch.
 2. Fabric Thickness: 0.013 inch.
 3. Mesh Weight: 12.50 oz./yd².
- C. Colors: Selected by Architect from manufacturer's standard colors.

- D. Fabric Properties: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.

2.5 ACCESSORIES

- A. Fascia: Removable extruded aluminum. Size as required to conceal shade mounting. Attachable to brackets without exposed fasteners.
 - 1. Finish and Color: As selected by Architect.
 - 2. Can be installed across two or more shade bands in one piece.
 - 3. Single Fascia: Accommodate regular roll shades or reverse roll shades. Verify with Architect.
 - 4. Profile: Square.
- B. Room-Darkening Channels: Extruded aluminum side and center channels with brush pile edge seals, mounting base, and concealed fasteners. Channels to accept one-piece exposed blackout hembar to assure side light control and sill light control.
- C. Other Materials: Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Architect subject to the approval of the Owner.

2.6 SHADE FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
 - 1. Do not fabricate shades until field dimensions for each opening have been taken with finished conditions in place. "Hold to" dimensions are not acceptable.
- B. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.
- C. Fabricate shade cloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shade cloth to roll true and straight without shifting sideways more than 1/8 inch in either direction per 8 feet of shade height due to warp distortion or weave design. Fabricate hem into hem type selected by Architect.
- D. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shade bands. Contractor shall be responsible for ensuring the width-to-height (W:H) ratios will not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shade cloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

- E. For railroaded shadebands, provide seams in railroaded multi-width shadebands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer's standards. In absence of such standards, assure proper use of seams or battens as required, and assure the proper tracking of the railroaded multi-width shadebands.
- F. Openings Requiring Continuous Multiple Shade Units with Separate Rollers: Locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work.
- B. Do not begin installation until substrates have been properly prepared.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the Project conditions.

3.3 INSTALLATION

- A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow proper clearances for window operation hardware.
- B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
- C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- D. Train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.
 - 1. Use operation and maintenance manual as a reference, supplemented with additional training materials as required.

3.4 PROTECTION AND CLEANING

- A. Protect installed products until completion of Project.

- B. Touch-up, repair or replace damaged products before Substantial Completion.
 - 1. Clean soiled shades and exposed components as recommended by manufacturer.
 - 2. Replace shades that cannot be cleaned to "like new" condition.
- C. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 13 36 13.15
STEEL FIRE HOSE TOWER

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide powered fire hose tower where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to the following.
1. Hose tower lift complete with rack, self supporting mast, mounting anchors, and electric driven chain hoist.
 2. Foundation, anchors, bearing plate and dry pack.
 3. Electrical work to motorized hoist, conduit, and connection to electrical service.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
1. Section 03 30 00: Cast-In-Place Concrete - Concrete footings for tower.
 2. Division 26: Electrical wiring and connections.

1.2 REFERENCES

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

1.3 SYSTEM DESCRIPTION

- A. One individual electric driven hose tower lift, complete and operational as follows:
1. Size A - Large, unless otherwise indicated.
 2. Net Hose Capacity: 80 hose lengths.
 3. Net Hoist Capacity: 3 ton.
 4. Platform Size: 92" x 96".

5. Travel: 25 feet.
 6. Speed: 16 feet per minute.
 7. Number of Stops: Two (2) - stop at top / stop at bottom.
 8. Foundation: Per design of hose tower manufacturer.
- B. Hose Tower Operation: Two push button (up/down) with an on / off keyed lock control, electrically driven by chain hoist with 208 volt, 3 phase power characteristics.

1.5 QUALITY ASSURANCE

- A. Work shall be performed by competent mechanics skilled in this work and under the direct control and supervision of the hose rack manufacturer's experienced foreman.
- B. Source Limitations: Provide fire hose tower as produced by a single manufacturer, including necessary accessories, fittings and fasteners.

1.6 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data:
 1. Submit materials list, manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 2. Submit details of installation and anchorage sufficient to enable proper interface of the work of this Section with the work of other trades.
- C. Shop Drawings: Submit shop drawings of electric hose tower installation and components. Show conduit diagrams and connection to electrical services.

1.7 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Deliver items or materials to Site after area in which they are to be installed is ready to receive them in their final place of installation.
- C. Store materials in a storage allotted, in such a manner as to prevent deterioration, damage, or loss of their essential properties.
- D. Protect from damage during delivery, handling, storage and installation. Fully protect moveable and operating equipment from weather.

1.8 COORDINATION

- A. Verify all dimensions for proper fit and attachment of all parts.

- B. Coordinate with other trades as required for a timely and smooth execution of work.

1.9 WARRANTY

- A. Manufacturer's warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Submit a written warranty, executed by manufacturer, agreeing to repair or replace components that fail in materials or workmanship within one (1) year from date of Substantial Completion. Failures include, but are not limited to, the following:
 - 1. Structural failures, including cracked or broken structural support members and load-bearing welds.
 - 2. Faulty operation of operators, control system, or hardware.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers: Subject to compliance with requirements, provide electric hose tower by Tiger Firehose Towers, Bakersfield, CA Tel (661) 340-8758.
- B. Operating Equipment: Provide hose tower complete with rack, self-supporting mast, mounting anchors, electric driven chain hoist, controllers, guide rails, buffers, buttons, wiring, indicators, hardware and fittings, with power-assisted drying feature, to provide a fully operational hose rack.
 - 1. Hoist: Coffing hoist model EC 6016, 25'-0" lift, 16 FPM (maximum) speed.
 - 2. Rack: 80 peg hose capacity with trolley and rollers.
 - 3. Mast: 16" diameter, 1/4" steel pipe, 32.4' high, self supporting with a 6" I beam hose rack track.
 - 4. Base Plate and Anchors: 1 1/2" x 24" diameter steel base plate anchored with six 1 1/4" diameter X 84" long anchor bolts.
 - 5. Foundation: As indicated.
- C. Construction: Fabricate from structural- and formed-steel shapes. Fabricate entire assembly to withstand deformation during both operating and stored phases of service.
 - 1. Structural Steel Shapes and Miscellaneous Steel: ASTM A36.
 - 2. Rolled Steel Sections, Shapes and Rods: ASTM A53 grade B.

3. Tubular Steel: ASTM A500 Grade C with FY = 50 ksi.
 4. Bolts: ASTM A307.
 5. Concrete: Minimum 3000 psi at 28 days.
- D. Industrial Enamel Finish and Color:
1. Finish Preparation: Steel assembly shall be wire brush cleaned to remove all scale and slag, removed of all oils and grease with solvent, and ground smooth at all welds.
 2. Primer: Shop coat zinc oxide alkyd.
 3. Enamel: Shop applied machine enamel, color as selected by Architect.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine the areas and conditions under which work of this Section will be performed. Report defects to Architect in writing which may affect work of this trade or equipment operation. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
- B. Ensure that mast and track for moving equipment are plumb, level, and in line and that foundation is to proper depth, dimensions and reinforced as specified.
- C. Supply in ample time for installation, inserts, anchors, pipe sleeves, bearing plates, brackets, supports and bracing, including setting templates and diagrams for placement.

3.2 INSTALLATION

- A. Install the work of this Section in strict accordance with manufacturer's recommendations as approved by the Architect, using only the approved mounting materials, and locating all components firmly into position, level and plumb.
- B. Install complete with all necessary clips, grounds, backing materials and anchors as required.
- C. Set mast and track true and plumb.
- D. Install machinery, guides, controls, rack equipment, and accessories in accordance with manufacturer's instructions and applicable codes and standards to provide a quiet, smoothly operating installation, free from sidesway, oscillation, or vibration.
- E. Install base plate, mast track, and all accessories in conformance with manufacturer's shop drawings and specifications.

- F. Install operating controls and wiring, and connect electrical service.
- G. Adjusting and Balancing: Make necessary adjustments of equipment to ensure hose tower lift operates smoothly and accurately.

3.3 INSPECTION AND MAINTENANCE

- A. Obtain and pay for permits, tests and inspections as required by authorities having jurisdiction. Perform tests in the presence of Owner's Inspector. Final inspection shall take place after hose rack installation.
- B. Maintain entire hose tower lift installation for twelve (12) months after date of Substantial Completion of Work.
- C. Any required maintenance or service shall be performed solely by the hose tower lift manufacturer or a certified distributor and shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

3.4 CLEANING AND PROTECTION

- A. Upon completion of the work of this Section, immediately remove all tools, equipment, excess materials and waste from the Site.
- B. Locate and protect movable equipment and controls in such a way that they can only be operated by authorized persons.
- C. Prior to final acceptance, remove protection from finished surfaces and clean and touch up surfaces with due regard to type of material.
- D. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

3.5 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Provide the services of an authorized representative of the manufacturer to instruct the Owner's personnel in the proper operation and routine maintenance of the electric hose tower.

END OF SECTION

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SECTION 13 48 00**SOUND, VIBRATION, AND SEISMIC CONTROL****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
- B. Provide vibration isolators for electrical equipment as specified complete and as shown on the Drawings to prevent transmission of vibration and sound to the building.
- C. All seismic restraining devices shall comply with the current seismic requirements of the State of California for the type of device specified.

1.2 REFERENCES

- A. ANSI - American National Standards Institute.
- B. NEMA - National Electrical Manufacturers Association.

1.3 QUALITY ASSURANCE

- A. Furnish Owner's Representative with a copy of a certified factory test report complying with ANSI and NEMA standards.
- B. Provide all material required for testing. Refer to the Owner's administrative requirements for detailed requirements. Testing laboratory shall report results of the tests to Owner's Project Manager who will approve or disapprove the work.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Shop Drawings, Product Data and Calculations: The following includes the minimum required shop drawing data and calculations.
 - 1. Manufacturer's model number for each isolator or restraining device and the equipment to which it will be applied.
 - 2. Neoprene isolator free height, deflected height, isolator loading and displacement.
 - 3. Seismic and anchorage design, including methods to achieve vertical restraint for seismic slack cables.
 - 4. Written certification from isolation manufacturer that isolation is installed correctly.
- C. All submittals shall be signed by a structural engineer licensed in the State of California.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide vibration isolators as specified in Paragraph 2.1.B below. Provide restraining devices as specified in Paragraph 2.1.C below, and as shown on the Drawings. The isolators and the seismic restraining devices shall comply with the current seismic requirements of the State of California.
- B. Vibration Isolators:
 - 1. General Properties:
 - a. All vibration isolators shall have either undeflected heights or calibration markings so that, after adjustment when carrying their load, the deflection under load can be verified, thus determining that the load is within the range of the device and that the correct degree of vibration isolation is being provided according to the design.
 - b. All isolators shall operate in the linear portion of their load versus deflection curve. Furnish load versus deflection curves from manufacturer; curves shall be linear over a deflection range of not less than 50% above the design deflection.
 - c. The ratio of lateral to vertical stiffness shall be neither less than 0.9, nor greater than 1.5.
 - d. The theoretical vertical natural frequency for each support point based upon the load per isolator and isolator stiffness shall not differ from the design objectives for the equipment as a whole by more than (+) 10%.
 - e. Wave motion through the Isolator shall be reduced to the extent that isolation above the primary vertical system resonance frequency shall follow the theoretically predicted isolation curve for single degree of freedom systems with 10 db to 50 db at all frequencies above 150 Hz.
 - f. All neoprene mountings shall have a shore hardness of 40-65 after minimum aging of thirty (30) days, or corresponding open-aging.
 - g. Vibration isolators shall provide the proper weight distribution to produce uniform deflection.
 - 2. Isolator Types:
 - a. Type MS shall be spring type without housings or snubbers, equipped with leveling bolts and with two layers of ribbed or waffled neoprene pads, separated by a 1/16" galvanized steel plate under the base plate. Neoprene sleeves and washer shall be installed at all anchor bolts.
 - b. Type HS shall be suspension hangers having a steel frame and spring element, in series with a neoprene pad, cup or washer. The isolator

shall be designed so that hanger rod may be misaligned 15 degrees in any direction relative to the vertical, without contacting hanger box frame.

- c. Type MN shall be neoprene isolator support type unit having a minimum static deflection of 1/4".
 - d. Type HN shall be a suspension hanger type employing a neoprene isolator unit having a minimum static deflection of 1/4".
3. Equipment Frames:
- a. Mounting frames and brackets shall be provided to carry the load of the equipment without causing mechanical distortion or stress to the equipment.
 - b. The mounting frames shall consist of welded, wide flange or channel structural steel, with welder brackets to accept the isolators. The section depth of any frame member shall be not less than 1/10th of the length of the longest frame member, and not less than 1/10th of the greatest span between support points. All frame members shall have the same depth.
- C. Restraining Devices:
- 1. Restraints shall consist of 2" by 1/4" flat iron bars with resilient pads to provide vertical and lateral restraint during seismic shock.
 - 2. Each restraint shall consist of two pieces of flat iron bars bolted together with two 3/8" bolts and serrated washers. The holes in the bars shall be slotted vertically to permit adjustment for required clearance.
 - 3. Steel wire minimum #12 AWG.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All electrical equipment shall be mounted on vibration isolation rails or frames using neoprene isolators.
- B. Provide restraints for engine-generator/ATS sets, unit substations, switchboards, distribution boards, motor control centers, sectionalizing switches, floor mounted transformers and any other floor standing electrical equipment shown on the Drawings.
- C. Provide restraints for all suspended transformers and other suspended electrical equipment.
- D. Bolt restraints to floor with 1/2" lag type bolts and anchors.
- E. Install restraints after equipment has been set on isolators and after the isolators have been adjusted for required deflection.

- F. The diesel engine-generator set, all unit substations and all floor supported transformers in excess of 300 KVA located within the building shall be mounted on isolation units utilizing type MS springs, appropriately secured to the housing. Spring units shall be selected for a minimum static deflection of 1.5".
- G. All floor supported transformers of 300 KVA and smaller located within the building shall be mounted on vibration isolation rails utilizing Type MN neoprene mounts selected to deflect a minimum of 0.25".
- H. Suspended electrical equipment shall be supported on an appropriate steel frame from Type HS hangers, selected for a minimum static deflection of 0.75".
- I. Provide cable restraints for lighting fixtures, wireways and bus ducts.

3.2 ACCEPTANCE TEST

- A. Inspect the installation of all vibration isolators in accordance with manufacturer's printed recommendations.
- B. Replace, at no extra cost to the Owner, isolators which do not produce the required deflection, are incorrectly loaded above or below their correct operating height, or which do not produce the required isolation as approved.
- C. Inspect whether all electrical equipment has seismic restraints as specified.

END OF SECTION

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SECTION 21 13 13**WET-PIPE SPRINKLER SYSTEMS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
- B. Work to be performed under this Section consists of furnishing all labor, material, tools, equipment, services, testing and performing all operations required for the furnishing and installing complete automatic fire sprinkler system to serve the entire Project.
 - 1. Complete wet automatic fire sprinkler system shall be installed, including automatic sprinkler riser assembly stand pipes, automatic sprinkler heads and piping, main and auxiliary drain valves for trapped sections of pipe and valves, for complete 100% fire sprinkler systems, as per all code requirements.
 - 2. The fire service, detector check meters, backflow preventor, PIV, underground piping up to 5 feet outside building lines and fire hydrant shall be installed by others.

1.2 WORK NOT INCLUDED

- A. Painting of all automatic sprinkler piping.
- B. Guard posts.
- C. Electrical wiring from flow indicators and switches to alarm panel and alarm bell.

1.3 REFERENCES

- A. ASTM D1869 - Standard Specification for Rubber Rings for Fiber-Reinforced Cement Pipe.
- B. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
- C. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm).
- D. Factory Mutual Insurance Company - FM Approvals Certification.
- E. NFPA 13 - Standard for the Installation of Sprinkler Systems.
- F. OSFM - The Office of the State Fire Marshal.
- G. UL - UL Solutions: Product Certification.

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1.4 FIRE SERVICE

- A. Refer to Civil Drawings.

1.5 PERMITS, FEES, AND INSPECTIONS

- A. Obtain all permits, pay all fees, and arrange for all inspections for this work required by governing authorities and other agencies having jurisdiction.
- B. Pay for any special City, County or District assessments, bonded fees, connection fees, or other charges required for the furnishing of utility services and detector check meters.
- C. Sprinkler subcontractor shall perform all necessary tests as called for by the regulations of such authorities.

1.6 CODES

- A. All work and materials shall comply with all applicable codes and complete sprinkler system shall be installed in accordance the NFPA 13, L.A. County Building and Safety, and L.A. County Fire Department requirements. Also comply with fire sprinkler notes indicated on the Plumbing Drawings.

1.7 VISITING THE SITE

- A. Each bidder, before submitting a proposal for the fire sprinkler work, shall visit the site and ascertain all conditions pertaining to the installation and shall include all eventualities in his bid.

1.8 CUTTING AND PATCHING

- A. Perform all drilling as necessary for installation of equipment. Perform cutting and drilling of structure only with prior approval of Architect. Repair or replace all street, roadway, sidewalk, curb and other surfaces that are damaged or cut into as a result of service connection installation or investigation.

1.9 EARTHWORK

- A. Perform excavating, trench work and backfilling for fire sprinkler work in accordance with the provisions specified in Civil Drawings.

1.10 DESIGN OF SYSTEM

- A. The automatic sprinkler subcontractor shall prepare coordinated shop drawings and detailed installation drawings for 100% automatic sprinkler (wet) systems with wet stand pipes and shall be based on requirements of NFPA 13 and L.A. County Fire Department (Verify the classification of occupancies with Authority having Jurisdiction (AJH) prior to submitting proposal).
- B. Protection shall be complete and shall include any and all combustibles concealed spaces, overhang areas, and wherever required by building and fire departments.

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- C. Sprinkler system shall be installed in such a manner to prevent any interference with doors, windows, lights, heating ducts and equipment, plumbing, and electrical equipment.
- D. All sprinkler pipes shall be concealed and the routing shall be discussed and verified with the Architect. Comply with proposed fire sprinkler riser and stand pipe locations indicated in the Fire Sprinkler Drawings.

1.11 DRAWING SUBMITTALS

- A. Within two weeks of receiving the Contract, submit, in accordance with the Owner's administrative requirements, five (5) sets of preliminary coordinated shop drawings and brochures for Architect's review.
 - 1. The preliminary coordinated drawings shall indicate the following items:
 - a. Location of all sprinkler heads per Fire Sprinkler Drawings.
 - b. Location of fire risers. (Comply with riser locations indicated in the Fire Sprinkler Drawings).
 - c. Location of Fire Department Connections (FDC).
 - d. Fire service main and supply feed mains.
 - e. The proposed routing for the sprinkler piping. Where possible, avoid deviations from approved Fire Sprinkler and Civil Drawings.
 - 2. Also include the following submittal:
 - a. Brochures and sample of proposed sprinkler heads.
 - b. Brochures and sample of fire department connections.
 - c. Brochures of all valves, supervisory switches, alarm bell, etc.
 - d. Brochures of all pipe support system such as hangers, sway bracing etc.
 - e. Brochures of all pipes and fittings.
- B. The Architect will review the layout and may relocate fire riser, control and add, remove or relocate sprinkler heads to achieve an orderly and acceptable layout, at the fire sprinkler subcontractor's cost. The Architect will also review the sprinkler heads and will accept or reject them. In order to achieve the desired look where deviations from approved drawings are necessary, the base bid shall include unit pricing for different types of fire sprinkler heads.
- C. After obtaining approval from the Architect for the preliminary layout, prepare final shop drawings and submit five sets for Architect's review and approval prior to starting installation. Shop drawings shall also be submitted to the Office of the State Fire Marshal.

- D. Shop Drawings shall be prepared by a licensed fire protection or mechanical engineer in the State of California hired directly by fire sprinkler subcontractor.
- E. All new material and equipment which is called out either on the drawings or in the specifications shall require five sets of brochures submitted with the working drawings. The descriptive literature should show the actual items clearly identified by manufacture's name and model number.
- F. Conflicts between Contract Documents: In the event conflicting requirements between items or the Drawings or between items in the Specifications, or between items on the Drawings and in the Specifications, the more stringent or costly shall govern, unless decided otherwise by the Architect, who shall be the sole judge in these matters.
- G. Conflicts in Shop Drawings or Submittals: The fire sprinkler subcontractor agrees that shop drawing submittals processed by the Engineers do not become Contract Documents and are not Change Orders; that the purpose of the shop drawing review is to establish a reporting procedure, and is intended for the fire sprinkler subcontractor's convenience in organizing his work and to permit the Architect to monitor the fire sprinkler subcontractor's progress and understanding of the design. The process of review of the fire sprinkler subcontractor's submittals is not the purpose of testing the Architect's perception. If deviations, discrepancies, or conflicts between shop drawing submittals and the Contract Documents discovered either prior to or after the shop drawing submittals are processed by the Architect, the fire sprinkler subcontractor agrees that the Contract Documents shall control and shall be followed.
- H. It is also the responsibility of the fire sprinkler subcontractor to review the shop drawings and submittals to be submitted prior to submittals to the Architect for his review. If shop drawings and submittals are received without the fire sprinkler subcontractor's review stamp, that shop drawing or submittal will be returned to the fire sprinkler subcontractor prior to Architect's review.

1.12 INTERPRETATION OF DRAWINGS

- A. It is the fire sprinkler subcontractor's responsibility to provide complete system. The exact location of the sprinkler heads shall be approved by L.A. County Fire Department and Architect prior to starting installation.
- B. All Architectural and Structural Drawings of the building and those for Plumbing work, Heating Ventilation and Air Conditioning and Electrical work are hereby made a part of these Specifications, and shall be consulted by the fire sprinkler subcontractor and his work adjusted to meet the conditions shown thereon.
- C. The fire sprinkler subcontractor shall coordinate with all other subcontractors so that no interference will occur, and in order that grade lines may be established for the work of each subcontractor, as no extra will be allowed any subcontractor for the changes made necessary by interference with the work of other trades.

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- D. Sprinklers shall be installed as per code requirements. Provide additional heads, piping and labor where required by authorities and type of construction. Sprinkler pipes shall be routed so it is concealed everywhere.

1.13 GUARANTEE

- A. Prior to final acceptance of the Project, deliver to the Owner a written one-year guarantee on all workmanship, materials and equipment and agree to repair or replace all such defective items promptly that may occur during this period, including repair or replacement of the premises that may be damaged due to leaks or breaks in pipes and fittings furnished under this work.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials shall be new and in perfect condition; all materials for similar uses shall be of the same type, material and manufacturer for ease of future maintenance.
- B. All materials, sprinkler heads and equipment shall be covered or sealed upon installation so as to provide for safety and to ensure that operation and appearance will be maintained after subsequent construction operations.

2.2 PIPE AND FITTINGS

- A. Underground Piping: Refer to Civil Drawings.
- B. Underground piping, as it enters the building up to 5'-0" outside of building, shall be Class 52 ductile iron pipe.
- C. Above ground pipe shall be schedule 40, black steel pipe, threaded, and black cast iron standard weight screwed sprinkler fittings, for 2 inches and smaller, with grooved fittings 2-1/2 inches and larger.

2.3 VALVES

- A. Valves shall be located and arranged in conformity with NFPA regulations. All valves shall be underwriters' laboratories approved, 175 PSI design, and of the following types and manufacture:
 - 1. Control Valves: Butterfly valves UL listed, 175 psig or higher, iron body, bronze mounted, Nibco GD-4765-8N or equal by Stockham.
 - 2. Drain Valves: Angle pattern type, screwed, with brass bodies and trimming and iron wheel handle, Stockham, Model No. B-216.
 - 3. Check Valves: Iron body, bronze swing, disc and hinge, Crane #375, Jenkins #629, or Walworth #883-F.

4. Post Indicator Valve: Valve shall be adjustable type Nibco NIP-1AJ or equal by Stockham, Mueller, or Kennedy. Underwriters' laboratories and factory mutual listed and sized per Drawings.
5. Gate valve, non-rising stem for underground use, iron body indicator post pattern, Nibco M609-RW or equal by Stockham or Kennedy.
6. Gate Valves: UL listed, 175 PSIG iron body, bronze swing, disc and hinge, Crane #375, Jenkins #629, or equal by Kennedy or Stockham.

2.4 FIRE DEPARTMENT CONNECTIONS

- A. Refer to Civil Drawings.

2.5 SUPERVISED ALARMS

- A. Flow Indicator Switch: Furnish and install a line size Factory Mutual listed and NFPA approved flow indicator switches, Autocall, Model No. WF-4, in new automatic riser assemblies, so located that an alarm will be sounded in case one or more sprinkler heads are opened. Indicator switch shall have two normally open isolated contacts. Valve shall have time delay adjustment variable from zero to 15 seconds to compensate for line surge. The normally open contact shall be wired to an outside alarm bell and to the main alarm panel.

2.6 SPRINKLER HEADS

- A. Sprinkler heads shall be Underwriters' Laboratories approved fusible link, pendant, upright or side wall type heads as required.
- B. Sprinkler heads shall be 212-degree rated where excessive temperatures are anticipated per NFPA 13.
- C. Corrosion resistant lead coated sprinkler heads shall be installed where they are exposed to the weather, moisture or corrosive vapors.
- D. Sprinkler heads installed where they might receive mechanical injury shall be protected with approved guards.
- E. Provide and install additional heads, piping, fittings and labor where required due to type of construction, or Code requirements.
- F. Coordinate locations with other trades.
- G. Sprinkler heads in finished ceiling areas shall be recessed.
- H. Architect must approve all sprinkler heads.
- I. All sprinkler heads shall be approved by State of California and State Fire Marshal.

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2.7 HANGERS AND SUPPORTS

- A. Hangers shall be adjustable split ring, malleable iron type with threaded tee hanger rods as manufactured by Carpenter-Paterson, Fee and Mason, or Grinnell.

- B. Rods: Size of rods and supporting screws shall not be less than the following:

<u>Pipe Size</u>	<u>Size of Rod</u>
2 or less	3/8-inch
2-½ and 3	3/8-inch
3-½	1/2-inch
4 and 5	1/2-inch
6	1/2-inch

- C. All sprinkler piping shall be braced to meet the NFPA 13, for the Project location seismic requirements.

2.8 SLEEVES AND PLATES

- A. Sleeves shall be 18-gauge galvanized iron or steel for slabs, walls, ceiling and partitions. Sleeves for concrete walls shall be standard weight galvanized steel pipe.

- B. Plates shall be polished, chrome-plated cast brass with set screw flanges.

2.9 FLEXIBLE COUPLINGS

- A. All required couplings shall be Dresser, Style 167.

2.10 GAUGES

- A. Gauges shall be provided in conformance with NFPA 13.

2.11 INSPECTOR'S TEST VALVES

- A. Inspector's test valves shall be supplied and installed rear the hydraulically most remote portion of the systems. Test valves shall be located in conformance with NFPA 13 and LA County Fire department requirements.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. All workmanship shall be performed by skilled mechanics using the best standard practices of the trade.

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3.2 INSTALLATION

- A. Underground Piping: Refer to Civil Drawings.
- B. Piping within Buildings: Screwed fittings shall be used for all 2-inch and smaller piping within building except flanged fittings shall be used at base of risers. For pipe sizes 2-1/2 inch and larger, grooved fittings and mechanical or welded outlets shall be used. Reducing fittings shall be used wherever a change is made in the size of the pipe. No bushing of any type shall be used. Piping system shall be installed in such a manner that breakage of sprinkler piping will not occur. This shall be accomplished by use of flexible couplings, sway bracing and hangers, and by means of proper clearance around pipes passing through concrete construction. Flexible couplings shall be installed where required by NFPA 13.
- C. Location of Hangers: Per latest requirements of NFPA ordinances.
- D. Sway bracing for the mains and restraints for branch lines shall be provided per NFPA 13 requirements.
- E. Sleeves in concrete slab and wall construction shall be set in forms before concrete is poured and shall extend 1-inch above finished floor slab. Sleeves shall provide adequate clearance around pipes per NFPA 13 requirements. Sleeves shall be fire rated "Link Seal" by Garlock Pipeline Technologies (GPT).
- F. Plates shall be installed where pipes pass through floors, walls, and ceiling in finished portions of the building.
- G. At fire rated walls and floors, provide and install approved fire rated wall/floor sleeves. Sleeves shall be approved for the same rating as the construction in which they are installed.
- H. Provide the Owner a stock of spare sprinkler heads of each type used, a wrench or tool for their replacement in a steel box mounted on a wall location chosen by the Architect. The quantity of each type of sprinklers shall be per NFPA 13 requirements.

3.3 TESTS

- A. Entire piping systems, including underground mains, fire pumps, tanks, risers, and inside piping shall be tested, at 200 psi or 50 psi above normal working pressure whichever is greater for period of two hours. All tests shall be made in the presence of the Owner's Project Manager. All necessary equipment, material and labor for tests shall be provided by the fire sprinkler subcontractor.
- B. After each system has been completely approved, secure a letter of final acceptance from the Fire Rating Bureau having Jurisdiction and deliver three (3) copies of the letter to the Architect.

END OF SECTION

SECTION 22 00 00**PLUMBING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. The Owner's administrative requirements are applicable to the work under this Section.
- B. The work under this Section of the Specifications includes all labor, materials and equipment for a complete and operable plumbing system, consisting of water supply, waste and vent for future connections as indicated, storm drain, hot and cold water, fuel gas, and waste and vent systems for new plumbing fixtures including all fittings, valves, trenching, backfilling, saw cutting, sleeves, rough-in and final connections to N.I.C. and/or Owner furnished equipment as specified and as indicated on the Drawings and unless otherwise herein specified, shall be completed, tested and ready for use.
- C. The work includes, but is not necessarily limited to the following:
 - 1. Plumbing fixtures and equipment.
 - 2. Sanitary Sewer System: Make point of connection to sanitary sewer mains for each building, as indicated in the Civil Engineering Drawings. Verify the exact location, size depth before starting construction.
 - 3. Domestic Water System: Make new point of connection to water service line as indicated in the Civil Drawings. Verify exact location and size and water pressure before starting construction. Provide separate water meter for irrigation system.
 - 4. Natural Fuel Gas System: Make arrangements and pay for the installation of new gas meter and gas service line and make new point of connection to gas meter with new gas header and gas shut-off valve as indicated. Verify exact location, size and gas pressure before starting construction. Provide earthquake shut-off valves.
 - 5. Storm Water Disposal: System, including roof drains and overflow drains, deck drains, interior downspouts attached thereto and underground piping to points of discharge. Verify exact location, size and depth before starting construction. Also refer to Civil Drawings.
 - 6. Mechanical Equipment Services: Rough-in and all final connections for gas, water with back flow preventer and condensate waste services to mechanical equipment, as indicated and as specified.
 - 7. Plumbing labor, materials and equipment and rough-in and all final connections to all equipment and fixtures requiring such connections, whether such equipment and fixtures are furnished under this Section or under other Sections

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of these Specifications or not indicated on the Drawings or Specifications, which are required for proper operation of the systems, in accordance with the true intent and meeting of the Contract Documents, shall be provided and incorporated in the work by and at the expense of the plumbing subcontractor.

8. All necessary trench excavation, backfilling, drilling, cutting and patching required for the work. Repair all concrete slabs as necessary. Patching materials and finish shall match the surrounding work.
9. Equipment and piping support system including seismic restraints.

1.2 RELATED WORK NOT INCLUDED IN THIS SECTION OF THE SPECIFICATIONS

- A. Documents, etc.
- B. Electrical, except as noted.
- C. Automatic fire sprinkler system.
- D. Section 09 90 00: Painting and Coating, except as noted.

1.3 RELATED WORK INCLUDED IN OTHER SECTIONS

- A. Section 22 15 19.13: General Service Packaged Reciprocating Air Compressors.
- B. Section 33 56 13: Aboveground Fuel-Storage Tanks.

1.4 REFERENCES

- A. ADAAG (Americans with Disabilities Act Accessibility Guidelines) for Buildings and Facilities.
- B. ASME - The American Society of Mechanical Engineers.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- D. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
- E. ASTM A888 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
- F. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
- G. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- I. AWWA C651 - Disinfecting Water Mains.

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- J. C.B.C. - (California Building Code) 2022 Edition.
 - K. CISPI - Cast Iron Soil Pipe Institute.
 - L. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
 - M. CISPI 310 - Specification for Coupling for Use In Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
 - N. IAPMO - International Association of Plumbing and Mechanical Officials.
 - O. IBC - International Building Code 2024 Edition.
 - P. SMACNA - Seismic Restraint Manual: Guidelines for Mechanical Systems.
 - Q. UL 723 - Test for Surface Burning Characteristics of Building Materials.
- 1.5 ON SITE VISIT
- A. It shall be the plumbing subcontractor's responsibility to visit the Project Site and acquaint himself with all existing conditions, as well as ascertain the extent of the work involved. By the act of submitting a bid, the plumbing subcontractor shall be deemed to have made such an examination, to have accepted such conditions, and to have made allowances therefore in preparing his figure.
- 1.6 ORDINANCES, REGULATIONS AND CODES
- A. The installation shall comply with all of the latest applicable ordinances, regulations and codes of all agencies having jurisdiction, including the California Plumbing Code, Los Angeles County Building and Safety Department and all other authorities having jurisdiction.
 - B. Nothing in these Drawings and Specifications is to be construed to permit work in violation thereof.
 - C. No extras will be paid for furnishing items required by the codes, but not specified or shown on the Drawings.
 - D. Rulings and interpretations of the enforcing agencies shall be considered as part of the codes.
- 1.7 SUBMITTALS
- A. Comply with pertinent provisions of the Owner's administrative requirements.
 - B. Within 30 calendar days after award of Contract by the Owner, submit to the Architect for review, six copies of lists of materials and equipment he proposes to furnish. Each item shall be identified by the manufacturer's name, catalog number

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and size, and modifications noted. Any deviation from Specifications or Drawing requirements shall be clearly delineated on the submittals, regardless of catalog literature. Any delay in processing of submittals or progress of work due to improper or incomplete submittals shall be at the plumbing subcontractor's expense.

- C. In the event that the plumbing subcontractor installs equipment or materials in a manner not acceptable to the Architect, without having first submitted shop drawings and equipment for review, any changes which are required shall be made at the plumbing subcontractor's expense.
- D. Submittals shall include, but not limited to:
 - 1. Underground tank and accessories.
 - 2. Fuel dispensing equipment and accessories.

1.8 CONFLICTS BETWEEN CONTRACT DOCUMENTS

- A. In the event of conflicting requirements between items on the Drawings, or between items in the Specifications, or between items on the Drawings and in the Specifications, the more stringent or costly shall govern, unless decided otherwise by the Architect, who shall be the sole judge in these matters.

1.9 CONFLICTS IN SHOP DRAWINGS OR SUBMITTALS

- A. Plumbing subcontractor agrees that shop drawing submittals processed by the Architect do not become Contract Documents and are not Change Orders; that the purpose of the shop drawing review is to establish a reporting procedure, and is intended for the plumbing subcontractor's convenience in organizing his work and to permit the Architect to monitor the plumbing subcontractor's progress and understanding of the design.
- B. The process of review of the plumbing subcontractor's submittals is not the purpose of testing the Architect's perception. If deviations, discrepancies or conflicts between shop drawing submittals and the plumbing subcontractor's Documents are discovered either prior to or after the shop drawing submittals are processed by the Architect, the plumbing subcontractor agrees that the Contract Documents shall control and shall be followed.
- C. It is also the responsibility of the plumbing subcontractor to review the shop drawings or submittals to be submitted prior to submittal to the Architect for his review. If shop drawings or submittals are received without the plumbing subcontractor's review stamp, the shop drawings or submittals will be returned to the plumbing subcontractor prior to the Architects review.

1.10 PERMITS, FEES, AND INSPECTIONS

- A. Obtain and pay for all necessary permits, fees, and inspections required by governing authorities.

1.11 EXISTING UTILITY LINES

- A. Location and character of principal existing utilities, including dimensions as shown on the Drawings, for convenience only, are believed complete and correct but shall be subject to verification by the plumbing subcontractor, as the Owner assumes no responsibility for their correctness.
- B. Adjust location or alignment of the new work as necessary to avoid or to connect to existing utilities or piping without additional cost to the Owner.
- C. Make arrangements and pay for the installation of the new gas and water meters and provide and for any temporary storm drain, gas, water, and sanitary sewer connections. Verify before installation the invert elevations, locations, sizes and pressures of all existing utility lines at the new point of connections. Repair or replace all roadways, sidewalk pavements, or streets and other work incidental to these installations.

1.12 INTENT OF DRAWINGS

- A. The Drawings are essentially diagrammatic. The size and location of equipment and fixtures are drawn to scale wherever possible.
- B. The Contract Drawings show the extent and general arrangement of the work covered under this Section.
- C. The work shall be followed as closely as possible; however, proper adjustments shall be made, with the Architect's concurrence, to secure maximum headroom, a neat arrangement to keep passageways and openings clear, provide accessibility and provisions for maintenance, and meet all Code requirements, at no additional charge.

1.13 EXCAVATING, TRENCHING AND BACKFILLING

- A. The mechanical work shall include all saw cutting, excavating, trenching, and backfilling required for the installation of piping, anchor blocks, and any other devices that are a part of this work.
- B. Backfilling shall be performed in accordance with the applicable portions of Civil Engineering Drawings.
- C. Backfill shall not be placed until the mechanical work installed has been inspected, tested, and approved by the Inspector.

1.14 CUTTING AND PATCHING

- A. The plumbing subcontractor shall do all drilling, cutting, and patching of the general construction work, rough, finish, and trim, which may be required for the installation of the work. All patching shall be of the same materials, workmanship, and finish as the original work, and shall accurately match the surrounding work. All cutting and patching shall be done under the Architect's supervision.

1.15 QUALITY OF EQUIPMENT, MATERIALS AND WORKMANSHIP

- A. Unless otherwise specified, all equipment and materials used in the installation shall meet ASME and IAPMO requirements. All workmanship shall be of the best quality, and none but competent mechanics skilled in their trades shall be employed.
- B. All materials and equipment shall be installed as recommended by the manufacturer.

1.16 DAMAGE BY LEAKS

- A. Plumbing subcontractor shall be responsible for all damage to any part of the premises caused by leaks or breaks in piping, equipment, or fixture furnished and/or installed by him, for a period of one year from the date of acceptance of the work by the Owner.

1.17 AS-BUILT DRAWINGS

- A. Plumbing subcontractor shall keep an up-to-date, on the site accurate, dimensional reproducible set of record as-built drawings, showing all work which is installed per Contract Drawings or differently from that shown on the Contract Drawings. As-built drawings shall include the location and the depth of buried or concealed piping, or equipment, etc.
- B. Upon completion of the work, the plumbing subcontractor shall deliver the as-built drawings to the Architect for final approval.

1.18 CLOSING-IN OF UNINSPECTED WORK

- A. Plumbing subcontractor shall not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and approved by the Architect's representative and local inspector. Should any of his work be covered up or enclosed before such inspection and test, he shall, at his own expense, uncover the work, and after it has been inspected, tested, and approved, make all repairs with such materials as may be necessary to restore all his work and that of other trades to its original and proper condition.

1.19 PRELIMINARY OPERATION

- A. Should the Owner demand that any portion of the plant, apparatus, or equipment be operated for beneficial use prior to the final completion and acceptance of the work, the plumbing subcontractor shall consent.
- B. Such operation shall be under the supervision and direction of the plumbing subcontractor, but all the expense therefore will be paid by the Owner, separate and distinct from any money paid on account of the Contract. Such preliminary operation or payment therefore shall not be construed as an acceptance of any of the work of this Contract.

1.20 SEISMIC RESTRAINT REQUIREMENTS

- A. All components of the plumbing systems shall be seismically restraint in full compliance with seismic notes indicated in Plumbing Drawings. In case of discrepancy with requirements indicated in this Section the more seismically stringent requirement shall govern.
- B. Hangers for suspended equipment piping shall be sway braced in two directions in accordance with "Seismic Restraint Manual: Guidelines for Mechanical Systems" by SMACNA.
- C. All prefabricated equipment is to be designed and constructed in such a manner that all portions, elements, subassemblies, and/or parts of said equipment and the equipment as a whole, including its attachments, will resist a horizontal and vertical load equal to the operating weights of those parts multiplied by the following factors in the latest Building Code being enforced during construction.
- D. Load is to be applied at the center of gravity of the part and to be in any direction horizontally and vertically. Anchorage, support, and/or attachment of said prefabricated equipment to the structure shall be in accordance with "Seismic Restraint Manual: Guidelines for Mechanical Systems" by SMACNA.
- E. Submit shop drawings and calculations for seismic restraints and anchorage of the equipment to the Architect for review. Installation of equipment or supporting elements shall not begin until shop drawings are reviewed and signed by the Architect.

1.21 STERILIZATION OF WATER PIPING

- A. The water supply and distribution system shall be sterilized by chlorine in solution in accordance with AWWA C651 and local ordinances. Provide additional isolation valves as required.
- B. All work and Certification of Performance shall be done by approved applicators or qualified personnel with chemical and laboratory experience. Submit a Certificate of Sterilization.

1.22 COOPERATION WITH OTHERS

- A. The plumbing subcontractor shall so organize the work that progress will harmonize with the work of all trades, so that all work may proceed as expeditiously as possible.
- B. He shall be responsible for the correct placing of the work and the connection thereof to the work of all related trades.

1.23 GUARANTEES

- A. As a condition precedent to the issuance of the final certificate for completion payment, the plumbing subcontractor shall deliver to the Owner a special written guarantee. In effect, the plumbing subcontractor shall guarantee all workmanship,

equipment and materials for a period of one year from the date of acceptance of the installation. Plumbing subcontractor shall be responsible for all damages to premises caused by leaks or breaks in piping during this period. Should any other defects occur during this period, the plumbing subcontractor shall promptly repair or replace the defective items as directed by the Architect, free of charge to the Owner.

- B. He shall warrant the complete and perfect operation of the entire system and that all apparatus will perform in accordance with the detailed Drawings and Specifications.
- C. He shall warrant that all equipment shall be supported in such a manner as to be free from objectionable vibration and noise.
- D. He shall warrant that all licenses and royalties for use of any patented feature of the system will be paid before acceptance of the installation. Payment of such licenses and royalties shall be a part of the Contract.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials shall be new and in perfect condition; all materials for similar uses shall be of the same type, material, and manufacture for ease of future maintenance.
- B. Accessibility: All equipment shall be readily accessible for maintenance and repairs. Provide all necessary staging, scaffolding, ladders, or similar facilities necessary to install work.
- C. Exposed Trim: All trim, piping, and fittings allowed to remain exposed in finished parts of the building shall be chromium-plated brass, or rough piping may be covered with chromium-plated brass tubing.
- D. Protection: All materials, fixtures and equipment shall be covered or sealed upon installation so as to be provided for safety and to insure that operation and appearance will be maintained after subsequent construction operation.

2.2 PIPING

- A. Provide soil, waste, vent and storm drain piping underground, from points beyond (downstream) 5 feet outside of buildings. Refer to Civil Engineering Drawings and Specifications.
- B. Soil, waste, vent, and storm drain piping, underground inside of buildings and to points 5 feet outside of building, shall be service weight, coated, cast iron soil pipes and fittings and shall conform to the requirements of CISPI 301, ASTM A888 or ASTM A74 for all pipes and fittings. Pipes and fittings shall be marked with the collective trademark of Cast Iron Soil Pipe Institute and manufactured by AB&I, Charlotte, Tyler, or equal products having received prior approval of the Plumbing Engineer. Joints for hubless pipe and fittings shall conform to the manufacturer's

installation instructions, CISPI 310 and local code requirements. Hubless coupling gaskets shall conform to ASTM C564. Joints for hub and spigot pipe shall be installed with compression gaskets conforming to the requirements of ASTM C564 or shall be installed with lead and oakum. Provide Tyler SV Hub & Spigot soil pipe with TY-Seal Gasket and gasket lubricant. Service weight, coated cast iron pipe with MG coupling is also acceptable.

- C. Soil and waste piping inside of building, above ground shall be coated service weight cast iron soil pipe with cast iron soil fittings, and shall conform to the requirements of CISPI 301, ASTM A888 or ASTM A74 for all pipes and fittings. Pipes and fittings shall be marked with the collective trademark of Cast Iron Soil Pipe Institute or receive prior approval of the Plumbing Engineer. Joints for hubless pipe and fittings shall conform to the manufacturer's installation instructions, CISPI 310 and local code requirements. Hubless coupling gaskets shall conform to ASTM C564, ASTM A74 or no-hub joint soil pipe per CISPI 301, with stainless steel couplings per CISPI 310, with cast iron drainage fittings. Piping 3 inches and larger shall be service weight, coated, cast iron no-hub joint soil pipe per CISPI 301 with stainless steel couplings per CISPI 301.
- D. Vent piping above ground inside of the building or below ground shall be service weight, coated, cast iron no-hub joint soil pipe per CISPI 301 with stainless steel couplings per CISPI 310.
- E. Storm drain piping shall be the same as sanitary sewer piping. All exposed storm drain piping above ground shall be galvanized schedule 40 pipe, ASTM A53/A53M, and with cast iron screwed fittings and long sweep elbows. Roof drain downspouts and leaders shall be as detailed on the Architectural Drawings.
- F. Domestic and industrial water piping below ground shall be type "K" hard drawn copper tubing, ASTM B88. Copper tubing shall be made up with 95-5 hard tin solder, and wrought copper fitting shall be in accordance with the manufacturer's recommendations. Wrap piping with 10 mil identified and approved polyvinyl chloride tape. Two layers, half-lapped, shall be applied.
- G. Domestic and industrial water piping above ground shall be type "L" hard drawn copper tubing, ASTM B88. Copper tubing shall be made up with 95-5 hard tin solder and wrought copper fittings shall be in accordance with the manufacturer's recommendations. Where necessary, combination of fittings, reducers, and adapters shall be employed in making up the piping using wrought copper fittings. Cast fittings will not be permitted, except as specified under "Valves".
- H. Condensate drain piping for air conditioning units to point of discharge shall be Type "M" copper tubing with wrought copper fittings. Condensate piping in ceiling space below roof and in walls shall be insulated with Owens-Corning Fiberglas 25. Pipe insulation shall be completely fire safe FRJ jacket with self-sealing lap and with end joint butt strips, or equal by Johns-Manville. Provide trap at air conditioning unit as detailed on the Drawings.
- I. Natural gas piping above ground inside of building 2 ½ inches and smaller shall be schedule 40, black steel pipe, ASTM A53/A53M, with 150 PSI black banded malleable iron screwed fittings and plain pattern couplings. Gas piping 3" and

larger shall be schedule 40 black steel pipe, ASTM A53/A53M, with butt welding fittings. Natural gas piping above ground outside of building exposed to outside air shall be schedule 40 galvanized steel pipe.

- J. Natural gas piping underground outside of building 1 ¼ inches and larger shall be schedule 40, black steel pipe, ASTM A53/A53M, with butt welded fittings. Coat and wrap piping with Plexco X-Tru Coat plastic coating of high-density polyethylene, extruded on steel pipe over thermoplastic adhesive.
- K. NOTE: NO GALVANIZED PIPE IS ALLOWED FOR WASTE AND VENT, HOT AND COLD WATER PIPING INCLUDING TRAP, AND TRAP ARMS ETC.

2.3 PIPE CONNECTIONS

- A. All connections between 85% red brass pipe, type "K" or type "L" copper tubing and steel pipe shall be made with Maloney dielectric unions or flanges, which will prevent the flow of electrical current from one type of metal to another.
- B. Sleeves shall be fire rated (3-hour fire resistance) PyroPac rubber link seal sleeve series L.S. with galvanized link seal sleeve series W.S., complete for fire rated wall or floors. Use standard link seal sleeves and rubber link seals for non-rated wall.
- C. Unions in copper piping, 2-½ inches and smaller shall be Nibco, #733, 2 inches and larger shall be Nibco #740. For steel piping provide Crane No. 300 AAR, galvanized malleable iron, ground joint, brass-to-iron seat.
- D. Drop ear elbows, 90 degrees, shall be Nibco No. 707-5, copper-to-copper or Nibco No. 707-3-5, copper to FSPS, for use at counter and wall trim connection.

2.4 VALVES

- A. All valves shall be manufactured by Nibco, Milwaukee, ITT, Grinnell or Lunkenheimer, gate type, unless otherwise noted. All valves of the same type shall be of the same make. Valves shall be line size and shall be solder joint type for copper tubing.
- B. Gate and Globe Valves for Steel Piping: Brass bodied, 2-½ inches and smaller. 125 WSP, 200 WOG and IBBM 3 inches and larger 125 WSP, 200 WOG.
- C. Gate and Globe Valves for Copper and Brass Piping: All bronze or brass screwed construction, 125 WSP, 200 WOG.
- D. Check Valves for Copper and Brass Piping: Swing check with Teflon disc Y-pattern 125 WSP, 200 WOG.
- E. Butterfly Valves for Copper and Brass Piping: All bronze with bronze disc, 125 WSP, 200 WOG.
- F. Balancing and gas cocks at equipment shall be Crane No. 252 or Walworth No. 555.
 - 1. Gas cocks 2 inches and smaller shall be of brass with a square head. Gas cocks above 2 inches shall be of lubricated plug type.

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- G. Pressure and Temperature Relief Valves: All P.R. valves shall be ASTM stamped with capacity equal to BTU input rating as manufactured by McDonnell & Miller or Watts.

1. Pressure reducing valves shall be Wilkins Co. Model 500YSBR, all bronze, size 2-½" with bronze strainer and pressure gauge and with 75 PSI to 125 PSI spring range.

- H. Check valves installed in vertical piping and in discharge piping from pumps shall be non-slam check valves, Miller No. 162 or Stockham No. WG-970.

2.5 ESCUTCHEON PLATES

- A. Provide polished dull chrome-plated cast brass set screw flanges where pipes pass through walls, floors, ceilings, and partitions in exposed portions of the building. Escutcheon plates shall be provided in pipes at fixture and shall be polished chrome-plated. Steel escutcheon plates are not acceptable.

2.6 STRAINERS

- A. All strainers shall have 20 mesh model screen, style B, with iron body for steel piping, style F, with bronze body, for copper or brass piping as manufactured by Keckley, Hoffman, or Walworth.

2.7 ROOF FLASHING

- A. Flash all vents and other piping stubbed up through roof with a waterproof flashing constructed of 18-gauge galvanized sheet metal or aluminum not less than 0.040 inches thick. Extend base of flashing on the roof not less than 18 inches from the pipe. Extend flashing up the pipe not less than 6 inches and in contact with the pipe for 1 inch at top.

2.8 PIPE HANGERS, SUPPORTS AND ISOLATORS

- A. Provide hangers by Tolco. Provide lateral bracing where hangers exceed 18 inches long.
- B. Isolate all pipe hangers or piping supports from hot and cold water piping with Acousto-Plumb or Semco "Trisolators", Series 100 for IPS piping, and series 500 for tubing, or Potter-Roemer PR Isolators, Series 100 for IPS piping, and Series 300 for tubing. Where pipes pass through openings or touch any part of the structure, wrap with 1/4 inch thick waterproofed felt wrap.

2.9 INSULATION

- A. All domestic hot water supply and return piping 3/4" and smaller shall be insulated with (R-4) 1" of glass fiber pipe insulation with factory applied white jacket, and all hot water supply and return piping greater than or equal to 1" shall be insulated with (R-6) 1-1/2" of glass fiber pipe insulation with factory applied white jacket, as per Manville "Micro-Lok 850 AP" or equal by Owens-Corning. Insulate fittings, flanges and valves with pre-molded one-piece aluminum molded fitting covers with factory matched pre-cut insulation inserts as per Manville "Zeston". Insulation shall meet the flame spread and

smoke density ratings as per International Building Code Section 791.7 for flame spread and smoke density of not more than 25/50 fire hazard classification and shall meet ASTM E84 and UL 723 requirements.

- B. All domestic hot water supply and return piping insulation exposed to outdoor/weather shall be weatherproofed with JM Aluminum Jacketing. Install over the insulation specified above. Jacketing shall be manufactured from 1100, 3105 or 5010 aluminum alloy with 3/16 inch corrugations. Smooth or embossed jackets may be permitted. Jacketing shall be furnished with an integrally bonded moisture barrier over entire surface in contact with insulation. The minimum thickness of aluminum jacketing shall be 0.016 inch.
- C. Exposed portions of drains, traps, and hot water pipes, stop valves and risers serving ADA plumbing fixtures shall be covered with Truebro protective covers or protective enclosures in compliance with CBC Section 11B-213.
- D. Condensate piping within building, in room, in ceiling space below roof, inside walls and above ceilings shall be insulated with 1/2" Owens Corning Fiberglas 25 or J-M Micro-Lok fiber glass insulation.

2.10 CLEANOUTS

- A. Provide and install cleanouts where indicated on Drawings and at all bends, angles, upper terminals, and not over 100 foot intervals in any horizontal piping, as required by the local Plumbing Code.
- B. All cleanouts shall have extra heavy cast iron body and extra heavy bronze plug. All flush with floor cleanouts shall have adjustable watertight covers. When waterproofing membrane is used, the cleanout body shall have integral anchoring flange and heavy clamping collar. All cleanouts shall be as follows:
 - 1. Interior Finished Room Floors: Cleanouts to have nonskid nickel-bronze top, and be Smith No. 4043, Josam No. 58350, or Zurn No. Zn-1324.
 - 2. Interior Finished Room Walls: Cleanouts shall have bonderized prime coated steel cover, and be Smith No. 4532 P.C., Josam No. YL-1590-B, Zurn No. Z-1320, or Wade No. W-8460-R. Install 26-gauge galvanized sleeve from tee through opening to finished wall surface.
 - 3. Exposed cast iron lines, above ground, wall, shall be Smith No. 4405, Josam No. Y-30, Zurn No. Z-1305, or Wade W-8550-R.
 - 4. Interior finished room floors shall have nickel-bronze top, Smith No. 4043, Josam No. Y-670-FB, Wade No. W-7000 Series, or Zurn No. ZN-1400-2.

2.11 BACKFLOW PREVENTER

- A. Backflow preventer shall be installed in all branch piping from the potable water system where required by authorities having jurisdictions.

- B. Backflow preventer shall be reduced pressure backflow preventer type as per Wilkins Model 975, size as per Drawings.

2.12 WATER HAMMER ARRESTERS

- A. Provide P.P.P. (Precision Plumbing Products, Inc.) water hammer arrester at all fixture headers with two or more fixtures or at each fixture or equipment which create surges in water supply piping due to sudden on and off operation of valves. Size shall be as recommended by manufacturer for the application. Install water hammer arrester as closely as possible to valve or equipment being served.

2.13 PIPING IDENTIFICATION

- A. Secure "Brady" pipe identification system at eight feet on center, classifying the material carried, to each pipe line. All line valves shall be identified with "Brady" valve tags.

2.14 ACCESS DOORS, BOXES AND COVERS

- A. Provide and install where indicated on drawings and adjacent to all concealed valves and equipment requiring service. Doors shall be metal hinged, adequately sized, and fire rated to match construction.
- B. Access openings for valves and cleanouts shall be fitted with not less than 18-gauge metal frames, 16-gauge doors with concealed hinges, locks operated with Allen head wrench, and anchor straps. Access doors shall be prime coated for painted wall, and polished chromium for tile walls, Karp # 214-P-AKL, 12' X 12".

2.15 PRESSURE GAUGES

- A. All pressure gauges shall have 3-½ inch dial with shut-off cock as manufactured by Marsh.

2.16 THERMOMETERS

- A. All thermometers shall have brass body with separable socket as manufactured by Taylor, Weiss, Palmer or Moeller.

2.17 PLUMBING FIXTURES REQUIREMENTS

- A. All plumbing fixtures shall be American Standard or Kohler, unless otherwise specified, each complete with polished chrome-plated all-brass trim, unless otherwise noted.
- B. Plumbing subcontractor shall verify all fixture and equipment locations with the Architectural Drawings, and shall furnish and connect all fixtures and equipment shown thereon.
- C. Each individual fixture supply shall be provided with chrome-plated loose key IPS stop valves. Deliver loose keys to Owner.
- D. All wall hung fixtures shall be securely attached to a 1/4 thick by 8-inch wide steel plate, which shall extend to at least one stud beyond the first and the last fixture mounting

point. Plate shall be shop drilled with holes 1/16 inch larger than stud bolts supplied with fixture or fixture arms specified. A jamb nut shall be set tight against face of plate to secure stud. Fixture hanger or arm shall be supported free of finished wall by means of a second set of jamb nuts. For wood construction, studs shall be notched and steel plate set flush with surface. Plates shall be securely bolted to each stud crossed with 1/8 inch minimum by 2-inch steel backup plates. Fixtures with back, specified with supporting arms, shall, in addition to the above specified plates, have fixture hangers securely attached to a 2-inch by 8-inch wood backing.

- E. All plumbing fixtures serving accessible units shall comply with all ADA requirements.
- F. All accessible (ADA approved) plumbing shall comply with required operating force and parameters for CBC Sections 115B2.1.2, 115B2.1.1.2, 115B2.1.2.1 and 115B.6.2 et seq.

2.18 FIXTURE SUPPORT CARRIERS

- A. Lavatories, Wall Mounted: Shall be J.R. Smith No. 0700-E supporting arms (concealed) attached to steel plate fixture backing specified herein.
- B. Carrier approved equivalents by Zurn or Josam.

2.19 PLUMBING FIXTURES (Refer to Plumbing Fixture Schedule on Sheet P0.4)

NOTE: NO GALVANIZED PIPE IS ALLOWED FOR WASTE AND VENT, HOT AND COLD WATER PIPING INCLUDING TRAP, AND TRAP ARMS ETC.

- A. Item WH-1: Gas hot water heater shall be of size and have the capacity as listed on the Drawings. The complete installation shall be in accordance with all applicable State and Local Codes, meet all energy efficiency and heat loss standard required by State Code, and be supplied with all necessary controls for safe and proper operation, including a seven day timer.
- B. Item CP-1: Pump shall be in-line-circulating pump, all bronze, corrosion-proof construction, as manufactured by Bell and Gossett. In-line circulating pump shall be of the model and shall have the capacity indicated on the Drawings. Pump shall include mechanical seals, on #316 stainless steel shaft, centrifugal impeller, spring coupler, bronze sleeve bearings, and motor. Pump shall be controlled from insertion-type aquastat and 7 day programmable time clock.
- C. Aquastat: Aquastat shall be of the insertion type, range 80 degrees F. - 240 degrees F. temperature, 120 volt, 60 cycles, single phase, set at 100 degrees F. to start pump on temperature drop and located in return line to control recirculating pump, as manufactured by Honeywell.
- D. Item TP: Trap primer shall be PPP (Precision Plumbing Products) pressure differential type unit.
- E. Item WHA: Water hammer arrestor shall be PPP (Precision Plumbing Products) maintenance free type unit.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. All workmanship shall be performed by-skilled mechanics using the best standard practices of the trade.

3.2 GENERAL PIPING INSTALLATION

- A. Thoroughly clean all piping before installation. Cap all openings during construction.
- B. All above ground piping shall be concealed wherever possible. Underground piping shall have a minimum cover of 24 inches.
- C. Provide a union on one side of all valves at equipment connections and in other locations as required for ease of servicing of equipment.
- D. Make suitable provisions for maximum expansion and contraction of piping. Provide swing joints and anchors as necessary.
- E. No bullhead tees, close nipples, or bushings will be allowed in piping.
- F. All connections between 85% red brass, type "K" underground or type "L" copper tubing and steel pipe, shall be made with dielectric unions or flanges which will prevent the flow of electrical current from one type of metal to another.
- G. Arrange piping to maintain head room and keep passageways and access openings clear and offset as required to coincide with structural features of building. Do not spring, bend, or force pipe into place. Use fittings for all offset or changes in alignment of piping. Except for water piping below floor, use long sweep bends. Run piping to drain at low points, free of traps, sags, and bends. Provide ample space between pipes for proper thickness of covering.
- H. Horizontal sanitary and drain piping shall be installed to a uniform grade of not less than 1/4 inch per foot, unless shown or directed otherwise. Vent piping shall be installed to provide proper ventilation of the plumbing and graded to provide for its drainage. Buried sewer, waste, and drain piping shall be continuously supported along the full length of the pipe.
- I. Openings in pipes, drains, fittings, apparatus, and equipment shall be kept covered or plugged to prevent accumulating obstructions in the piping.
- J. Water piping shall be run free of traps, sags, and bends, and graded and valved to provide for the complete drainage and control of the system.
- K. All excavation shall be completely backfilled as soon after inspection as practicable. Adequate precaution shall be taken to insure proper compactness of backfill around piping without damage to such piping. Pipes inside the trenches shall be laid on 6" bed of sand and after inspection cover up to 6" above the top of the pipe with sand. Trenches shall be backfilled in thin layers to twelve (12) inches above the top of the piping with clean earth which shall not contain stones, boulders, cinderfill or other

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materials which would damage or break the piping or break the piping or cause corrosive action. Mechanical devices such as bulldozers, grades, etc. may then be used to complete backfill to grade. Fill shall be properly compacted. Suitable precautions shall be taken to insure permanent stability for pipe laid in filled or made ground.

- L. Gas piping shall not be embedded in concrete or concealed below floor slab within the building.
- M. All threaded piping shall be made up with an approved pipe dope, applied to male thread only, covering the entire thread.
- N. All joints in copper tubing shall be made 95-5 tin antimony and a non-corrosive flux. Both inside and outside surfaces shall be thoroughly cleaned with sandpaper or with wire brush before fittings are assembled. Joints showing indications of defective workmanship or use of acid flux shall be dismantled, cleaned, and resoldered. Tubing cutter shall not be used for cutting copper tubing, hack saw blade or erosive saw shall be used.
- O. At all exterior locations, install all yard boxes, and clean out to grade in the center of a concrete collar surrounding the yard box or clean out. The collar shall be full depth and a minimum 3" wide around the object but a minimum size of 12" X 12" X 12" deep. The concrete collar shall be squared with the building, level and true with grade.

3.3 PLUMBING FIXTURE INSTALLATION

- A. Traps and trap arms shall be set at right angles to walls, in line with fixture outlets, without any offsets, angles, or bends. Fixture connections shall be properly aligned to prevent any undue strain on equipment or fixture.
- B. Each fixture shall be set level and in continues contract with floor or wall.
- C. Exposed plated, polished, or enameled connections from fixtures shall be put up with special care showing no tool marks or threads.
- D. Trap installations, exposed above the floor, shall have chromium-plated brass escutcheon plates, casings, and uniform code pattern traps.
- E. Trim shall be polished chromium-plated brass, by the same manufacture for each type. Where stop valves are required in exposed piping, they shall be short stem polished chromium-plated type. Flush valves shall all be by the same manufacture.
- F. Plumbing fixtures, equipment, faucets, and trim shall be identical in each category.
- G. All fixtures installed in floors with waterproof membranes shall be provided with approved membrane clamps.

3.4 VENT PIPING AND FLASHINGS

- A. Sanitary plumbing vents shall terminate 12 inches above the roof and be flashed as per Section 07 62 00 - Sheet Metal Flashing and Trim.

- B. Tops of flashing shall be sealed and counter-flashed.

3.5 VALVES

- A. Valves shall be arranged and located to give complete control of all apparatus and plumbing fixtures, and as indicated, to isolate batteries of fixtures or sections of water systems. All valves shall be easily accessible.
- B. In no case will exposed valves be allowed in finished portions of buildings. Provide access plates over valves in finished walls and valve boxes for valves in ground outside of building.

3.6 EXPANSION

- A. Expansion of piping shall be provided for by swings, offsets, and anchors where required for a satisfactory installation. Anchors shall be constructed of structural shapes of sufficient strength for purpose intended.

3.7 ACCESS DOORS

- A. Each access door shall be securely fastened into place and protected from construction damage.

3.8 HANGERS AND SUPPORTS

- A. Piping shall be firmly held in place by adjustable split ring malleable iron hangers, supports and pipe rests, located adjacent to fittings, at each offset or change of direction, at the ends of branch over 5 feet long, at riser pipes, and along piping where necessary to prevent sags, bends, or vibrations.
- B. Maximum spacing for supports of horizontal piping shall be as follows:
 - 1. Steel or Brass Pipe: 1-¼ inch or larger, 10 feet
 - 2. Steel or Brass Pipe: 1 inch, 8 feet
 - 3. Steel or Brass Pipe: ¾ inch, 6 feet
 - 4. Copper Tubing: 1-¼ inch, 8 feet
 - 5. Copper Tubing: 1 inch or smaller, 6 feet
- C. Hanger rods shall be solid mild steel in accordance with the following schedule:
 - 1. 2 Inches and Smaller: 3/8 inch diameter rod
 - 2. 2-½ Inches to 3-¼ Inches: 1/2 inch diameter rod
 - 3. 4 Inches to 5 Inches: 5/8 inch diameter rod

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- D. Piping on roofs shall be supported and secured on redwood blocks anchored to roof and set in mastic.

3.9 UNION, FLANGES, AND PIPING CONNECTIONS

- A. Connections between copper tubing and valves, 2 inches and smaller, shall be made with brass, copper tubing to pipe threaded adapters. Connections between copper tubing and other types of piping having threaded openings shall be made with fitting adapters.
- B. Provide dielectric couplings or unions at points where copper tubing or piping joins steel piping, or equipment made of a material containing iron.
- C. Unions are required on the inlet and outlet sides of all apparatus or equipment having screwed connections, 2 inches and smaller and also on the outlet side of all screwed valves, 2 inches and smaller, to facilitate easy removal for repair and replacement.
- D. Unions are not required where valves are underground or are accessible only through hand size access plates.
- E. Connections between copper tubing and other types of piping having threaded openings shall be made of brass, copper, to IPS ground joint unions.

3.10 TESTING AND ADJUSTING OF PLUMBING EQUIPMENT

- A. No piping work, fixtures, or equipment shall be concealed or covered until they have been inspected and approved by the Architect who shall be notified by the plumbing subcontractor when the work is ready for inspection.
- B. Should any work be enclosed or covered up before such inspection and test, the plumbing subcontractor shall, at his own expense, uncover the work, and after it has been inspected, tested and approved, make all repairs with such materials as may be necessary to restore all his work and that of other Sections to their original and proper conditions.
- C. All work shall be completely installed, tested as required by this Section and the local ordinances, and shall be leak tight before inspection is requested. All tests shall be repeated to the satisfaction of those making the inspection.
- D. Water piping shall be flushed out, tested at 150 PSI, and shall be left under pressure of supply main for the balance of the construction period.
- E. All flush valves, loose key stops, valves and similar equipment shall be adjusted and balanced to provide for the proper operation of the various systems.
- F. Plumbing fixtures shall be filled with water and checked for leaks or retarded flow.
- G. Each piece of plumbing equipment and the entire plumbing system shall be adjusted and readjusted as required to assure proper functioning, and left in first-class operating condition.

- H. Gas piping shall be tested at 100-pounds air pressure for one hour. Check each joint with liquid soap for evidence of bubbles.
- I. After soil and waste pipe have been tested at the cleanout plugs shall be removed, heavily flushed with graphite impregnated grease, replaced, and screwed up snugly. Nylon plugs shall not be coated.

TEST SCHEDULE

<u>PIPING TESTED</u>	<u>PSIG</u>	<u>TEST WITH</u>
Water	150	Water
Gas	100	Air

- J. All soil, waste, and vent piping shall be filled with water to the highest point in each system with all air removed. The lines shall be flushed by removing the test plug. Piping may be tested in sections, providing all portions to be concealed shall be subjected to not less than a 10-foot head. Standpipe installed for head test shall be 1-inch minimum diameter.
- K. Sewer piping shall be filled with water to its highest point, but at not less than 5 PSIG pressure.
- L. All tests shall be maintained without leaks or pressure loss for not less than six hours, with allowance for temperature changes, except for transit pipe.

3.11 FINAL OPERATION

- A. Upon completion of the installation of the equipment, the plumbing subcontractor shall place a competent employee in charge who shall operate the equipment, instructing the Owner's operators in all details of operation and maintenance of the equipment and controls for a period of 4 hours.
- B. Six copies of operation and maintenance manuals for each site shall be delivered to the Architect for review prior to final completion of the Project.

END OF SECTION

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SECTION 22 15 19.13**GENERAL SERVICE PACKAGED RECIPROCATING AIR COMPRESSORS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide compressed air equipment system complete in place where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 22 00 00: Plumbing.
 - 2. Section 26 05 00: Electrical.

1.2 QUALITY ASSURANCE

- A. All workmanship shall be performed by skilled mechanics using the best standard practices of the trade.
- B. The installation shall comply with all of the latest applicable ordinances, regulations and codes of all agencies having jurisdiction, including the California Plumbing Code, Los Angeles County Building and Safety Department and all other authorities having jurisdiction.
- C. Nothing in these Drawings and Specifications is to be construed to permit work in violation thereof.
- D. No extras will be paid for furnishing items required by the codes, but not specified or shown on the Drawings.
- E. Rulings and interpretations of the enforcing agencies shall be considered as part of the codes.
- F. All materials and equipment shall be installed as recommended by the manufacturer.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Submit manufacturer's specifications and other data for air compressors and accessories needed to prove compliance with the specified requirements.

1.4 INTENT OF DRAWINGS

- A. The Drawings are essentially diagrammatic. The size and location of equipment are drawn to scale wherever possible.
- B. The Contract Drawings show the extent and general arrangement of the work covered under this Section.
- C. The work shall be followed as closely as possible; however, proper adjustments shall be made, with the Architect's concurrence, to secure maximum headroom, a neat arrangement to keep passageways and openings clear, provide accessibility and provisions for maintenance, and meet all Code requirements, at no additional charge.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Air Compressor: Ingersoll-Rand, Model #2475N7.5-P with a pressure rating of 0 psi to 175 psi and as indicated on the Drawings. Features included are two-stage pump, 80 gallons vertical tank air receiver with a 3/4" NPT air outlet service full port ball valve. The pump shall be a heavy-duty running gear, balanced V-design. The inlet filter shall be a durable canister with a dry type 10-micron inlet filter/silencer as standard and mounted on top of a Solberg Inlet chamber type silencer with inlet piping connecting to the low pressure cylinder. The first stage discharge shall be connected the high pressure cylinder by a multi-finned tube intercooler. Dynamically balanced fan/belt flywheel, totally enclosed, OSHA type steel belt guard safety devices shall include full time factory mounted and wired, low oil level switch, U.L. listed automatic start/stop control, dual dial, direct readout pressure indicator, ASME code receiver with discharge airline service valve. The motor shall be a NEMA design high efficiency motor. Compressor shall be 7.5 HP minimum, 208 volt, 3 phase, 60 hertz with factory mounted and wired magnetic starter. The compressor shall be test run prior to delivery to the Job site with the requirements set forth on the equipment schedule.
- B. The compressor shall be supplied with a Start up kit that is to include 2- inlet air filter elements and 4 quarts of synthetic oil for 1 year operation spares. The compressor pump shall be pre filled with compressor oil prior to reaching the Job site.
- C. Air Compressor Installation Kit: Include 1-36", stainless steel with swivel end connectors, 4- rubber vibration pads and 4- wedge type anchor bolts. The installer shall set the compressor on the pads per Ingersoll-Rand's recommendations.
- D. Air Dryer: Inline Dryer MP-Filenco model MS 38-4 D8 M or IR High Inlet Temperature Refrigerated Compressed Air Dryer model D60IT.
 - 1. Two (2) Air Hoses: 75-ft. lengths of 1/4" air hose with quick coupler and tire gauge (2) with range of 15 psi to 200 psi.

- E. Compressed Air Outlets: Am-Flo C2, Hansen #1300, Foster Series 4 or Fowler-Pem 3-1 quick coupler fitting with ball check valve for compressed air service. 180 psi design male outlet.
- F. Hose Reels: Reel Craft O (open) low pressure type with hose, spring driven. 3/8" air hose, 70 ft. long, Model #7670 OLP. Verify with L.A. County Fire Dept.
- G. Compressed Air Piping: Type "L" hard drawn copper tubing with wrought copper solder joint fittings or standard weight galvanized steel with 150 psig galvanized malleable iron fittings.
- H. Compressed Air Valves: Full Port, Nibco T-580 bronze ball type rated at 300 psi.
- I. Provide other materials, not specifically described but required for a complete and proper installation, subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before equipment installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written instructions.
- B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- C. Utilities: Refer to Divisions 22 and 26 for plumbing and electrical requirements.

3.3 TESTING AND ADJUSTING

- A. Test each item to verify proper operation. Make necessary adjustments.
- B. Verify that accessories required have been furnished and installed.

END OF SECTION

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SECTION 23 00 00**HEATING, VENTILATION AND AIR CONDITIONING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Owner's administrative requirements are applicable to the work under this Section.
- B. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the Drawings and/or specified herein.
- C. Work shall include furnishing and installing a year round air conditioning for all spaces within the building including ventilation of Storage Rooms, Toilet Rooms, Janitor Closets and other service areas. Dormitory spaces shall be on separate systems from other areas of the station. If a station has a Training Room, a separate system with timer shall be provided.
- D. Work includes but is not necessarily limited to the following:
 - 1. Filters.
 - 2. Exhaust fans.
 - 3. Vibration isolation mountings.
 - 4. Air distribution ductwork systems for air conditioning, ventilation and exhaust. Systems to be complete with access doors, dampers, diffusers, registers, grilles and all required accessories.
 - 5. Hangers and support for ductwork.
 - 6. Automatic control systems.
 - 7. Thermal and acoustical insulation for plenums and ductwork.
 - 8. Low voltage electrical line and low voltage wiring and conduits for Mechanical controls including final connections as indicated in the wiring diagrams.
 - 9. Equipment maintenance manuals and instructions.
 - 10. Energy conservation devices.
 - 11. Fire damper, frames and fusible links.
 - 12. Testing and balancing of systems (independent, provided by subcontractor).
 - 13. Shop drawings and equipment certifications.
 - 14. Record (as-built) drawings.

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15. Miscellaneous items, including instruments, equipment supports, flashings, sleeves, tags and markings, testing and adjusting, and all accessories and items required for a complete installation.
16. Plan check, permits and related fees.
17. Smoke detectors.
18. Examine all Sections for work related to those other Sections and required to be included as work under this Section.

E. Related Work:

1. Apparatus Room Vehicle Exhaust System: Refer to Section 23 35 16.16.
2. Line Voltage Electrical Work (110 Volts and Higher) and All Conduit: Refer to Division 26.
3. Gas piping and HVAC equipment drains.
4. Furnishing electrical devices necessary for mechanical work, except disconnects unless indicated otherwise.
5. Installation of automatic dampers furnished by temperature control subcontractor.
6. Responsibility for obtaining clarification of discrepancies between mechanical and electrical work from Architect prior to proceeding with the work.
7. Conduit for line and low voltage wiring for mechanical controls as indicated on wiring diagrams.
8. Condensate drain plumbing from fan coil, cooling coils and warm air furnaces, and split heat pumps.

1.2 REFERENCES

- A. 2022 Building Energy Efficiency Standards (Includes Title 24).
- B. AABC - (Associated Air Balance Council) National Standards for Total System Balance.
- C. AGA - Aligned Global Assurance.
- D. AMCA - Air Movement and Control Association International, Inc.
- E. ASHRAE - (American Society of Heating, Refrigerating and Air-Conditioning Engineers) Handbook in Four Volumes:
 - 2025 ASHRAE Handbook—Fundamentals.
 - 2024 ASHRAE Handbook—HVAC Systems and Equipment.

- 2023 ASHRAE Handbook—HVAC Applications.
 - 2022 ASHRAE Handbook—Refrigeration.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- G. CMC - 2022 California Mechanical Code.
- H. FM - Factory Mutual Insurance Company.
- I. IBC - 2024 International Building Code.
- J. IMC - 2024 International Mechanical Code.
- K. NEMA 250 - (National Electrical Manufacturers Association) Enclosures for Electrical Equipment.
- L. NFPA - National Fire Protection Association.
- M. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.
- N. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- O. OSFM - Office of the State Fire Marshal.
- P. SMACNA - Sheet Metal and Air Conditioning National Association.
- Q. SMACNA - Seismic Restraint Manual Guidelines for Mechanical Systems, Fourth Edition, 2024.
- R. SMACNA - HVAC Duct Construction Standards - Metal and Flexible, Fourth Edition, 2020.
- S. UL - UL Solutions.
- T. UL 33 - Standard for Heat Responsive Links for Fire-Protection Service.
- U. UL 555 - Standard for Fire Dampers.
- V. UL 555S - Standard for Smoke Dampers.
- W. UL 723 - Test for Surface Burning Characteristics of Building Materials.
- X. UMC - 2024 Uniform Mechanical Code.

1.3 SYSTEM DESCRIPTION

- A. Powered exhaust systems for Toilet Rooms, Service Utility Sink/Janitor, Kitchen, Turnout Storage Rooms, Apparatus Room and Electrical Rooms. The Turnout Storage Room shall have at least 12 air exchanges per hour. Makeup air to the Turnout Room will be provided from the gravity vent on the roof.

- B. Variable refrigerant flow zoning. Refer to Section 23 81 29 for complete specifications.
1. Cooling system throughout by simultaneous heating and cooling system (Variable Refrigerant Flow Zoning). At warmer locations evaporative "swamp" cooling units shall be used in the Apparatus Room with wall mounted controls. Telecom Room to be cooled with VRF system.
 2. Heating system throughout by simultaneous heating and cooling system (Variable Refrigerant Flow Zoning). In the Apparatus Bays, heating system is a single Makeup Air unit with gas heating section. Unit is interlocked to door switches to shut off unit if a door is open. Automatic controls room thermostats will be wall mounted. The controlling thermostat shall be located in the Apparatus Room and maintain a minimum 65° F.
 3. HVAC units may be simultaneous heating and cooling system (Variable Refrigerant Flow Zoning) at locations where screened roof equipment areas could be provided with ceiling or attic mounted split indoor fan coils.
 4. Zonal control system will be simultaneous heating and cooling system (Variable Refrigerant Flow Zoning); master thermostat controllers will be located for each zone.

1.4 DESIGN CRITERIA

- A. System to be designed in accordance with the factors and practices as recommended by the ASHRAE in their Handbook, latest edition.
- B. Equipment and installation to conform with current IBC and IMC, 2023 County of Los Angeles Green Building Standards Code and Los Angeles County Fire Department requirements.
- C. All installed systems and equipment shall be fully tested/commissioned prior to delivery to the Los Angeles County Fire Department.

1.5 EXAMINATION OF THE SITE

- A. Examine the Site and all conditions thereon or therein. Take into consideration all conditions that may affect the work under this Contract. Lack of this information will not be considered as justification for extra cost or allowances to Contract Sum.

1.6 REGULATIONS AND CODES

- A. All work and material shall be installed in accordance with local codes and regulations of governing authorities, unless otherwise herein specified. Nothing in the Drawings or Specifications is to be construed to permit work not conforming to these codes. Furnish all necessary drawings required by governing authorities. Arrange for inspections and examinations as required, and deliver certificate of inspection to the Architect.
- B. No extra will be paid for furnishing items required by the codes, but not specified or shown on the Drawings.

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- A. Ruling and interpretations of enforcing agencies shall be considered as part of the codes.
- 1.7 PERMITS AND FEES
- A. Apply and pay for all necessary permits, fees, charges, and inspections required by any public authority having jurisdiction. Any expense incurred is a part of this Contract.
- 1.8 QUALITY ASSURANCE
- A. All workmanship, manufacturing procedures, airflow design, and materials shall be tested and performance guaranteed.
 - B. Temperature control system subcontractor shall be manufacturer certified and have installed manufacturer's zonal control system on at least five (5) other projects.
- 1.9 SUBMITTALS
- A. Comply with pertinent provisions of the Owner's administrative requirements.
 - B. Shop Drawings: Furnish detailed shop drawings or catalog plates of all manufactured and special equipment as required for approval. Shop drawings or catalog plates shall show sizes, sections and dimensions of equipment and methods of connection or attaching to work of other trades, and copies of all shall be furnished to other trades. Make all erection drawings necessary for the installation of the work. Provide detailed ductwork layouts of HVAC units if unit manufacturer deviates from that specified. Include the following for Architect's approval.
 - 1. Diffusers, Registers and Grilles: For each type register grille or diffuser and manufactured plenums, with reference to schedule number on Drawings.
 - 2. Seismic Restraints: For all ductwork and equipment.
 - 3. Temperature Control System and Sequences: For proposed temperature control system with a detailed description of the control sequence.
 - 4. Volume Dampers: Locate devices on shop drawings.
 - 5. Anchoring of Mechanical Equipment: Submit shop drawings and seismic calculations to the Architect on the anchoring of all equipment.
 - A. Detailed and dimensioned ductwork shop fabrication drawings that have been coordinated with other trades shall be submitted to the Architect, 4 weeks prior to duct fabrication and equipment arrival. Top and bottom duct elevations shall be indicated for all ductwork and fittings. Minimum drawings scale shall be 1/4" per foot. Building openings, sleeves, penetrations and equipment locations shall be dimensioned to column lines or building construction.
 - C. Material List: Before entering into any contract for purchase of materials, and before any work is started, submit for approval and receive approval of eight (8) identical

copies of a complete list, including catalogs and descriptive matter, of the following materials and equipment they proposed to furnish and install. Materials list shall be complete and contained in the bound loose leaf notebooks. Items not contained in the submittal shall conform to design specifications. Partial or supplemental submittals will not be accepted.

1. Fans, motors, drives, and bases.
 2. Filters.
 3. Grilles, registers, diffusers.
 4. Air conditioning units.
 5. Insulation.
 6. Controls.
 7. Vibration isolation equipment.
 8. Miscellaneous ductwork appurtenances, i.e., flex connections, dampers, etc.
 9. Flexible duct.
 10. Smoke detectors.
 11. VVT system.
 12. Fire dampers/Combination Smoke and Fire dampers.
 13. Testing and Balancing report.
 14. Operating and maintenance manual.
 15. Record drawings.
- D. Wiring Diagrams: Wiring diagrams of work required for the installation of the ventilating and air conditioning equipment shall be submitted for approval. Only approved diagrams shall be used for installation purposes.
- E. Tests and Balancing:
1. Provide a test and balance report conducted by an AABC certified independent agency.
 2. Qualifications of Test & Balance Agency: Total systems balance shall be performed by an independent agency which specializes in and whose business is dedicated to the testing, adjusting, and verification of HVAC system performance. Work of this Section shall conform to specifications referred to in Chapters 17 through 26 of the AABC National Standards for Total System Balance and other criteria as set forth in this Section.

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3. Name of test and balance agency shall be submitted for approval by the Owner within 15 days after receipt of Construction Contract. Selected agency shall submit Warranty Certificates which includes preconstruction plan check and field inspection program immediately upon receipt of test and balance contract.
4. Submit to the Architect one week prior to final inspection, five bound and indexed copies of the report on system operation, including air quantities at each outlet and fan, fan speeds, pulley and motor sizes, motor loads and all other pertinent data.
5. Pre-Approved Agencies: Agencies presently found qualified by the Architect are as follows.

Penn Air Control, Inc.
5941 Lakeshore Dr.
Cypress, CA 90630
(714) 220-9091

Air Balance Company
874 S. Village Oaks Dr.
Covina, Ca 91724
(626) 339-4700

Winaire, Inc.
15641 Chemical Ln. #A
Huntington Beach, CA 92649
(714) 901-2747

1.10 GUARANTEE

- A. In addition to other guarantees required and as a condition precedent to the issuing of the final certificate for completion payment, deliver to the Owner a written guarantee that all materials, apparatus and equipment furnished and installed hereunder shall be new and free from all defects.
 1. Guarantee all materials, equipment and workmanship for a period of three (3) years from date of final acceptance of the complete job against original defects of material and workmanship or excessive wear or deterioration.
 2. Guarantee all apparatus and equipment to deliver the capacities as scheduled and/or specified.

1.11 DESCRIPTIVE NAMES

- A. Selected Manufacturers: Where the name of a selected manufacturer of equipment, fixtures, or material is specified, the subcontractor's proposal shall be based on the use of the named product, or equivalent product of manufacturers if such are listed.

1.12 EXTRA MATERIALS

- A. Provide two (2) additional air conditioning filters for each mechanical unit installed, for Owner's use in air conditioning maintenance.
- B. Furnish extra materials packaged with protective covering for storage and identified with labels clearly describing contents.

PART 2 - PRODUCTS

2.1 SHEET METAL

- A. Description: Sheet metal shall include housings, ductwork, plenums, dampers, equipment connections, fire dampers, etc.
- B. Materials: Sheet metal shall be fabricated of hot-dipped galvanized steel sheets of lock forming quality (LFQ) and shall have a galvanized coating of 1-1/4 oz. total for both sides of 1 sq. ft. of a sheet. Supports, access doors not part of ducts, bar or angle reinforcing, damper rods and items made of uncoated mild steel shall be painted with two (2) coats of primer.
- C. Construction: Sheet metal ductwork shall be of either rectangular construction galvanized steel, or round construction (only spiral seam steel). Gauges as per specified by the latest edition of CMC. Duct construction and installation shall be in accordance with the SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as hereinafter specified.

RECTANGULARROUND

1.	Up to 12" wide	No. 26	Up to 12"	No. 26
2.	13" to 30" wide	No. 24	12" to 23"	No. 24
3.	31" to 54" wide	No. 22	23" to 37"	No. 22
4.	55" to 84" wide	No. 20	37" to 51"	No. 20
5.	85" or larger	No. 18.	51" to 61"	No. 18
6.			61" to 84"	No. 16
- D. Elbows and tees shall have a center line radius of 1-1/2 times duct width, measured in plane of turn. All square or rectangular elbows shall be equipped with turning vanes of double thick metal of air foil design. Vanes shall be straight and securely fastened to the sides. Square or rectangular elbows with radius heel will not be permitted.
- E. Partitions forming plenum or suction chambers 18 gauge with 1-1/2" x 1/2" x 3/16" galvanized iron angles and rivets for seam connections and stiffening.
- F. Use aluminum duct downstream of evaporative coolers.
- G. Hangers and supports shall be in accordance with the SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as hereinafter specified.
- H. Seismic Bracing: All ducts, pipe and Mechanical equipment shall be braced in accordance with the SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.

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- I. Flexible Connections: Neoprene coated fiberglass sleeve to provide a minimum 3" clearance between metal parts of all fan and unit connections. Verify approval of material with local authorities.
- J. Extractors: Adjustable volume type with extended flexible shaft, connected to air distribution device face or to side of duct permitting adjustment from exterior of duct, where required by Drawings.
- K. Manually Operated Dampers or Splitters: Fabricated of 16 gauge steel, and as recommended by SMACNA HVAC Duct Construction Standards, equipped with Ventlok 637 self-locking regulator on all ducts, unless noted otherwise. Provide where required for air balancing, including O.S.A. intakes. Single leaf, damper approved up to 36" x 12" maximum duct size, over these sizes multi-blade opposed type damper shall be used.
- L. Fire Dampers: Dampers shall be a standard manufactured item constructed in accordance with NFPA and local fire department requirements. Each unit shall have the manufacturer's name and model number stamped in a conspicuous location.
 - 1. Provide "STATIC" or "DYNAMIC" type as required. "STATIC" type shall be type "B" louver blade or curtain folding blade type. "DYNAMIC" type shall be type "B" louver blade type with closure spring. Pottorff or Ruskin.
 - 2. Fire dampers shall be vertically mounted. Dampers will be provided in factory sleeves as tested and listed by manufacturer. Dampers shall be rated for 1-1/2 hours for installation in one or two hour partitions. Provide U.L. listed fusible links of adequate size and temperature rating. Dampers to be installed according to the manufacturer's recommended installation instructions provided with units. Provide suitable access for inspection and servicing of each damper. Pottorff or Ruskin, OSFM and Owner approved.
 - 3. Combination Fire and Smoke Dampers: Combination fire and smoke dampers shall be louver blade type. Units shall be tested and listed under U.L. 555 and U.L. 555S. Rating 1-1/2 hours for installation in one or two hour partitions. The seals shall be non-degradable steel-to-steel. Leakage shall not exceed 15 CFM/sq. ft. at 1" w.g. and shall be tested to 850 degrees F. The damper shall be capable of being remotely controlled and reset for pressurization and smoke evacuation (if required). The fire releasing device will be a U.L. 33 listed bi-metal link. Melting fusible links are not acceptable. The dampers shall be provided in sleeves with pre-mounted motor actuators and dual position indicators for remote annunciation (if required). The complete assembly must be factory cycled and tested prior to shipment. Provide suitable access for inspection and servicing of each damper. Pottorff or Ruskin, CSFM and Owner approved.
- M. Access Doors: Provide 18 gauge access doors fabricated of galvanized steel angles. Hinge and double latches with sponge rubber gasket to provide airtight seals. Provide two or three Ventlok 260 latches as required to maintain airtight closure. All doors shall be lined where required for access to controls and all items requiring servicing.

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- N. Joints and Seams: Seal all concealed field joints and seams airtight with "Hardcast" products. Ductwork exposed to weather shall have all joints sealed with canvas and "Arabol" duct sealant.
- O. Provide ductwork for kitchen exhaust hood.
- P. Dryer Vent Duct: Ductwork for dryer vent shall be galvanized 26 gauge with adjustable elbows, dirtleg at dryer, no S/M screws or other extension into the air stream. Maximum 14'-0" length and 90 degrees elbows.

2.2 DIFFUSERS, REGISTERS AND GRILLES

- A. All diffusers, registers and grilles shall be furnished with natural aluminum finish unless otherwise specified or noted.
- B. The manufacturer shall verify that all supply and return selections shall not produce an ambient noise level in excess of NC-25. Only the self-noise of the outlet shall be considered. All ceiling diffusers, grilles, and registers shall have factory enamel finish to match ceiling, as approved by the Architect. Refer to Architect's reflected ceiling plan for ceiling types.
- C. All diffusers, registers and grilles shall be furnished with neoprene gaskets.
- D. Provide all air distribution accessories necessary to maintain a uniform temperature at the control setting throughout the room with no apparent drafts or excessive air movement within the ventilated or air conditioned area.
- E. Provide diffusers, registers and grilles by Krueger, Anemostat, Metalaire, Titus, or Tuttle & Bailey.
- F. Square Diffuser (T-Bar Ceilings): Krueger series 1240p with type 23 frame, key operated opposed blade dampers. Verify finish for each area with Architect.
- G. Square Diffuser (All Other Ceilings): Krueger series 1240 with type 22 frame, key operated opposed blade dampers. Verify finish for each area with Architect.
- H. Sidewall Supply Register: Krueger 5880 double deflection with key operated opposed blade damper. Verify finish for each area with Architect.
- I. Return registers (T-Bar Ceilings): Krueger series 1190 with type 23 frame, key operated opposed blade dampers. Verify finish for each area with Architect.
- J. Ceiling Return Registers (All Other Ceilings): Krueger Series S580H with key operated opposed blade dampers factory supplied lined plenum where possible. Verify finish and frame style for each area with Architect.
- K. Exhaust Relief Registers: Same as return registers.
- L. Linear Bar Supply Diffuser: Anemostat Series AL-20. Verify finish and border type with Architect.
- M. Spray paint black all visible ductwork and framing visible through registers.

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2.3 THERMAL DUCTWORK INSULATION

- A. Manufacturers: CertainTeed-Saint Gobain, Owens Corning, or Schuller. Material shall be equivalent to those specified and as approved by the Architect. Manufacturer's names specified are for type and quality required. Flame spread of insulation shall be Class A, 25 or less. Smoke density of insulation shall be 450 or less.
- B. Concealed Ductwork: Glass fiber blanket material, Schuller "Microlite". Supply duct insulation to be provided with foil face vapor barrier. Refer to Drawings for thickness and density.
- C. Indoor exposed ductwork is not insulated unless noted otherwise.
- D. Duct wrap insulation shall be 2" thick fiberglass, 1.0-pound density, with aluminum foil facing and with minimum R4 value. Attach to ducts with devices approved by the insulation manufacturer. Cover all joints with vapor barrier tape. Provide duct wrap insulation on all supply and return ducts that are not in within conditioned space. Duct wrap insulation is not required on lined ducts.
- E. Duct liner shall be 2" thick, 1.5-pound density fiberglass with minimum R4 value. Face liner with a black-coated mat suitable for velocities to 2500 FPM. Adhere liner to all interior surfaces of the duct with fire retardant adhesive. Use mechanical fasteners on at least 16" centers at top sections (when width exceeds 12") and on other surfaces (when height exceeds 24") installed per manufacturer's recommendation. Provide and install duct liner where indicated on the Drawings, in supply air duct from fan, 10 feet minimum in supply and return ducts from fan coil units.
- F. For plenums, provide 1" thick rigid acoustic board insulation.
- G. All materials shall meet NFPA requirements.

2.4 ACOUSTICAL AND THERMAL LINED DUCTS

- A. Material: Flexible glass fiber, blanket type duct liner. Lining must be approved by local Codes and shall meet or exceed NFPA Standards. NRC rating shall be at least 0.80 at frequencies above 1000. Refer to Drawings for thickness and density, at concealed areas only.
- B. Minimum of 10 lineal feet of supply and return ductwork from AC units shall be lined.
- C. Manufacturer: CertainTeed, Owens Corning, or Schuller.

2.5 FLEXIBLE AIR DUCT AND CONNECTORS

- A. Flexible duct shall be a factory fabricated assembly consisting of a zinc-coated spring steel helix, inner liner, wrapped with nominal 1" thick fiberglass insulation and sheathed in a vapor barrier jacket. The composite assembly, including insulation and vapor barrier, shall meet the Class 1 requirements of flame spread of 25 or less, smoke developed of 50 or less, as set forth in NFPA 90A and be labeled by UL Solutions as an air duct.

- B. Flexible duct shall be Casco Silent-Flex II, UL Class I rated air duct.
- C. Maximum length of flexible duct and connectors shall not be more than 5 feet. Flexible ducts shall not be used in lieu of rigid elbows.

2.6 GREASE DUCT WRAP (IF REQUIRED)

- A. System Description: A lightweight, non-asbestos, high temperature inorganic foil encapsulated ceramic fiber blanket duct wrap. Duct wrap system is used on commercial grease hood duct systems and air duct systems allowing a 0" clearance to combustible construction, and as a 2 hour fire resistive rated enclosure system and shaft enclosure, when used with a listed or approved through-penetration protection system. Remove dirt and dust, and clean surfaces of openings and items penetrating rated floors and rated walls. UL listed and NFPA approved.
 - 1. Fire Resistive Duct Wrap: Thermal Ceramics Firemaster Duct Wrap, 1-1/2" thick.
 - 2. Tapes:
 - a. High Performance Filament: Tape No. 898, 1" wide, by 3M Company.
 - b. Aluminum Foil Tape: To seal cut edges of blankets.
 - 3. Banding Material:
 - a. For 0 Clearance to Combustibles and 1 Hour Rating: 3/4" inch wide, no less than 0.015" thick, carbon steel.
 - b. 2 Hour Requirements: 3/4", no less than 0.015" thick, stainless steel hose clamps, 1/2" may be substituted for hanger insulation only.
 - 4. Insulation Pins: 10 gauge, 4-5" long, copper coated steel, or no less than 1-1/2" diameter galvanized steel speed clip.

2.7 SMOKE DETECTORS

- A. Description: Rate compensated, fixed-sensitivity photo electric smoke sensor complete with two (2) sets of Form "C" auxiliary contact, heat detector and sensing tube to transverse duct, 120 Volt AC.
- B. FM, UL and State of California approvals required.
- C. Manufacturer: Pottorf DH400.

2.8 VIBRATION ISOLATION

- A. General: All mechanical equipment shall be isolated as specified below. All vibration isolation shall be submitted for approval. Submittals shall show type of isolation for each piece of equipment together with deflection, operating height and spring diameters. Vibration isolation shall be bolted down.

- B. Rooftop Condensing Units and Utility Fans: Spring-rail type, 1" deflection vibration isolation. "RMUAB-EQ" Type with seismic restraints.
- C. Unit Heaters: Vibrex HSS, rubber-in-shear isolator, 3/8" deflection with cable seismic restraint system.

2.9 POWER ROOF EXHAUSTER

- A. Description: Roof mounted centrifugal fan. Each unit shall be complete with non-overloading centrifugal fan wheel, motor protected from air stream, resiliently mounted motor plate, direct or adjustable V-belt drive (Refer to Schedule), disconnect switch, integral wiring conduit, aluminum housing and aluminum bird screen. Fans shall be furnished with prefabricated roof curb and back draft dampers.
- B. Capacities: Fan shall be rated in accordance with AMCA Test Codes for both sound and air performance.
- C. Provide drives sized for a minimum of 165% driven horsepower. Also provide machined cast iron pulleys, keyed to shaft with adjustable sheaves for balancing.
- D. Provide heavy-duty permanently sealed, lubricated pillow block ball bearings and heavy-duty ball bearing-type motors.
- E. Manufacturers: Loren Cook Company, Greenheck, or Acme.

2.10 GREASE EXHAUST FAN (IF REQUIRED)

- A. Exhauster shall be approved for grease hood application and meet local code requirements. Exhauster shall also meet NFPA 96 for exhaust application. Unit shall be certified to carry AMCA label for air and sound performance, shall not exceed 15 sones. Forced air cooling shall be provided for motors and bearings. Capacity as per current code requirements.
- B. Grease exhauster shall be provided with built-in leak proof grease collector with grease through and drain connection. Hood and housing shall be of heavy gauge aluminum with heavy steel, epoxy coated, steel base. Exhaust air shall be exhausted vertically.
- C. Motor shall be continuous duty type with shielded ball bearings. Motor shall be mounted on special slide rail for adjustable belt alignment and tension. Motor and drive assembly shall be completely separated and isolated from the exhaust air stream. Motor shall be factory wired to an external junction box.
- D. Provide external mounted disconnect switch. Variable speed adjustable belt drives shall be provided allowing for 24,000 hours service at maximum horsepower.
- E. Fan shaft shall have oversized sealed ball bearings. Fan housing shall be hinged for easy access to motor, drive and parts requiring cleaning. Provide hinged base and vented curb.
- F. Manufacturer: Loren Cook Company, Greenheck, or Acme.

2.11 SUPPLY FAN (IF REQUIRED)

- A. Filtered supply fan unit shall be complete with 1" aluminum filters, aluminum tiered hood with removable cover. DWDI blower wheel and all cabinet parts shall be fabricated from heavy gauge galvanized steel. Unit shall have all internal wiring, including motor and motor controls, factory wired and pretested.
- B. Manufacturer: Loren Cook Company, Acme, or Greenheck.

2.12 DUCTLESS MINI SPLIT AIR CONDITIONER

- A. Split System Indoor Fan Coil Unit:
 - 1. Indoor unit cabinet shall be constructed of galvanized steel and shall be bonding and coated with a baked enamel finish. A condense drain and overflow connection shall be provided. All components shall be accessible through removable panels. The units shall be supplied with TXV (thermostatic expansion valve).
 - 2. Filters: Two-inch full width throw-away type filters shall be provided, similar and equal to Ames-glass.
 - 3. Indoor fan shall be centrifugal type.
 - 4. Manufacturer: Fujitsu or Carrier.
- B. Cooling Coils (If Required):
 - 1. Provide direct expansion cooling coils. Coils shall be non-ferrous with aluminum plate fins. Coil unit enclosure shall be insulated and constructed of galvanized steel, bonderized and finished with baked enamel.
 - 2. Coil shall have factory installed refrigerant metering device, refrigerant line fittings which permit mechanical connections, and two (2) condensate pans with primary and secondary drain connections on each.
 - 3. Capacities: As per current code requirements. Low static.
 - 4. Manufacturer: Carrier.
- C. Forced Air Unit (If Required):
 - 1. Indoor air handling unit shall consist of upflow or horizontal gas-fired fixed capacity condensing furnace and shall have a primary and secondary heat exchanger assembly, direct vent sealed combustion chamber, monoport burners, and inducer assembly, insulated for thermal and acoustical transmission. The heat exchanger shall provide efficient heat transfer and operating economy, complete with concentric venting kit, auto gas valve, gas intake valve and air intake valve. Direct-drive blower shall be driven by multiple speed motor with fan and limit controls. The units shall be A.G.A. certified.
 - 2. Capacities: As per current code requirements.

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3. Provide return air cabinets with filter rack.
4. Accessories: Concentric vent termination kit, isolation pads and air filter, provide twinning kit for units.
5. Product: Carrier 58MXA.

2.13 AIR FILTERS

- A. Size as required by air conditioning unit conditions, 2" thick as indicated on Drawings. Maximum 375 FPM face velocity. Provide one spare set of filters to maintenance personnel.
- B. Filters supplied with air conditioning units shall be changed out to filters specified upon turn over of building to Owner.
- C. Product: Camfil Farr 30/30.

2.14 INDIRECT DRAIN PIPING

- A. Cooling coil drains shall be piped to nearest approved receptacle or lavatory tail piece using Type "M" copper tubing and wrought copper sweat fittings. If required, provide a drain pan and condensate pump. Units suspended over a ceiling or electric room shall have auxiliary drain pan or primary and secondary drain outlets.

2.15 REFRIGERANT PIPING AND ACCESSORIES

- A. All refrigerant piping shall be Type "L" hard-drawn copper.
- B. Refrigerant piping shall be made up with wrought copper or forged brass designed for refrigerant piping and for use with "Sil-Fos" high temperature solder.
- C. Hangers on insulated refrigerant piping shall fit outside covering. Provide covering protection saddle 18" long at each hanger. Rigid insulation shall be provided at all hangers to prevent crushing.
- D. Provide Semco trisolators at all hangers of uninsulated piping.
- E. Drier: Sporlan silica gel replaceable core sized for compressor capacity with three valve bypass for liquid line, or equal by Henry or Alco.
- F. Shut-off valves shall be balanced action packless type for lines sized 1-1/8" o.c. or smaller, and wing cap packed bronze valves with bolted bonnets, replaceable under pressure, by Henry.
- G. Installation: Dehydrate complete system and test thoroughly for leaks before initial charge is placed in system.
- H. Refrigerant and Oil: Furnish and charge the system with the necessary charger or refrigerant, together with all the oil necessary to operate the system. Sufficient refrigerant shall be supplied to fill the system for proper operation.

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- I. Warranty: Replace at no additional cost to the Owner all refrigerant and oil lost due to leaks or faulty materials and workmanship for a period of one year after date of acceptance.

2.16 REFRIGERANT PIPING AND CONDENSATE PIPING INSULATION

- A. Pipe hangers shall be installed on the outside of the insulation.
- B. Insulate indirect drain lines from air conditioning units within building.
- C. Piping: Insulate condensate lines, including fittings, with 1-1/2" thick Schuller "Aerotube" or Fiberglas O-C flexible tubing insulation.
- D. Refrigerant Piping Insulation: All Refrigerant piping 2" and smaller shall be insulated with a min. (R-4.6) 1" of glass fiber pipe insulation with factory applied white jacket, all refrigerant piping greater than or equal to 2-1/2" shall be insulated with a min. (R-6) 1-1/2" of glass fiber pipe insulation with factory applied white jacket, as per Johns Manville "Micro-Lok HP" or equal by Owens-Corning. Insulate fittings, flanges and valves with pre-molded one-piece P.V.C. molded fitting covers with factory matched pre-cut insulation inserts as per Johns Manville "Zeston". Insulation shall meet the flame spread and smoke density ratings as per UMC Section 602.2 for flame spread and smoke density of not more than 25/50 fire hazard classification and shall meet ASTM E84 or UL 723 requirements.
- E. All Refrigerant piping insulation exposed to outdoor/weather shall be weatherproofed with Childers Aluminum jacketing. Install over the insulation specified above. Jacketing shall be manufactured from 1100, 3105 or 5010 aluminum alloy with 3/16-inch corrugations. Smooth or embossed jackets may be permitted in special situations to match an existing installation. Jacketing shall be furnished with an integrally bonded moisture barrier over entire surface in contact with insulation. The minimum thickness of aluminum jacketing shall be 0.016 inch.

2.17 GRAVITY HOODS

- A. Hoods shall be constructed of heavy gauge galvanized steel or aluminum. Provide Cook VR, or Greenheck Fabra Hood.
- B. Provide bases with minimum 5" height. Bases shall be 8" minimum larger than throat size.
- C. Hood shall be provided with hinged or removable type supports for easy service access.
- D. Provide 1/8" galvanized steel mesh insect screen.
- E. Backdraft damper shall be provided.

2.18 SEISMIC

- A. Seismic restraints shall be provided for all ductwork and equipment in accordance with State of California and local codes.

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PART 3 - EXECUTION

3.1 SHEET METAL WORK

- A. Sizes shall be as per current code requirements and to provide quiet draft-free ventilation.
- B. Slope: No more than 1 to 7 on any side except where connections dictate. A maximum of 1 to 4 may be used, subject to approval.
- C. Throat: Area of the branch duct takeoff shall be in direct proportion to the volume of air to each branch.
- D. Holes: Holes in duct for damper rods and other necessary devices, shall be drilled and shall be airtight. No pipes, conduits or other member may pass through any duct unless otherwise shown on the Drawings.
- E. Noise: Entire system shall prove quiet to a degree satisfactory to the Owner. Make any adjustment required to produce quietness before work can be deemed to be finished and accepted.
- F. Isolation: Where incompatible materials come in contact, they shall be isolated from each other with rubber, neoprene, lead or material best suited for the materials to be isolated.
- G. Supports: Secure ducts against displacement and vibration. Anchor to structural parts of the buildings at intervals not greater than 10 feet. Suspend with 18 gauge straps and as recommended in the SMACNA Manual.
- H. Volume Dampers:
 - 1. Provide adjustable volume dampers in branch supply ducts.
 - 2. Locate the dampers as close as possible to the main duct.
 - 3. Provide remote operating device where damper is inaccessible.

3.2 FIRE DAMPERS

- A. Install as required by governing code.
- B. Verify with local Fire Marshall to confirm that all fire dampers are installed in compliance with the local code and requirements.

3.3 GENERAL DUCTWORK INSULATION

- A. All ductwork, equipment and appurtenances handling air at temperatures above or below room ambient shall be insulated as generally described herein. Certain plenums, exhaust ducts and transfer air ducts shall be insulated as described herein and where indicated on the Drawings.

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- B. Installation shall be neat and workmanlike in appearance and quality of workmanship. Insulation shall be neatly cut at supports, etc., and beveled at inspection doors, unions, etc., and shall be first class in workmanship. Installation shall be in direct compliance with manufacturer's written and approved instructions for his particular materials. Care shall be taken during installation to eliminate or reduce dust and dirt to a minimum. Waste and debris shall be removed as it accumulates.
- C. Location: All supply and return air ductwork shall be insulated on the exterior where not indicated on the Drawings and/or specified to be lined on the interior.
- D. Application: Insulation shall be firmly wrapped around duct and lapped minimum of 4" longitudinally and transversely. Securely fasten with 16-gauge galvanized wire spaced not more than 12" o.c. for straight runs and 3" o.c. for elbows and fittings. In addition, securely wire each transverse joint of the insulation.

3.4 ACOUSTICAL AND THERMAL LINED DUCTWORK

- A. Location: First 10 feet of duct run from air conditioning unit on both supply and returns and where indicated on the Drawings.
- B. Application: Adhere to metal using fire-resistive adhesive over 100% of the surface (plus weld pins or friction clips on 12" centers when duct dimensions exceed 24"). Air side surface shall be uniform. No tufting allowed. Seal all raw edges.
- C. Where ducts are lined on the interior, no external insulation is required.
- D. Duct and plenum sizes shown on the Drawings are actual sheet metal size and include allowance for lining.

3.5 FLEXIBLE AIR DUCTS ALLOWED IN CONCEALED SPACES ONLY

- A. Flexible duct shall be maximum 7' length, size as per current code requirements and have galvanized sheet metal male and female end-connectors. End-connectors shall be attached to each other or to other sheet metal fittings with 4 - #8, 3/8" sheet metal screws spaced approximately 90 degrees apart; or with a 1/2" wide metal band screw type clamping device.
- B. All metal fittings used with the flexible duct shall be insulated with a 2" thick, 1-lb. density flexible blanket insulation, jacketed with a vapor barrier and taped to provide a continuous seal and a neat workmanlike appearance.
- C. Flexible ducts shall be installed in a fully extended condition free of sags and kinks, using only the length required to make the connection. Where, in the opinion of the Architect, flexible duct length is excessive, the duct shall be shortened or replaced with a flexible duct of suitable length.
- D. The flexible duct bending radius shall not exceed the specific manufacturer's UL approval. Where horizontal support is required, flexible duct shall be suspended on 36" centers with a minimum 2" wide flat banding material.
- E. Provide a manual damper at each take-off-connector.

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3.6 ELECTRICAL WORK

- A. Motor starters, disconnect switches, line voltage wiring and all conduit (power line and low voltage) are specified in the Electrical Section of the Specifications unless otherwise specified and/or noted on the Drawings.
- B. Wiring diagrams of electrical connections required for the installation of equipment of this Section shall be submitted to the Owner for approval. After approval the wiring diagrams shall be submitted to the electrical subcontractor for use in installation.
- C. In the event the equipment furnished or submitted requires a greater number of motors starters, etc., or requires motors, starters, etc., of higher rating than shown on the Drawings, the subcontractor for the work of this Section shall be responsible for any additional cost involved in providing additional electrical services to the equipment.

3.7 EXHAUST FANS CONTROLS

- A. Restroom exhaust shall be controlled by restroom lights.

3.8 SMOKE DETECTORS

- A. Interlock all duct installed smoke detectors serving common spaces, and fire alarm panel (if one is provided).

3.9 PAINTING

- A. Painting of all apparatus, unless hereinbefore specified, shall be done under the Painting Section of the Specifications.
- B. All apparatus furnished shall be provided with a shop coat at the factory. Inside of ducts behind all air inlets and outlets in finished areas shall be painted two (2) coats.
- C. Painting of exposed piping shall be as directed by the Architect. Submit piping paint colors for approval.

3.10 EQUIPMENT IDENTIFICATION

- A. Identify all equipment, using brass discs or black with white engraved letters laminated plastic. Install in readily visible locations, not interfering with insulation.
- B. Fans, Air Conditioning Units, etc.: Laminated plastic showing manufacturer, H.P. capacity, static pressure and electrical characteristics.

3.11 TESTING AND BALANCING

- A. General:
 - 1. Test, balance, and adjust the air conditioning, heating and ventilating systems as specified herein. All work shall be done under direct supervision of a qualified engineer.

2. All instruments used shall be accurately calibrated and maintained in good working order. Perform work in complete accordance with AABC National Standards for Total System Balance. Include, perform and record, as though repeated herein, all methods and procedures listed in and applicable to Sections on Air and Hydronic Balancing.
 3. Visit the Jobsite in the early stages of the installation and then again when the installation is well along but before any closing-ins, to verify that all fittings, air volume control devices are of the proper type or properly fabricated and are installed in accordance with the Specifications and that the systems as required herein are enabled for balancing.
 4. Provide, if necessary, dampers and pulley and belt changes. Provide immediate labor and tools to make corrections when required within the systems.
 5. Before the ceilings are closed, perform a preliminary air balance to within 10% of the specified valves. Acoustical "A" scale reading in each room with 100% air flow.
 6. Balancing and testing shall not begin until systems have been completed and are in full working order. Put all heating, ventilating and air conditioning systems and equipment into full operation of same during each working day of testing and balancing.
 7. Perform the following tests, compile the test data and submit five (5) copies of the complete test data to the Owner.
- B. Air Testing Procedure: Perform the following tests and balance system in accordance with but not limited to the following requirements.
1. Test and adjust blower RPM to design requirements.
 2. Test and record motor full load amperes.
 3. Make pitot tube traverse of main supply ducts and obtain design CFM at fans.
 4. Test and record system static pressures, suction and discharge.
 5. Test and record entering and leaving air dry bulb and wet bulb temperatures.
 6. Test, adjust and record all supply, return, outside air and exhaust air ducts to proper design CFM.
 7. Test and adjust each diffuser, grilles and register to within (+) or (-) 5% of design requirements and minimize drafts in all areas.
 8. Manufacturer's ratings on all equipment shall be used to make required calculations.

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9. Readings and tests of diffusers, grilles and registers shall include required FPM velocity and test resultant velocity, required CFM and test resultant CFM after adjustments.
 10. In cooperation with the control manufacturer's representative, set temperature controls so as to duplicate conditions during which each system will require maximum heating and also maximum cooling.
 11. Make any changes in the pulleys, belts and dampers or the addition of dampers required for correct balance as recommended by the air balance agency, at no additional cost to the Owner.
- C. Upon completion of the balance of the system, all the information shall be inserted on a sheet listing all items required by specifications and be included in complete test and balance report and then shall be submitted for approval.
 - D. The Owner reserves the right to request the readjustment of air volume and different systems requirements to meet local conditions during the six months following completion of the total balancing of the systems. During this time, the Architect, at his discretion, may request a recheck or resetting of any outlet, supply air fan, or exhaust fan or any other equipment or part of as listed in the test report. Provide technicians to assist the Architect in making any tests he may require during this period of time.

3.12 HERS RATING

- A. Test, balance, and adjust the air conditioning, heating and ventilating systems as specified herein.
- B. All work shall be done under direct supervision of a qualified HERS rater. All instruments used shall be accurately calibrated and maintained in good working order.
- C. Perform work in complete accordance with HERS Technical Manual. Include, perform and record, as though repeated herein, all methods and procedures listed in and applicable to Sections on Air and Hydronic Balancing and Testing. HERS raters scope shall include but not be limited to verifying duct leakage for all HVAC systems, verifying refrigerant charge for all HVAC systems, and verifying air conditioner EER for all HVAC systems.

3.13 OPERATING TESTS

- A. Perform test before final acceptance and under the supervision of the Architect and/or Owner's Project Manager. Operation of the tests shall be for eight hours. Furnish all labor and instruments for test.
- B. Demonstrate that calibrated A-scale reading in all areas of occupancy not to exceed 35 dBA at a distance of not less than 10 feet from the nearest supply register.
- C. Demonstrate that all machinery and devices comply with Specifications and that there is free and equal circulation from each part of the piping and duct systems, as well as satisfactory operation of all dampers, automatic controls, etc.

- D. Demonstrate that calibrated "A" scale reading in all areas of occupancy to not exceed 35 dBA at a distance of not less than 10' from the nearest supply register.

3.14 ANCHORING OF MECHANICAL EQUIPMENT

- A. All base mounted equipment set on concrete slabs or built up on concrete bases shall be secured to resist a horizontal seismic force equivalent to 50% of the operating weight of the equipment. Wood platforms are acceptable where indicated in Architectural and Structural Drawings.
- B. Where anchor bolts are set in place with cinch anchors, all bolt shanks shall be grouted tight to prevent any horizontal movement. Bolts holes on equipment base plates shall be not more than 1/8" larger than the anchor bolt size.

3.15 PRELIMINARY OPERATION

- A. The Owner reserves the right to operate any systems of equipment prior to final completion and acceptance of the work. Such preliminary operation shall not be construed as an acceptance of any work.

3.16 CLEANING

- A. Completely cover motors and other moving machinery to protect from dirt and water during construction. Cap all openings into ducts and pipes to protect from foreign matter while under construction.
- B. Thoroughly clean inside of ductwork before installing grilles.
- C. During process of work, premises shall be kept reasonably free of all debris, cuttings, and waste material resulting from work under this heading. All debris, rubbish, leftover materials, tools and equipment shall be removed from the site prior to final acceptance.
- D. Thoroughly clean all parts of apparatus and equipment. Exposed parts which will be painted shall be thoroughly cleaned of cement, plaster and other materials. All grease or oil spots shall be removed with carbon tetrachloride. Such surfaces shall be carefully brushed down with a wire brush to remove rust and other spots and left smooth and clean.
- E. Damaged factory applied finishes shall be "touched up". "Touch" shall be accomplished with preparation, prime and finish coats applied in strict accordance with the manufacturer's recommendations.

3.17 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Submit to Architect complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished in accordance with Owner's administrative requirements. Each set shall be permanently bound and shall have a hard cover. The following identification shall be inscribed on the covers; the words "OPERATING AND MAINTENANCE INSTRUCTIONS", the name and location of the building, the name of the subcontractor and the subcontract number.

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- B. Incorporate, among others, in the set of operating and maintenance instructions to the Owner's Project Manager, the following directions:
1. Part numbers of all replaceable parts.
 2. Manufacturer's cuts and rating tables.
 3. Oiling, lubricating and greasing data.
 4. Complete electrical load data from operation tests.
 5. Air flow data on all fans indicated on the Drawings.
 6. Serial numbers of all principal pieces of equipment.
 7. Installing company's names, addresses and telephone numbers.
 8. Control diagrams and operating sequences together with labeling of control wiring and instruments to match diagrams.
- C. After approval by the Architect, five (5) copies of this instruction and maintenance manual shall be furnished to the Architect.

3.18 INSTRUCTION TO PERSONNEL

- A. Upon completion of the installation of the equipment, place a competent person in charge to operate the different systems and instruct the Owner's maintenance representative in all details of operation and maintenance. Any required instructions from manufacturer's representative shall be given during this period.
- B. Provide three (3) complete sets of operating and maintenance instructions for the systems specified in this Section, and submit evidence that the Owner's maintenance representative who will operate the system has been fully instructed.

3.19 COMPLETION OF WORK

- A. All H.V.A.C. work shall be completed and in operation 30 calendar days prior to final acceptance. During this period, the equipment shall be in operation, tested, and given final adjustments. Final acceptance will depend upon compliance with this provision.

END OF SECTION

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SECTION 23 35 16.16**MECHANICAL ENGINE EXHAUST SYSTEMS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide all labor, materials, and equipment necessary to put in working operation a complete turnkey vehicle exhaust removal system to remove both diesel and automotive exhaust gases and particulate of operating vehicles within the confines of specified fire station. All necessary controls, motors, fittings, ductwork, blower, labor and all other equipment and materials specified shall be part of the work.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.

1.2 REFERENCES

- A. 47 CFR 15 - (Code of Federal Regulations, Title 47, Part 15) Radio Frequency Devices.
- B. ACGIH - American Conference of Governmental Industrial Hygienists.
- C. AMCA - Air Movement and Control Association.
- D. ANSI/SMACNA 005 - Round Industrial Duct Construction Standards.
- E. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- G. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- H. EPA - U.S. Environmental Protection Agency.
- I. IMC - 2024 International Mechanical Code.
- J. ISO 9001:2015 - Quality management systems — Requirements.
- K. NFPA 70 - 2023 National Electrical Code (NEC).
- L. UL 508A - Industrial Control Panels.

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1.3 SYSTEM REQUIREMENTS

- A. All items of equipment and materials described in these Specifications are to be furnished installed and placed into proper operating condition in accordance with good practice and manufacturer's written or published instructions.
1. The vehicle exhaust removal system shall provide virtually 100 percent complete evacuation of all diesel fumes at the source from start up to exit of the apparatus from the fire station. The vehicle exhaust removal system shall be capable of delivering complete coverage for bays up to 60 ft. in length. The system must be able to accommodate drive through and back-in bays to meet all the needs of the fire department.
 2. System must be designed and installed to NIOSH recommendation, specifying that occupational exposures to carcinogens be limited to the lowest feasible concentration. Exposure in the human breathing zone should be limited to lowest feasible level, without any time delay required for the system to effectively capture the diesel fumes.
 3. System must also be capable to provide virtually complete capture and evacuation of carbon monoxide emitted as part of the vehicle exhaust.
 4. Systems that solely use filters, in which diesel particulate may accumulate, and that would potentially have to be treated as hazardous materials, will not be accepted.
 5. System must meet the guidelines for the IMC for Source Capture Systems. Such system is defined as a mechanical exhaust system designed and constructed to capture air contaminants at their source and to exhaust such contaminants to the outdoor atmosphere.
 6. The system shall not affect personnel boarding the apparatus. Hose loops shall not hang any lower than six feet from the bay floor. The hose assembly shall not come into contact with the vehicle other than one connection point to the vehicle's tailpipe. The hose assembly shall not touch or drag on the bay floor.
 7. The exhaust system shall not block doorways, exits, and aisles in the apparatus bay, which could endanger the welfare of fire personnel or visitors.
 8. The exhaust system shall not need to be disconnected from the vehicle while shore lines are connected, during battery charging, or washing of the vehicle, as with other types of systems.
 9. To protect the apparatus electrical system from possible damage, the system bid shall not incorporate any type of electromagnetic device that requires the apparatus to be utilized as an electrical ground for systems operation.

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10. Due to the harmful effects of diesel exhaust, the system must be designed and capable of capturing virtually 100% of the exhaust gas and virtually 100% of the particulate even in the event of a complete power failure. The system shall not detach itself from the apparatus for any reason during a power failure other than normal exiting of the apparatus bay. System shall discharge exhaust outside the station even in the event of a power failure.
11. The system shall capture the exhaust gases and particulate directly from the tailpipe of the apparatus by a direct connected "visible" high temperature rated hose. Particulates emitted from the apparatus are known to be heavier than air and therefore must be captured by a directly connected hose with a tight seal, as loose nozzles or air filters cannot capture these heavy particulates. The particulates have been documented to be the main respirable carcinogen in diesel exhaust, and therefore are the primary concern of the fire department to capture virtually 100% of these particulates.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Bids shall only be accepted by bidders supplying equipment from manufacturers that have an established reputation in the business of manufacturing Automatic Emergency Response Vehicle Exhaust Removal Systems for a minimum of no less than twenty (20) years.
 1. Standard Products: Where the requirement calls for a packaged exhaust system to be provided, all items shall be the product of one manufacturer. The product offering must be a product that has been offered by that manufacturer for a minimum period of twenty (20) years. No prototypes or private label products by other manufacturers will be allowed. System bid shall have a life of service of no less than ten (10) years to establish proof of quality, longevity and service. There will be no exceptions.
 2. Certifications: Certification documents shall be provided and attached to the installer's bid proposal. There will be no exceptions.
 - a. All components shall be fabricated in strict accord with standards set forth in the current edition of ISO 9001:2015.
 - b. The manufacturer must be UL and cUL Certified <https://productiq.ulprospector.com/en> and certified by the AMCA <https://www.amca.org/certify/#amca-certified> to assure quality, consistency and reliability of products.
- B. Installer Qualifications:
 1. Bids will only be accepted from factory certified companies that have an established reputation in the business of system design, turnkey installation and long-term service of Automatic Emergency Response Vehicle Exhaust Removal Systems for a minimum of no less than five (5) years. Bidder shall be a registered corporation, partnership or sole

proprietorship within the State of California. Installer shall have a valid and current California State Contractor's License for the work being bid.

2. Installer shall show proof that the system specified in this Bid Document has been field tested and proven by supplying a list of references with no less than 50 fire stations with systems installed by bidder (with comparable emergency and non-emergency run rates) within a 200 mile radius of the City of Valencia. References shall be submitted with the Bid Document and shall include phone numbers and contact names.

C. Conduct conference at Project Site.

1. Review methods and procedures related to vehicle exhaust removal system installation.
2. Review access requirements for equipment delivery.
3. Review equipment storage and security requirements.
4. Inspect condition of preparatory work performed by other trades.
5. Review structural loading limitations.
6. Review that all components specified in this Section and related components specified in other Sections are accounted for.

1.5 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Record Building Dimensions: Note vehicle type and prepare shop drawings which include equipment position, dimensions, sizes, weights, performance data, and also location and size of field connections. Include details of wiring for power differentiating between manufacturer-installed and field-installed wiring.
- C. Product Data: Indicate manufacturer's model number, technical data including description of components and static pressure/air flow chart, and installation instructions.
- D. Provide fan curves with specified operating point clearly plotted.
- E. Submit fan sound level data for fan specified.
- F. Manufacturer's Installation, Operation and Maintenance Manual: Outline the procedures required for system installation, start up, operation and shut down. The instructions shall include the manufacturer's name, telephone number, model number, service manual number, parts list, and brief description of all equipment and the basic operating features. The maintenance instructions shall list routine maintenance procedures, and troubleshooting guide. Include a spare parts list.

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1.6 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Deliver components with protective packaging. Store in original protective crating and covering and in a dry location.

1.7 COORDINATION

- A. Coordinate layout and installation with other work, including light fixtures, fixed equipment and work stations, HVAC equipment, radiant tube heaters and fire-suppression system components.
- B. Coordinate location and requirements of service-utility connections.

1.8 WARRANTY

- A. Guarantee all materials, equipment and workmanship for a period of two (2) years from the date of final acceptance, against original defects. Replacement costs will be at no expense to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Plymovent Corporation, 5 Corporate Drive, Cranbury, New Jersey 08512. Telephone: (609) 395-3500, Toll Free: (800) 644-0911, FAX: (609) 655-0569, WEB: info@plymovent.com.

Local Sales Contact: John Whitney, 909-238-7686
John.whitney@airexchange.com

2.2 RAIL MATERIAL

- A. Aircraft aluminum alloy Type AA-6063 (ASTM B209/B209M).
- B. One-piece continuous extruded aluminum rail in a minimum length of 19 ft. in an effort to reduce the points of leakage due to joints or connections. The construction profile shall be of a square profile type, width of 5 ¾ inches with a rail thickness of 0.177 inch. The bottom portion of the rail shall have a continuous slot to accept a rubber lip seal.
- C. Extruded as a one piece design to maximize the structural integrity of the rail and to minimize joints. Extruded into the rail profile shall be all necessary mounting guides, which will allow for support of the rail mounting hardware.
- D. Mounting channels shall be provided continuously along the top on both sides of the rail extrusion in order the proper positioning of all required mounting supports in accordance with codes.
- E. The rail shall allow the trolley/hose assembly to glide to the door threshold in a safe and effective manner. The extruded rail channel shall allow the whole rail to

remain rigid and shall provide an area to attach bolts for splicing additional rails together for systems over 19 ft. long. The overall extruded rail lengths shall be 19 ft. standard

- F. Rail system shall be equipped with a hydraulic braking system that limits travel of flex hose/trolley as the vehicle exits the building. Hydraulic brake shall be incorporated into the end cap of the suction rail.

2.3 TOP MOUNTING SUSPENSION

- A. Designed to attach with 2 mounting cleats to the mounting slots that are extruded into the top of the rail profile. The top suspension mount support shall consist of 2 triangular plates with a 90 degree brake providing a mounting cleat provided with 2 pre-punched 3/8 inch holes for attaching to the aluminum leg assembly.

2.4 SUPPORT LEGS

- A. Support Leg and Mounting Feet: Manufactured and provided by the supplier of primary exhaust removal system (Equipment Manufacturer).
- B. Leg Material: Aircraft aluminum alloy Type AA-6063 (ASTM B209/B209M).
- C. Supports shall come standard in 19 feet lengths. A minimum of one support with appropriate bracing shall be provided for every 10 linear feet of track profile.
- D. The support legs shall consist of a square tubular profile with dimensions no less than 2 inch OD X 0.1 inch with 3/8 inch fastening hardware provided.
- E. Vertical Adjustable Mounting Foot: Capable of attaching the leg assembly to a ceiling with a 30 degree pitch, complete with a slider bar and 3/8 inch hardware necessary for mounting the horizontal rail to the mounting channel system.
- F. Horizontal Adjustable Mounting Foot: Capable of attaching the leg assembly to a wall, complete with a slider bar and 3/8 inch hardware necessary for mounting the horizontal leg to the mounting channel system.
- G. Support Leg: Equipped with round tubular zinc-plated steel knee brace with pressed ends in standard lengths of 20 inches, 30 inches and 72 inches
- H. Angle completely adjustable to the leg support and mounted perpendicular and parallel to direction of the track. Typical Support Angle: 45 degrees from the centerline of the factory provided support leg.
- I. The standard leg shall be capable of meeting a Seismic 4 requirement. "Uni-strut", all-thread rod, and/or chains may not be used in place of a leg assembly as sole support of the system. Vertical support and bracing shall be provided to safely secure the rail profile in accordance with building code and seismic standards which may apply. A minimum of one support with appropriate bracing shall be provided for every 10 to 12 linear feet of rail profile.

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2.5 HYDRAULIC BRAKE SYSTEM

- A. Incorporated into the end cap of the suction rail profile. The hydraulic brake system must incorporate a hydraulic shock capable of reducing the forward impact of 1 to 2 suction trolleys which may be installed now or in the future to the exhaust rail system. This hydraulic shock shall be secured to a steel end cap fabricated of a 0.1181 inch steel plate with formed 90 degree side rails for rigidity. End cap shall be secured to the rail with 6- 8 mm bolts with Nyloc nuts (3 on each side). The end cap shall be of a black powder coated finish. The hydraulic shock shall be capable of reducing to a full stop the trolley(s) in less than 4 inch, without physical damage to either the rail profile or trolley that it is stopping. The back end cap shall have an end feed 5 inch duct connection and shall be a black powder coated finish.

2.6 RAIL SPLICING JOINT

- A. Rail Splicing Joint: Formed steel fitting equal to the internal diameter of the suction rail profile. The splice shall have a wall thickness of no less than 14 gauge in thickness and a length of no less than 7.87 in. from end to end. Rail joint shall be secured by 12- 5/16 in. (DIN 933 M8) bolts with Nyloc nuts in the top and sides of the rail. Self tapping bolts or screws are not acceptable.

2.7 MIDDLE RAIL DUCT CONNECTION

- A. The rail duct connection shall be rectangular to a 5 inch diameter round transition fitting fabricated from 22 gauge galvanized steel (ASTM A653/ 1.0330/DC01+ZE). The rectangular slot shall be 19.5 inches long by 1.8 inch wide with a 1/4 inch external flange to slide into the rail profile and secured with self-tapping screws.

2.8 TROLLEY ASSEMBLY

- A. Gantry type trolley with sealed bearing loaded wheels designed to roll inside the internal rail profile flange. The trolley chassis shall be aluminum and epoxy coated with a black finish. The chassis shall be fitted with a tapered suction cone.
- B. Rubber Sealing Lips: Vulcanized Teflon strip covering 1 ½ inch of the bottom edge of the sealing lip which shall contact with (5) five Teflon rollers on each side of the suction cone to minimize resistance between the suction cone and the rubber sealing lips. The suction cone transition shall be a tapered slot design which shall fit inside the suction rail profile. The tapered slot shall be equal or exceed in area the diameter of exhaust ventilation hose to which it is attached.
- C. Equipped with rubber impact bumpers at both the front and rear of the trolley chassis to eliminate metal to metal contact which could damage the trolley assembly
- D. There shall be a system balancer assembly provided to aid in the delivery of the hose to the exit door. Balancer Assembly: Self-adjusting weight spring tension balancer with a lifting capacity of no less than 31 pounds. The balancer shall

have a minimum diameter steel cable of 0.080 inch and have a safety link connection.

2.9 UPPER FLEXIBLE HOSE

- A. Flexible ST (Standard Temperature) exhaust hose manufactured for the sole purpose of venting high temperature exhaust gases. Designed strictly for the harsh environment of rapid response and auto-release of a vehicle exhaust tailpipe.
- B. Hose: Shall be 4 inch or 5 inch diameters with a length of 4 ft., without joining or splicing connections. Hose Material: High temperature synthetic rubber impregnated into a high temperature laminated fabric with a mechanically crimped connection around a coated steel wire
- C. This construction of hose must be capable of operating at continuous temperatures of 400° F and intermittent temperatures of 500° F, such as are experienced when pump checks are performed inside the fire station
- D. Protective Clip Cover: This shall be accomplished in a fashion, which eliminates any possibility of personnel coming in contact with an exposed hot metal helix and be provided in a safety yellow color.
- E. The bend radius of the high temperature hose shall be no less than 1.5 times the diameter of hose to ensure that hot gases are not restricted as they pass through the system.
- F. Hoses utilizing an exposed metal helix will not be acceptable due to potential burn hazard and/or shock hazard from being utilized as a grounded, grounding or current carrying conductor for electromagnet connections. No exceptions will be allowed.
- G. Optional Flexible HT (High Temperature) Upper Hose: Flexible 4 inch or 5 inch diameter by 6 feet long section of yellow and black hose identical in appearance to the mid and lower hose assembly and extending from the metal saddle to the crab hose connection. This construction of hose must be capable of transporting exhaust at continuous temperatures of 900° F and intermittent temperatures of 1,050° F. An independent third party test report shall be submitted with bid as proof of claim. Wire Helix: Bound and protected in laminations of high temperature material. This shall be accomplished in a fashion, which eliminates any possibility of personnel coming in contact with an exposed hot metal wire helix. The hose shall further protect the internal wire helix from heat buildup and in turn add increased visibility to personnel. High Temperature Wear Strip: 9/16" inch wide and be provided in a safety yellow color. Hoses utilizing an exposed metal helix will not be acceptable due to potential personnel burn hazard. No exceptions will be allowed.

2.10 MID HOSE

- A. ST (Standard Temperature) Mid Hose: Designed strictly for the harsh environment of rapid response and auto-release from a vehicle exhaust tailpipe.

Semi rigid hose: Shall be 4 inch or 5 inch diameter by 10 ft. long section of yellow and black hose identical in appearance to the lower hose assembly and extending from the metal saddle to the SDCH. Hose Material: High temperature synthetic rubber impregnated into a high temperature laminated fabric with a minimum overlapping thickness of 2 7/16" inches. This construction of hose must be capable of operating at continuous temperatures of 400° F and intermittent temperatures of 500° F, such as are experienced when pump checks are performed inside the fire station. An independent third party test report shall be submitted with bid as proof of claim. Wire Helix: Bound and protected in laminations of hose winding. This shall be accomplished in a fashion, which eliminates any possibility of personnel coming in contact with an exposed hot metal helix. The hose shall further protect the internal wire helix from heat buildup and in turn add increased visibility to personnel. Wear Strip: 9/16" inch wide and be provided in a safety yellow color. Hoses utilizing an exposed metal helix will not be acceptable due to potential burn hazard and/or shock hazard from being utilized as a grounded, grounding or current carrying conductor for electromagnet connections. No exceptions will be allowed.

- B. Optional HT (High Temperature) Mid Hose: Designed strictly for the harsh environment of rapid response and auto-release from a vehicle exhaust tailpipe. Flexible hose: Shall be 4 inch or 5 inch diameter by 10 ft. long section of yellow and black hose identical in appearance to the lower hose assembly and extending from the metal saddle to the SDCH. This construction of hose must be capable of transporting exhaust at continuous temperatures of 900° F and intermittent temperatures of 1,050° F. An independent third party test report shall be submitted with bid as proof of claim. Wire Helix: Bound and protected in laminations of high temperature material. This shall be accomplished in a fashion, which eliminates any possibility of personnel coming in contact with an exposed hot metal wire helix. The hose shall further protect the internal wire helix from heat buildup and in turn add increased visibility to personnel. High Temperature Wear Strip: 9/16" inch wide and be provided in a safety yellow color. Hoses utilizing an exposed metal helix will not be acceptable due to potential personnel burn hazard. No exceptions will be allowed.

2.11 LOWER HOSE ASSEMBLY

- A. ST (Standard Temperature) Lower Hose: Rigid 4 inch or 5 inch diameter by 2 feet long section of yellow and black hose identical in appearance to the mid hose. This construction of hose must be capable of operating at continuous temperatures of 400° F and intermittent temperatures of 500° F such as are experienced when pump checks are performed inside the station. An independent third party test report shall be submitted with bid as proof of claim. Supports the magnetic connection nozzle and stainless steel reducing elbow in a rigid fashion to allow for the operator to place hose collection nozzle onto the tailpipe without bending over. The lower hose is the only section of hose which shall disconnect from the upper hose assembly and act as a safety disconnect in the unlikely event the nozzle gets entangled. Hoses utilizing an exposed metal helix will not be acceptable due to potential burn hazard. No exceptions will be allowed.

- B. Optional HT (High Temperature) Lower Hose: Semi rigid 4" inch or 5" inch diameter by 2 ft. long section of yellow and black hose identical in appearance to the upper hose. This construction of hose must be capable of transporting exhaust at continuous temperatures of 900° F and intermittent temperatures of 1,050° F. An independent third party test report shall be submitted with bid as proof of claim. Wire Helix: Bound and protected in laminations of high temperature material. This shall be accomplished in a fashion, which eliminates any possibility of personnel coming in contact with an exposed hot metal wire helix. The hose shall further protect the internal wire helix from heat buildup and in turn add increased visibility to personnel. High Temperature Wear Strip: 9/16" inch wide and be provided in a safety yellow color. Shall support the magnetic collection nozzle and stainless steel reducing elbow in a semi rigid fashion to allow for the operator to place hose collection nozzle onto the tailpipe without bending over. The lower hose is the only section of hose which shall disconnect from the upper hose assembly and act as a safety disconnect in the unlikely event the nozzle gets entangled. Hoses utilizing an exposed metal helix will not be acceptable due to potential personnel burn hazard. No exceptions will be allowed.

2.12 SAFETY DISCONNECT COUPLING HANDLE

- A. Safety Disconnect Coupling Handle (SDCH): An injection molded composite body with a 4 inch or 5 inch diameter hose connection. A 360 degree rubber bumper to protect the vehicle and disconnect from wear shall be incorporated in the design of the system. Coupling: Consists of a aluminum inner flange collar connected by a patented easy reconnect mechanism. The release tension of this device shall be preset at 102 pounds of force (450N) and easily reconnected with only 3 pounds of force (13N).

2.13 COLLECTION NOZZLE ASSEMBLY

- A. Collection Nozzle Assembly: Provides a substantially air tight seal around exhaust tail pipe when connected thus allowing for virtually 100% source capture. The seal shall limit escape of life threatening exhaust gases.
- B. The Magnetic Nozzle shall be engineered and designed with rare earth magnets that are strategically positioned on the face of the collection nozzle. The Magnetic Nozzle shall be coated with a galvanized finish or the optional BlackArmour version high temperature, wear and corrosion resistant duplex coating, to limit the effects from corrosive road treatment chemicals. The collection nozzle shall also incorporate a protective rubber safety cover to avoid damage to vehicle and surroundings. The magnets shall only make contact with the face of the tailpipe adapter located on the tailpipe. The reducing elbow that connects the flexible hose to the collection nozzle shall be fabricated using continuous welded construction and shall be made from polished 304 stainless steel. The angle of transition shall be no less than or greater than 67 degrees from the centerline of the reducer. The stainless steel reducer shall incorporate a primary expanded metal debris screen, which is permanently affixed by weld joints to the inside opening of collection nozzle. The collection nozzle shall be connected from an upright standing position by the user without bending over.

Since this item is a point of safety for both personnel and the system itself. No exception will be allowed.

- C. The standard conical tailpipe adapter shall be plated with a galvanized finish to limit corrosion from corrosive road treatment chemicals. The conical tailpipe adapter shall be of a self-aligning "Click and Seal" design for aiding in the connection and release of the collection nozzle from the fire apparatus.
- D. The optional TopGrade conical tailpipe adapter shall be constructed from a high temperature, corrosion resistant, magnetic stainless steel, to limit the effects from extremely aggressive corrosive road treatment chemicals. The conical tailpipe adapter shall be of a self-aligning "Click and Seal" design for aiding in the connection and release of the collection nozzle from the fire apparatus.

2.14 HOSE SADDLE

- A. Metal Hose Suspension Saddle: Fabricated of steel and powder coated with a black matte finish specifically manufactured for the sole purpose of suspending high temperature exhaust ventilation hose in a rapid response and auto-release application. The design of the saddle shall smoothly transition the direction of the hose during its travel along the track. Securing clamps shall be provided including a link fastener, for the purpose of attaching it to the balancer.

2.15 ELECTRICAL CONTROLLERS

- A. Controller: Built and supplied by a UL and cUL recognized and listed exhaust system manufacturer. Controller shall carry the UL and cUL listing label as an "Enclosed Industrial Control Panel." Individual components listed by UL and cUL shall not satisfy the above requirement. Manufacturer shall undergo quarterly inspections by UL to verify all requirements and standards are met as outlined by UL and cUL. The controller shall be delivered as an Operating System Three series controller or an approved equal to the specifications to follow.
- B. Electrical Controllers: Bear a visible UL and cUL listing label as proof of subscribership and shall be validated by UL www.ul.com/database/ as an "Enclosed Industrial Control Panel". Certification documents shall accompany bid documents.

1. Manufacturer Name: _____
2. UL File No.: _____
3. Electrical controller and manufacturer shall be recognized and listed by UL and cUL. Controller shall be manufactured in accordance with UL 508A. The electrical controller shall include a Class 1 limited energy control circuit. Enclosures shall be NEMA 12 rated and UL listed as Type 12. The electrical control components shall be provided and mounted in an electrical enclosure to restrict access to internal components of the controller by authorized personnel only.

- C. **Controller Performance:** Designed to sense the output pressure and/or temperature change inside the ductwork system, which is normally generated by any internal combustion engine designed to propel a motor vehicle. The operating logic shall be designed to complete this cycle. At any point in time when a collection device is connected to a motor vehicle's exhaust tailpipe, as the operator starts the vehicle, the controller shall automatically sense the engine's output pressure or temperature of the exhaust and in turn energize the electrical contactor which will supply power to the AMCA certified spark resistant fan. Through the use of an adjustable timer the controller shall keep the contactor energized for up to sixty minutes in accordance with the station's response requirement. If the responding vehicle does not disconnect from the exhaust ventilation system in less than the designated setting, the optional temperature override switch shall override the time delay to ensure continuous system operation. This automated function will work for as long as the exhaust gas temperature is in excess of the setting on the heat sensor located in the ductwork system. This cycle shall not allow the electrical contactor, which energizes the exhaust fan, to short cycle or stop the fan while the system is connected to an operating vehicle.
- D. **Motor Control Contactor:** Allen Bradley Industrial Electrical Contactor 100C series. The contactor shall be UL - cUL listed as an approved component.
- E. **Motor Control Overload Relay:** Allen Bradley 193 E1 Plus series. Overload relay shall have an adjustable trip range to meet the proper full load amperage of the blower motor.
- F. **Soft Touch Controls:** Incorporated on the face or the access door of the controller by the use of an adhesive backed Lexan membrane type label to prevent water infiltration, which would void the NEMA 12 rating. Label: Provided and secured permanently to the exterior of the electrical controller. Label: Includes the name of the manufacturer, address, telephone number, user instructions and any warnings or cautions required by Underwriters Laboratories.
1. **Auto Start:** This mode of operation shall be strictly for normal day to day use, as it would apply to receiving an emergency call and leaving the station. Any one or combination of the three devices listed below in Paragraph K shall activate the system. The system shall maintain itself in the Auto Start mode and always return there after the Stop sequence has been initiated. The controller shall not have a permanent off position due to the potential health hazards of diesel exhaust components.
 2. **Stop:** This mode of operation shall be a system override to shut down the system manually. Upon activating this mode of operation the exhaust system blower shall shut down. After a period not to exceed three seconds the controller shall automatically return to the Auto Start ready mode. This shall be a safety feature to prevent a potential health hazard from carcinogenic diesel exhaust leakage from systems having an undesirable open nozzle.
 3. **Manual Run:** This mode of operation shall be a system override to run the exhaust system blower continuously for the purpose of running the

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vehicles indoors for equipment checks during inclement weather. Upon activating this mode of operation the exhaust system blower shall start and run continuously until the Stop mode is activated at which point the system will automatically return to the Auto Start ready mode within a maximum three second time period.

- G. System Indicator LEDs: Show system status at all times.
1. Auto Start Indicator: Indicate the system is in the fully automatic mode of operation and that power is on to the controller.
 2. Fan On Indicator: Indicate that power is being applied to the system blower and the controller is operating normally.
 3. Filter Status Indicator: Indicates, if flashing, excessive pressure loss across the optional filter bank media. Consequently the filter must be serviced to maintain optimum efficiency of the system.
 4. Stop Indicator: Indicate the fan has been manually de-energized and will return to the Auto Start ready sequence in less than three seconds to prevent the system blower from being left in the Off mode.
 5. Manual Run Indicator: Indicate the fan is operating in a continuous run mode until interrupted by the stop mode activation.
- H. Controller Transformer: UL listed industrial control circuit transformer sized to properly supply all components so that only one transformer shall be required. Transformer shall be provided with multi-tap primary for 115, 208, 240, 277, 400, 480, and 600VAC, and 24 VAC secondary operating on 50 or 60 hertz with a capacity of 35 volt amperes.
- I. Control Circuit Protection: By the use of primary and secondary fuses to meet UL and cUL requirements. The primary shall be protected by a pair of FLQ style fuses. A single GMA style glass fuse rated at 3.15 amps at 250V shall protect the secondary side of the control circuit.
- J. Electronic Control Circuit Card: Solid state printed circuit board. The soft touch controls shall be an integral part of the control circuit card. The control circuit card shall utilize a potentiometer to adjust the length of the timing cycle up to 60 minutes. It shall incorporate several different modes of operation and optional features.
- K. Activation Devices:
1. Engine Start Switch: An engine pressure sensing type, capable of recognizing the output pressure of any type of motor vehicle exhaust. The electrical contact shall be dry type and not to exceed 24VAC. There shall be one sensor per vehicle.
 2. Optional Thermal Start Switch: Temperature sensing switch of the snap disc type and adjustable from 90° F to 130° F to configure the system

based on different exhaust temperatures. There shall be one sensor per vehicle if chosen.

3. **Optional Wireless Transmitter and Receiver System:** Shall be an optional feature operating on a 2400 MHz frequency. Complies with FCC rule part 15, FCC ID: UY124. The receiver shall utilize 3 independent channels of control and capable of supporting up to 60 transmitters. The receiver shall operate on 12-24 VAC or VDC and enclosed in a non-metallic enclosure with a clear see through lid to view system supervisory functions. The transmitter shall be programmable and shall be powered by a 3 year battery for ease of replacement and cost savings. The transmitter shall have an open field range of 1000 feet and shall be initiated by a NO contact closure such as from a pressure switch mounted on the traveling exhaust system trolley or a vehicle powered ignition transmitter mounted in the vehicle.
- L. **Clean Filter Indicator Alarm:** Used in conjunction with an optional Unifilter for filtering diesel exhaust particulate before release to the atmosphere. The clean filter indicator shall monitor the pressure loss across the filter bank media. Once the useful life of the filter has been depleted the pressure differential switch will signal a high-pressure loss and flash the "Fan On" indicator while the exhaust blower is running.
- M. **Optional System Monitor:** Shall be an optional feature to monitor the system and advise when a preset number of emergency runs or run time on the system have accrued.
- N. **Optional No Airflow Alarm:** Shall be an optional feature to monitor the system and advise when the exhaust fan is not functioning properly.
- O. **Optional Carbon Monoxide Alarm:** Shall be an optional feature to monitor the carbon monoxide levels inside the apparatus bay area.
- P. **Electrical Wiring:** Run in wire channel to allow for easier identification of the wiring circuits and for a neat appearance. All wiring circuitry shall meet National Electric Code and UL and cUL standards for proper size, bending radiuses and terminations.
- Q. **Electrical Terminal Block:** 600 V, UL and cUL rated and recognized. It shall provide individual connection points for remote controls, clean filter indicator and power connections. The primary and secondary control wiring fuses shall be incorporated into the terminal block as one unit.
- R. **Product Manual:** Shall be provided with each electrical control box supplied. The product manual shall include a description of components with part numbers inclusive to the controller. It shall include a wiring schematic showing all internal circuitry as well as all field installed wiring connections to the controller.
- S. **Electrical Interference:** To protect the apparatus and communications, designs that allow any possibility of electrical back-feed or induced current which may

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interfere with a central services communication or onboard vehicle computer logic or navigational equipment will not be accepted.

2.16 ELECTRICAL SYSTEM

- A. Station Electric Supply Panel: The power circuit for the "Emergency Response Vehicle Exhaust Removal System" shall originate in a circuit breaker panel board of the appropriate size to handle the load. Fan circuit shall be supplied by a UL listed, HACR rated circuit breaker (HACR rating is specifically for motor type loads) of the same type as indicated by the manufacturer of the circuit breaker panel or a dual element time delay fuse for fuse style panels. The circuit shall be clearly marked on an engraved ledger plate or in ink on the panel schedule as "Emergency Response Vehicle Exhaust Removal System".
- B. OS-3 Automatic Controller: Built and supplied by a UL recognized and listed exhaust system manufacturer. Controller shall carry the UL - cUL listing label as an "Enclosed Industrial Control Panel".
 - 1. Individual components listed by UL shall not satisfy the above requirement. Manufacturer must undergo quarterly inspections by UL to verify all requirements and standards are met as outlined by UL and cUL.
 - 2. The controller shall be delivered as an Operating System Three series controller or an approved equal to the specifications in Article 2.15 - Electrical Controllers.
 - 3. The controller shall be mounted 6 feet to the top of the cabinet AFF (above finished floor). A safety disconnecting means must be within sight of the controller for servicing and for safety reasons. If the supply panel is not within sight, a separate disconnecting means is required beside the controller (per NFPA 70). Safety disconnect shall be capable of being locked in the off position to follow lockout, tag out procedures.
- C. Power Wiring Conduit: Minimum of EMT utilizing fittings for damp locations such as apparatus wash down areas (per NFPA 70). Conduit shall be supported with a conduit strap every 10 ft. and within 3 feet of each box or termination, (per NFPA 70).
- D. Power Wiring from Supply Panel to OS-3: THHN stranded copper wire consisting of a flame retardant, heat-resistant thermoplastic insulation with a nylon jacket for abrasion, gas, and oil resistance and rated up to 600 volts or similar.
- E. Low Voltage Control Wiring: Minimum of a 16/2 multi-conductor cable to meet UL standards for the controller's low voltage field wiring.
- F. Low Voltage Control: Encased in a minimum of 1/2 inch EMT from the OS-3 Controller to the attic or building steel where it shall terminate with a EMT connector with a threaded plastic bushing. Conduit: Supported with a conduit strap every 10 feet and within 3 feet of each box or termination (per NFPA 70). The 16/2 multi-conductor cable shall be supported by the building structure and ran in a manner that the cable will not be damaged by normal building use (per

NFPA 70), securely fastening it with nylon tie wraps every 24 inches to 36 inches. Draping of the cable perpendicular to building steel or support members will be unacceptable.

- G. Power Wiring from OS-3 to Fan Motor: Minimum of EMT utilizing compression type fittings for damp locations such as apparatus wash down areas (per NFPA 70). Conduit shall be supported with a conduit strap every 10 ft. and within 3 ft. of each box or termination (per NFPA 70). Conduit shall extend through the outside wall through a hole of the proper size and terminate directly into the back of the safety disconnect with the appropriate connector and sealed with a silicon sealer or cement mortar. (Using fan model number, select appropriate wire from Table 1-1).
- H. Fan Safety Disconnect: Non-fusible, NEMA 3R rated for wet locations, mounted adjacent to the AMCA Certified blower. Safety disconnect shall be capable of being locked in the off and on position to follow lockout, tag out procedures (per NFPA 70).
- I. Liquid Tight Flexible Metal Conduit: UL listed liquid tight flexible metallic conduit (Sealtite). Conduit will encase the load wires and ground wire from the safety disconnect switch to the blower motor. Conduit length not to exceed 4 feet from disconnect to blower motor. The appropriate listed terminal fittings shall be used (per NFPA 70).
- J. Spark Resistant Blower: AMCA certified, designed and installed as a direct drive spark resistant blower. The motor shall meet current EPCA standards for energy savings. Fans utilizing belt drives and steel impellers will not be accepted.
- K. Optional Temperature Switch: One for each apparatus connected to the system. The temperature switch shall be of the snap disc type and adjustable from 90° F to 130° F. It shall be mounted on the ductwork or on the trolley by drilling a 1 inch hole, sealing the switch with silicone sealant and securing with 2 self drilling screws. Can be used in conjunction with the optional wireless control system. Electrical connection shall be made with terminals provided or solder less type such as Thomas & Betts part no. 14RB-2577.
- L. Pressure Switch: One for each apparatus connected to the system. The pressure switch shall operate at a maximum of 24VAC, pre-calibrated at 0.18 in. of water column.
 - 1. Mounting shall be accomplished by drilling a 3/8 inch hole into the aluminum rail profile and thread the hole with a 1/8 inch NPT tap, then thread the switch into the rail. For wireless systems, mounting shall be accomplished by drilling a 3/8 inch into the hose connection of the trolley and threading the switch into the hole.
 - 2. The electrical connections shall be made with a 0.020 inch by 0.187 inch female quick disconnect terminals, such as Thomas & Betts part no. 14RBD-18277.

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Plymovent Fan Component Sizing Table 1-1

Single Phase 1Ø

Plymovent Product Number	Motor Manufacturer *	HP Rating	Name Plate		2023 NEC Table 430.248 Amps	Wire Size THHN AWG	Length of Wire in Feet (Meters) Start to Finish		Circuit Breaker Size
			Voltage	FLA			From	To **	
FUA-1800-216	BALDOR	3/4	115	10	13.8	12	0	91 (27.7)	20A
			208-230	5.2-5	7.6-6.9	14	0	200 (61)	15A
FUA-2100-216	BALDOR	1	115	12	16	10	0	121 (36.8)	30A
			208-230	6.2-6	8.8-8	14	0	168 (51.2)	15A
FUA-2700-216	BALDOR	1.5	115	17	20	10	0	86 (26.2)	30A
			208-230	8.5	11-10	12	0	195 (59.4)	20A
TEV-359-216	BALDOR	2	115	20	24	10	0	73 (22.2)	30A
FUA-3000-216			208-230	11.4-10	13.2-12	12	0	145 (44.2)	20A
FUA-4700-216	BALDOR	3	230	13	17	10	0	224 (68.2)	30A
TEV-3110-216									
TEV-559-216	BALDOR	5	230	19.8	28	8	0	235 (71.6)	30A
TEV-585-216	BALDOR	7.5	208-230	36-32	44-40	8	0	117 (35.6)	50A
TEV-745-216	BALDOR	10	208	44	55	4	0	241 (73.4)	60A
			230	41.5	50	6	0	177 (53.9)	60A

Three Phase 3Ø

Plymovent Product No.	Motor Manufacturer	HP Rating	Name Plate		2023 NEC Table 430.250 Amps	Wire Size THHN AWG	Length of Wire in Feet (Meters) Start to Finish		Circuit Breaker Size
			Voltage	FLA			From	To *	
FUA-1800-536	BALDOR	3/4	208	2.5	3.5	14	0	482 (146.9)	15A
			230	2.4	3.2	14	0	555 (169.1)	15A
			460	1.2	1.6	14	0	2,222 (677.2)	15A
FUA-1800-636	BALDOR		575	1.3	1.3	14	0	2,564 (781.5)	15A
FUA-2100-536	BALDOR	1	230	3.2	4.2	14	0	416 (126.8)	15A
FUA-2100-636	BALDOR		460	1.6	2.1	14	0	1,666 (507.8)	15A
FUA-2700-536	BALDOR	1.5	575	1.2	1.7	14	0	2,777 (846.4)	15A
			208	4.4	6.6	14	0	274 (83.5)	15A
			230	4.05	6	14	0	329 (100.2)	15A
FUA-2700-636	BALDOR		460	2.05	3	14	0	1,300 (396.2)	15A
TEV-359-536 FUA-3000-536	BALDOR	2	575	1.6	2.4	14	0	2,083 (634.9)	15A
			208	5.2	7.5	14	0	231 (70.4)	15A
			230	4.8	6.8	14	0	277 (84.4)	15A
TEV-359-636 FUA-3000-636	BALDOR		460	2.4	3.4	14	0	1,111 (338.6)	15A
TEV-3110-536 FUA-4700-536	BALDOR	3	575	2	2.7	14	0	1,666 (507.8)	15A
			230	8	9.6	14	0	166 (50.5)	15A
			460	4	4.8	14	0	666 (203)	15A
TEV-3110-636 FUA-4700-636	BALDOR		575	3.05	3.9	14	0	1,092 (332.8)	15A
TEV-559-536	BALDOR	5	230	12	15.2	12	0	176 (53.6)	20A
			460	6	7.6	14	0	444 (135.3)	15A
			575	4.7	6.1	14	0	709 (216.1)	15A
TEV-559-636	BALDOR		230	18.4	22	10	0	183 (55.7)	30A
TEV-585-536	BALDOR	7.5	460	9.2	11	14	0	289 (88)	15A
TEV-585-636	BALDOR		575	7.4	9	14	0	450 (137.2)	15A
TEV-745-536	BALDOR	10	230	23.6	28	8	0	228 (69.5)	40A
			460	11.8	14	12	0	358 (109.1)	20A
			575	9.5	11	14	0	350 (106.7)	15A
TEV-745-636	BALDOR		230	35.5	42	6	0	240 (73.2)	60A
TEV-768-536	BALDOR	15	460	17.8	21	10	0	379 (115.5)	30A
TEV-768-636	BALDOR		575		17	10	0	0 ()	30A

*Note: Guidelines are subject to change without notice. Data supplied from our primary motor supplier. Please confirm at time of order. Plymovent assumes no liability for any electric installation, all local, city, and the 2023 National Electric Code must be followed. This chart is a minimum standard and to be used as a guideline only. Based on 3% voltage drop for branch circuits.

**Note: If distance is longer than the distance shown in the table, calculate for voltage drop per 2023 NEC.

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2.17 AIR MOVING DEVICES

- A. Centrifugal Fans: Direct drive centrifugal type, high pressure, single width, single inlet as required or indicated. Impeller Wheels: Radial design or backward incline for performance, spark resistant and made of a non ferrous material to prevent static electricity build up. The impeller shall be dynamically and statically balanced and of the non-overloading type to provide maximum efficiency while achieving quiet, vibration-free operation. The fan housing shall be manufactured from a epoxy powder coated galvanized steel or nonferrous material. The outlet configuration shall be top horizontal, bottom horizontal, or upblast. The housing shall be capable of field reconfiguration in the event the mounting position needs to be changed for unforeseen reasons. The exhaust discharge outlet shall be in compliance with IMC and ACGIH recommendations (min. of 36 inches above roofline). Air intakes, windows, cascade systems, prevailing currents, communication equipment and building aesthetics shall be considered in the final location of the fan.
- B. For aesthetic reasons the fan motor and assembly shall be mounted on an epoxy powder coated galvanized steel mounting base to prevent rust stains on the exterior of the building. Belt driven fans are unacceptable due to maintenance reasons and the potential for the fan to be left non-operational without warning.
- C. Fan Motor and Bearing: All 1/2 horsepower to 15 horsepower motors shall be totally enclosed fan cooled (TEFC) continuous duty rated. The motors shall be dual voltage where applicable. Motors shall comply with the government mandated "Energy Policy and Conservation Act" (EPCA) as outlined by the Department of Energy. The bearings shall be self-aligned, ball bearing type permanently sealed and lubricated.
- D. Performance: Lengths of ductwork, hoses, elbows, branches, wyes, etc. which increase the static pressure of the system, shall be taken into account to properly size the fan. The delivered volume shall be calculated taking into account the static regain of the vehicles engine exhaust (based on a virtually airtight connection at the tailpipe). The manufacturer's provided fan(s) shall be performance guaranteed by AMCA certification.
 - 1. Required Fan Capacity: The Fan Capacity shall be sized as such as to deliver the required CFM at each hose drop to which the vehicle is attached.
 - a. The 4 inch hose system shall be designed to deliver a minimum of 340 CFM at a velocity of 4500 FPM at the hose and nozzle connection.
 - b. The 5 inch hose system shall be designed to deliver a minimum of 540 CFM at a velocity of 4500 FPM at the hose and nozzle connection.
- E. Location: The preferable fan location shall be on the outside of the fire station as far away from any living quarters as possible so that firefighters would not be disturbed by the system activation. No blower fans shall be mounted inside the

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fire station. Silencers shall be provided when fan sound pressure level exceeds 64 dBA.

2.18 DUCTWORK SYSTEM

- A. Ductwork Type and Materials: UMC Class 2 or SMACNA Class II product conveying duct, meet or exceed criteria for construction and performance as outlined in ANSI/SMACNA 005. Materials of construction unless otherwise specified for all ductwork and fittings shall be a minimum G-90 galvanized sheet metal (ASTM A653/A653M). Only when specified, Type 304 stainless steel (ASTM A240/A240M) shall be provided.
- B. Ductwork Sizing and Gauges: Round pipe construction, with the range of available sizes not to exceed 16 inches in diameter. Duct gauge shall depend on diameter and a minimum operating pressure of 8 inches of water gauge. Acceptable Gauge and Reinforcement Requirements: Inner duct diameter 4 inches through 11 inches diameter shall be 22 gauge standard pipe (IMC).
- C. Ductwork Fittings: Round and have a wall thickness 2 gauges (one even gauge number) heavier than the lightest allowable gauge of the downstream section of duct to which they are connected (IMC). Air Duct Branch Entrances: Factory fabricated fittings or factory fabricated duct /tap assemblies. Fittings: Constructed so that air streams converge at angles no greater than 45 degree (IMC). All Seams: Continuous stitch welded and if necessary internally sealed to ensure air tightness. Turning elbows shall be stitch-welded and used for all diameters and pressures. They shall be fabricated of 24 gauge galvanized steel and constructed as two piece with continuous welded seam construction fittings similar to those provided by Lindab Inc. Tapered Body Fittings: Used wherever particular fallout is anticipated and where air flow is introduced to the transport duct manifold.
- D. Ductwork Design Velocities: Minimum of 3500 FPM to 4000 FPM transport velocity. Capture Velocity: 4500 FPM to 5500 FPM to extract virtually 100 percent of the exhaust gases.
- E. External Ductwork: Sized for the exact inlet and outlet of the exhaust fan blower. An exhaust rain cap shall be supplied and manufactured in accordance with EPA standard for free draft rain cap requirements. Included as an integral part of this rain cap shall be a back draft damper to provide protection from rain and other inclement weather.
- F. Exhaust Penetrations: The core drilling shall be properly sized to reduce the diameter of the opening to the smallest possible size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, service-utility connections, and other

conditions affecting installation and performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

- B. Project Site Conditions: Verify dimensions installation areas by field measurements.

3.2 PREPARATION

- A. Provide surface/substrate preparation as required by the manufacturer's printed installation instructions. Do not proceed with installation is in proper condition to receive vehicle exhaust system installation.

3.3 INSTALLATION

- A. Install vehicle exhaust system in accord with manufacturer's written instructions, original design and referenced standards.

3.4 ADJUSTING

- A. Adjust vehicle exhaust system for proper operation. Replace any parts that prevent the system from operating properly.

3.5 TRAINING

- A. Provide training to fire department personnel in the daily use and maintenance of the vehicle exhaust removal system that has been installed and specified herein.
- B. Training shall be for all personnel involved with the operation of the exhaust removal system to include all shifts required to man the particular facility.
- C. Provide training to all shifts during their normal shift period.
- D. The fire department shall be notified at least 7 days prior to the date scheduled for the training course.
- E. The training session shall be performed in person by a recognized representative of the manufacturer of the exhaust removal system. In addition, a training video shall be provided to the fire department.

3.6 CLEANING AND PROTECTION

- A. Remove all debris caused by installation of the vehicle exhaust system. Clean all exposed surfaces to as fabricated condition and appearance.
- B. Provide protection of the completed installation until completion of the Project. Repair any damage at no additional cost to Owner.
- C. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

SECTION 23 81 29**VARIABLE REFRIGERANT FLOW HVAC SYSTEMS****PART 1 - GENERAL****1.1 DESCRIPTION**

A. Work Included: Provide complete VRF HVAC system(s) which may include, but are not limited to, the following components.

1. Indoor, concealed, ceiling-mounted units for ducting.
2. Indoor, concealed, multi-position units for ducting.
3. Indoor, concealed, floor-mounted units for ducting.
4. Indoor, exposed, floor-mounted units.
5. Indoor, exposed, wall-mounted units.
6. Indoor, recessed, ceiling-mounted units with 33" x 33" grilles.
7. Indoor, recessed, ceiling-mounted units with 24" x 24" grilles.
8. Indoor, recessed, one-way ceiling-mounted units.
9. Indoor, suspended, ceiling-mounted units.
10. Indoor, heat recovery control units (HRCUs).
11. Outdoor, air-source heat recovery units.
12. VRF system controls.
13. VRF system refrigerant and oil.
14. VRF system condensate drain piping.
15. VRF system refrigerant piping.
16. VRF system control cable.

B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Nationally recognized manufacturer of VRF HVAC systems and products.

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2. Shipped VRF HVAC systems with similar requirements to local market for a continuous period of ten (10) years within time of bid.
 3. VRF HVAC systems and products that have been successfully tested and in use on at least five completed projects.
 4. Having full-time in-house employees for the following:
 - a. Product and application engineering.
 - b. Technical support for system installation training, startup, commissioning, and troubleshooting of installations.
 - c. Owner training.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by VRF HVAC system manufacturer.
1. Each employee shall be certified to have successfully completed manufacturer training for proper installation of systems, including, but not limited to, equipment, piping, controls, and accessories indicated and furnished for installation.
 2. Installer certificate shall be valid and current for duration of Project.
 3. Retain copies of Installer certificates on-site and make available on request.
 4. Each person assigned to Project shall have demonstrated past experience.
 - a. Demonstrated past experience with VRF products being installed for period within three consecutive years before time of bid.
 - b. Demonstrated past experience on five projects of similar VRF system complexity, scope, and value.
- C. ISO Compliance: System equipment and components furnished by VRF HVAC system manufacturer shall be manufactured in an ISO 9001 and ISO 14001 facility.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in a clean and dry place. Protect products from weather, dirt, dust, water, construction debris, and physical damage.
1. Retain factory-applied coverings on equipment to protect finishes during construction and remove just prior to operating unit.
- B. Cover unit openings before installation to prevent dirt and dust from entering inside of units. If required to remove coverings during unit installation, reapply coverings over openings after unit installation and remove just prior to operating unit.

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- C. Comply with manufacturer's written rigging and installation instructions for unloading and moving to final installed location.

1.4 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace equipment and components that fail(s) in materials or workmanship within specified warranty period
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period:
 - a. For Compressor, ten (10) year(s) from date of Substantial Completion.
 - b. For Parts, ten (10) year(s) from date of Substantial Completion.
- B. Installer's Labor Warranty: Installer agrees to repair or replace equipment and components that fail(s) in materials or workmanship within one (1) year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 VRF HVAC SYSTEMS

- A. Manufacturers: Basis of design is CITY MULTI. Subject to compliance with requirements, provide products by one of the following brands only.
 - 1. Mitsubishi Electric & Electronics USA, Inc.
 - 2. Trane, Inc.
 - 3. Daikin Applied.

2.2 SYSTEM DESCRIPTION

- A. VRF HVAC system(s) with variable capacity in response to varying cooling and heating loads. System shall consist of multiple indoor units, HRCUs outdoor unit(s), piping, controls, and electrical power to make complete operating system(s) complying with requirements indicated.
 - 1. System(s) operation being heat pump or heat recovery as indicated on Drawings.

2. Each system with one refrigerant circuit serving all indoor units connected to system.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. AHRI Compliance: System and equipment performance certified according to AHRI 1230-2023.
- D. UL Compliance: Comply with UL 60335-2-40.

2.3 INDOOR, CONCEALED, CEILING-MOUNTED UNITS FOR DUCTING

- A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.
- B. Cabinet:
 1. Material: Galvanized steel.
 2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
 3. Duct Connections: Extended collar or flange, or designated exterior cabinet surface, designed for attaching field-installed ductwork.
 4. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.
- C. Coil Assembly:
 1. Coil Casing: Aluminum, galvanized, or stainless steel.
 2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
 3. Coil Tubes: Copper, of diameter and thickness required by performance.
 4. Capacity Control: DX coil by electronic modulating type valve with linear or proportional characteristics. Hydronic coil by modulating control valve.
 5. Unit Internal Tubing: Copper tubing with brazed joints.
 6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
 7. Factory Charge: Dehydrated air or nitrogen.
 8. Testing: Factory pressure tested and verified to be without leaks.

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D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Unit-mounted lifting mechanism, capable of lifting drain water to an elevation above top of cabinet (sizes 54 and smaller only).
3. Field Piping Connection: Non-ferrous material.

E. Fan and Motor Assembly:

1. Fan(s):
 - a. Direct-drive arrangement.
 - b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
 - c. Fabricated from non-ferrous components or ferrous components with corrosion-resistant finish.
 - d. Wheels statically and dynamically balanced.
2. Motor: PSC, Brushless DC or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
5. External Static Settings: Vary based on Low, Medium, or High Static models. Models as shown on Drawings
 - a. Low Static settings include 0.02, 0.06, 0.14, or 0.20" WG.
 - b. Medium Static settings include 0.14, 0.20, 0.28, 0.40, or 0.60" WG.
 - c. High Static settings include 0.40 or 1.00" WG for 208V and 0.60 or 1.00" WG for 230V.
6. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Bottom, side, or rear to accommodate field installation and replacement without need for tools.
2. Media: Poly Propylene Honeycomb Fabric (Washable) with Low and Medium Static models.

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G. Field-Installed Unit Accessories:

1. Side-access filter box with one set MERV 13 Filter.
2. Condensate pump capable of at least 10 feet of lift.

H. Unit Controls:

1. Factory-Installed Sensors:

- a. Unit inlet air temperature.
- b. Coil entering refrigerant temperature.
- c. Coil leaving refrigerant temperature.

2. Interlocked Control Sequence: Four digital inputs and three digital outputs for use in defined or customizable interlock sequences; relay adapter kits may be required. Required interlock sequence(s) include the following.

- a. Backup heat control.
- b. On/off control.
- c. On/off and fault status.
- d. Mode and fan status.
- e. Indoor unit float switch connection.
- f. Branch controller float switch connection.
- g. Fan speed control.
- h. Forced fan operation.

3. Features and Functions:

- a. Self-diagnostics.
- b. Time delay.
- c. Auto-restart.
- d. External static pressure control.
- e. Auto operation mode.
- f. Manual operation mode.
- g. Filter service notification.

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- h. Drain assembly high water level safety shutdown and notification.
 - i. Run test switch.
 - I. Unit Electrical:
 - 1. Field Connection: Single point connection to power unit and integral controls.
 - 2. Disconnecting Means: Field-installed circuit breaker or switch.
- 2.4 INDOOR, CONCEALED, MULTI-POSITION UNITS FOR DUCTING
 - A. Description: Factory-assembled complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.
 - B. Cabinet:
 - 1. Material: Painted steel.
 - 2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
 - 3. Duct Connections: Extended collar or flange, or designated exterior cabinet surface, designed for attaching field-installed ductwork.
 - 4. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.
 - C. Coil Assembly:
 - 1. Coil Casing: Aluminum, galvanized, or stainless steel.
 - 2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
 - 3. Coil Tubes: Copper, of diameter and thickness required by performance.
 - 4. Capacity Control: DX coil by electronic modulating type valve with linear or proportional characteristics.
 - 5. Unit Internal Tubing: Copper tubing with brazed joints.
 - 6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
 - 7. Factory Charge: Dehydrated air or nitrogen.
 - 8. Testing: Factory pressure tested and verified to be without leaks.

- D. Drain Assembly:
1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
 2. Condensate Removal: Gravity.
 - a. If a floor drain is not available at unit, provide unit with field-installed condensate pump accessory.
 3. Field Piping Connection: Non-ferrous material.
- E. Fan and Motor Assembly:
1. Fan(s):
 - a. Direct-drive arrangement.
 - b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
 - c. Fabricated from non-ferrous components or ferrous components with corrosion-resistant finish.
 - d. Wheels statically and dynamically balanced.
 2. Motor: Brushless DC or electronically commutated with permanently lubricated bearings.
 3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
 4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
 5. External Static Settings: 0.30, 0.50, or 0.80" WG.
 6. Vibration Control: Integral isolation to dampen vibration transmission.
- F. Filter Assembly:
1. Access: Front to accommodate field installation and replacement without need for tools.
 2. Media: Poly Propylene Honeycomb Fabric (Washable).
- G. Field-Installed Unit Accessories:
1. Condensate pump capable of at least 10 feet of lift with drain pan level sensor and overflow switch.
 2. Relay interlock control kit allowing for interlock per Unit Controls H-4a.

H. Unit Controls:

1. Factory-Installed Sensors:
 - a. Unit inlet air temperature.
 - b. Coil entering refrigerant temperature.
 - c. Coil leaving refrigerant temperature.
2. Interlocked control sequence: Four digital inputs and three digital outputs for use in defined or customizable interlock sequences; relay adapter kits may be required. Required interlock sequence(s) include the following.
 - a. backup heat control.
 - b. humidifier control.
 - c. on/off control.
 - d. on/off and fault status.
 - e. mode and fan status.
 - f. indoor unit float switch connection.
 - g. branch controller float switch connection.
 - h. fan speed control.
 - i. forced fan operation.
3. Features and Functions:
 - a. Self-diagnostics.
 - b. Time delay.
 - c. Auto-restart.
 - d. External static pressure control.
 - e. Auto operation mode.
 - f. Manual operation mode.
 - g. Filter service notification.
 - h. Drain assembly high water level safety shutdown and notification.
 - i. Run test switch.

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I. Unit Electrical:

1. Field Connection: Single point connection to power unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch.

2.5 INDOOR, CONCEALED, FLOOR-MOUNTED UNITS FOR DUCTING

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

1. Material: Galvanized steel.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Duct Connections: Extended collar or flange, or designated exterior cabinet surface, designed for attaching field-installed ductwork.
4. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Capacity Control: DX coil by electronic modulating type valve with linear or proportional characteristics. Hydronic coil by modulating control valve.
5. Unit Internal Tubing: Copper tubing with brazed joints.
6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Factory Charge: Dehydrated air or nitrogen.
8. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.

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2. Condensate Removal: Gravity. If a floor drain is not available at unit, provide unit with field-installed condensate pump accessory.
 3. Field Piping Connection: Non-ferrous material.
- E. Fan and Motor Assembly:
1. Fan(s):
 - a. Direct-drive arrangement.
 - b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
 - c. Materials: Non-ferrous components or ferrous components with corrosion resistant finish.
 - d. Statically and dynamically balanced.
 2. Motor: PSC, Brushless DC or electronically commutated with permanently lubricated bearings.
 3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
 4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
 5. External Static Settings: Non-adjustable, supply grille and return grille openings should have free area equal to or greater than opening sizes on units and total external pressure drop be no more than 0.10" WG.
 6. Vibration Control: Integral isolation to dampen vibration transmission.
- F. Filter Assembly:
1. Access: Bottom, front to accommodate replacement without need for tools.
 2. Media: Washable screen.
- G. Field-Installed Unit Accessories: Condensate pump capable of at least 10 feet of lift with drain pan level sensor and overflow switch.
- H. Unit Controls:
1. Factory-Installed Sensors:
 - a. Unit inlet air temperature.
 - b. Coil entering refrigerant temperature.
 - c. Coil leaving refrigerant temperature.

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2. Interlock control sequence: Four digital inputs and three digital outputs for use in defined or customizable interlock sequences; relay adapter kits may be required. Required interlock sequence(s) include-
 - a. backup heat control.
 - b. humidifier control.
 - c. on/off control.
 - d. on/off and fault status.
 - e. mode and fan status.
 - f. branch controller float switch connection.
 - g. fan speed control.
 - h. forced fan operation.
3. Features and Functions:
 - a. Self-diagnostics.
 - b. Time delay, auto-restart.
 - c. Auto operation mode.
 - d. Manual operation mode.
 - e. Filter service notification.
 - f. Run test switch.

I. Unit Electrical:

1. Field Connection: Single point connection to power unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch.

2.6 INDOOR, EXPOSED, FLOOR-MOUNTED UNITS

- A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.
- B. Cabinet:
 1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.

2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
 3. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.
- C. Coil Assembly:
1. Coil Casing: Aluminum, galvanized, or stainless steel.
 2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
 3. Coil Tubes: Copper, of diameter and thickness required by performance.
 4. Capacity Control: DX coil by electronic modulating type valve with linear or proportional characteristics. Hydronic coil by modulating control valve.
 5. Unit Internal Tubing: Copper tubing with brazed joints.
 6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
 7. Factory Charge: Dehydrated air or nitrogen.
 8. Testing: Factory pressure tested and verified to be without leaks.
- D. Drain Assembly:
1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
 2. Condensate Removal: Gravity. If a floor drain is not available at unit, provide unit with field-installed condensate pump accessory.
 3. Field Piping Connection: Non-ferrous material.
- E. Fan and Motor Assembly:
1. Fan(s):
 - a. Direct-drive arrangement.
 - b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
 - c. Materials: Non-ferrous components or ferrous components with corrosion-resistant finish.
 - d. Statically and dynamically balanced.

2. Motor: PSC, Brushless DC or electronically commutated with permanently lubricated bearings.
 3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
 4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
 5. Vibration Control: Integral isolation to dampen vibration transmission.
- F. Filter Assembly:
1. Access: Front, to accommodate filter replacement without the need for tools.
 2. Media: Washable screen.
- G. Grille Assembly: Manufacturer's standard discharge grille mounted in top of unit cabinet.
- H. Field-Installed Unit Accessories: Condensate pump capable of at least 10 feet of lift with drain pan level sensor and overflow switch.
- I. Unit Controls:
1. Factory-Installed Sensors:
 - a. Unit inlet air temperature.
 - b. Coil entering refrigerant temperature.
 - c. Coil leaving refrigerant temperature.
 2. Interlock control sequence: Four digital inputs and three digital outputs for use in defined or customizable interlock sequences; relay adapter kits may be required. Required interlock sequence(s) include the following.
 - a. Backup heat control.
 - b. Humidifier control.
 - c. On/off control.
 - d. On/off and fault status.
 - e. Mode and fan status.
 - f. Indoor unit float switch connection.
 - g. Branch controller float switch connection.

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- h. Fan speed control.
 - i. Forced fan operation.
 - 3. Features and Functions:
 - a. Self-diagnostics.
 - b. Time delay.
 - c. Auto-restart.
 - d. Auto operation mode.
 - e. Manual operation mode.
 - f. Filter service notification.
 - g. Run test switch.
 - J. Unit Electrical:
 - 1. Field Connection: Single point connection to power entire unit and integral controls.
 - 2. Disconnecting Means: Field-installed circuit breaker or switch.
- 2.7 INDOOR, EXPOSED, WALL-MOUNTED UNITS
 - A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.
 - B. Cabinet:
 - 1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
 - 2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
 - 3. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.
 - C. Coil Assembly:
 - 1. Coil Casing: Aluminum, galvanized, or stainless steel.
 - 2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.

3. Coil Tubes: Copper, of diameter and thickness required by performance.
 4. Capacity Control: DX coil by electronic modulating type valve with linear or proportional characteristics. Hydronic coil by modulating control valve.
 5. Unit Internal Tubing: Copper tubing with brazed joints.
 6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
 7. Factory Charge: Dehydrated air or nitrogen.
 8. Testing: Factory pressure tested and verified to be without leaks.
- D. Drain Assembly:
1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
 2. Condensate Removal: Gravity. If a floor drain is not available at unit, provide unit with field-installed condensate pump accessory.
 3. Field Piping Connection: Non-ferrous material.
- E. Fan and Motor Assembly:
1. Fan(s):
 - a. Direct-drive arrangement.
 - b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
 - c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
 - d. Wheels statically and dynamically balanced.
 2. Motor: Brushless DC or electronically commutated with permanently lubricated bearings.
 3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
 4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
 5. Vibration Control: Integral isolation to dampen vibration transmission.

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- F. Filter Assembly:
1. Access: Front, to accommodate filter replacement without the need for tools.
 2. Media: Manufacturer's standard washable filter with antimicrobial treatment.
- G. Grille Assembly: Manufacturer's standard discharge grille within front face of unit cabinet.
1. Motorized Vane: Adjustable or oscillating flow pattern.
- H. Field-Installed Unit Accessories: Condensate pump for mounting inside wall cavity and capable of at least 10 feet of lift with drain pan level sensor and overflow switch.
- I. Unit Controls:
1. Factory-Installed Sensors:
 - a. Unit inlet air temperature.
 - b. Coil entering refrigerant temperature.
 - c. Coil leaving refrigerant temperature.
 2. Interlock control sequence: Four digital inputs and three digital outputs for use in defined or customizable interlock sequences; relay adapter kits may be required. Required interlock sequence(s) include the following.
 - a. Backup heat control.
 - b. Humidifier control.
 - c. On/off control.
 - d. On/off and fault status.
 - e. Mode and fan status.
 - f. Indoor unit float switch connection.
 - g. Branch controller float switch connection.
 - h. Fan speed control.
 - i. Forced fan operation.
 3. Features and Functions:
 - a. Self-diagnostics.

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- b. Time delay.
- c. Auto-restart.
- d. Auto operation mode.
- e. Manual operation mode.
- f. Filter service notification.
- g. Run test switch.
- J. Unit Electrical:
 - 1. Field Connection: Single point connection to power entire unit and integral controls.
 - 2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.8 INDOOR, RECESSED, CEILING-MOUNTED UNITS WITH 33" x 33" GRILLES

- A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.
- B. Cabinet:
 - 1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
 - 2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
 - 3. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.
- C. Coil Assembly:
 - 1. Coil Casing: Aluminum, galvanized, or stainless steel.
 - 2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
 - 3. Coil Tubes: Copper, of diameter and thickness required by performance.
 - 4. Capacity Control: DX coil by electronic modulating type valve with linear or proportional characteristics. Hydronic coil by modulating control valve.
 - 5. Internal Tubing: Copper tubing with brazed joints.

6. Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
 7. Factory Charge: Dehydrated air or nitrogen.
 8. Testing: Factory pressure tested and verified to be without leaks.
- D. Drain Assembly:
1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
 2. Condensate Removal: Unit-mounted integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.
 3. Field Piping Connection: Non-ferrous material.
- E. Fan and Motor Assembly:
1. Fan(s):
 - a. Direct-drive arrangement.
 - b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
 - c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
 - d. Wheels statically and dynamically balanced.
 2. Motor: Brushless DC or electronically commutated with permanently lubricated bearings.
 3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
 4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
 - a. Airflow volume shall vary based on three unit height settings.
 5. Vibration Control: Integral isolation to dampen vibration transmission.
- F. Filter Assembly:
1. Access: Bottom, to accommodate filter replacement without the need for tools.
 2. Media: Washable screen.

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- G. Return/Discharge-Air Grille Assembly: Attached to bottom of unit cabinet.
1. Discharge Pattern: Include accessory air outlet shutter plates as required for two, three, or four-way throw as indicated on Drawings.
 - a. Discharge Pattern Adjustment: Field-adjustable settings for up and down range of motion.
 - b. Discharge Pattern Closure: Ability to close individual discharges of units with multiple patterns using wall-mounted controller.
 2. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.
 3. Alternate Branch Supply Duct Connection: Sheet metal knockout for optional connection to one supply branch duct as shown on Drawings. Utilize accessory air outlet shutter plate with branch ducting.
- H. Integral Occupant and Location Detection: Unit includes occupant and location detection for automatic air distribution and energy saving setback control in the following manner.
1. Air Distribution:
 - a. Default Distribution Operation: Integral occupant and location detection will not be utilized to control air distribution. During COOL mode, vanes move to horizontal airflow direction. During HEAT mode, vanes move to down airflow direction.
 - b. Direct/Indirect Distribution: Vanes automatically move relative to the quadrant(s) where persons are detected.
 - c. Area Temperature Distribution: Vanes move to down airflow direction toward areas with a high floor temperature during COOL mode and toward areas with a low floor temperature during HEAT mode. Otherwise, vanes move to the horizontal airflow direction.
 2. Energy Saving:
 - a. Default Energy Operation: Integral occupant and location detection will not be utilized to automatically enable setback or mode changes. Set point and setback and mode determined by wall controller or central control when provided.
 - b. No Occupancy-Based Energy Save: If there are no persons in the room for 60 minutes or more, energy saving operation (setback) equal to 4°F is performed.
 - c. Room Occupancy-Based Energy Save: If occupancy rate decreases to approximately 30% of the maximum occupancy rate, energy saving operation (setback) equal to 2°F is performed.

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- d. No Occupancy Auto-OFF: If no persons are in the room for set amount of time (60–180 minutes), MODE is automatically changed (OFF, COOL, or HEAT).
- I. Outdoor Air Ventilation Connection: Sheet metal knockout for connection to outdoor air ventilation duct per Drawings.
- J. Field-Installed Unit Accessories:
 - 1. Multi-function casement with MERV 10 filter element.
 - 2. Condensate pump capable of at least 10 feet of lift.
- K. Unit Controls:
 - 1. Factory-Installed Sensors:
 - a. Unit inlet air temperature.
 - b. Coil entering refrigerant temperature.
 - c. Coil leaving refrigerant temperature.
 - d. Room occupancy/location.
 - 2. Interlock Control Sequence: Four digital inputs and three digital outputs for use in defined or customizable interlock sequences; relay adapter kits may be required. Required interlock sequence(s) include the following.
 - a. Backup heat control.
 - b. Humidifier control.
 - c. On/off control.
 - d. On/off and fault status.
 - e. Mode and fan status.
 - f. Indoor unit float switch connection.
 - g. Branch controller float switch connection.
 - h. Fan speed control.
 - i. Forced fan operation.
 - 3. Features and Functions:
 - a. Integral occupancy and location sensor.
 - b. Time delay.

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- c. Auto-restart.
- d. Auto operation mode.
- e. Manual operation mode.
- f. Filter service notification.
- g. Drain assembly high water level safety shutdown and notification.
- h. Run test switch.

L. Unit Electrical:

- 1. Field Connection: Single point connection to power entire unit and integral controls.
- 2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.9 INDOOR, RECESSED, CEILING-MOUNTED UNITS WITH 24" x 24" GRILLES

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

- 1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
- 2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
- 3. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Coil Assembly:

- 1. Coil Casing: Aluminum, galvanized, or stainless steel.
- 2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
- 3. Coil Tubes: Copper, of diameter and thickness required by performance.
- 4. Capacity Control: DX coil by electronic modulating type valve with linear or proportional characteristics. Hydronic coil by modulating control valve.
- 5. Internal Tubing: Copper tubing with brazed joints.

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6. Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
 7. Factory Charge: Dehydrated air or nitrogen.
 8. Testing: Factory pressure tested and verified to be without leaks.
- D. Drain Assembly:
1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
 2. Condensate Removal: Unit-mounted integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.
 3. Field Piping Connection: Non-ferrous material.
- E. Fan and Motor Assembly:
1. Fan(s):
 - a. Direct-drive arrangement.
 - b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
 - c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
 - d. Wheels statically and dynamically balanced.
 2. Motor: Brushless DC or electronically commutated with permanently lubricated bearings.
 3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
 4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
 5. Vibration Control: Integral isolation to dampen vibration transmission.
- F. Filter Assembly:
1. Access: Bottom, to accommodate filter replacement without the need for tools.
 2. Media: Washable screen.
- G. Return/Discharge-Air Grille Assembly: Attached to bottom of unit cabinet.
1. Discharge Pattern: Four-way throw.

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- a. Discharge Pattern Adjustment: Field-adjustable settings for up and down range of motion for individual vanes. Provide Deluxe controller to enable configuration.
 - 2. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.
- H. Integral Occupant and Location Detection: Unit includes occupant and location detection for automatic air distribution and energy saving setback control in the following manner.
 - 1. Air Distribution:
 - a. Default Distribution Operation: Integral occupant and location detection will not be utilized to control air distribution. During COOL mode, vanes move to horizontal airflow direction. During HEAT mode, vanes move to down airflow direction.
 - b. Direct/Indirect: Vanes automatically move relative to the quadrant(s) where persons are detected.
 - c. Area: Vanes move to down airflow direction toward areas with a high floor temperature during COOL mode and toward areas with a low floor temperature during HEAT mode. Otherwise, vanes move to the horizontal airflow direction.
 - 2. Energy Saving:
 - a. Default Energy Operation: Integral occupant and location detection will not be utilized to automatically enable setback or mode changes. Set point and setback and mode determined by wall controller or central control when provided.
 - b. No Occupancy Energy Save: If there are no persons in the room for 60 minutes or more, energy saving operation (setback) equal to 4°F is performed.
 - c. Room Occupancy Energy Save: If occupancy rate decreases to approximately 30% of the maximum occupancy rate, energy saving operation (setback) equal to 2°F is performed.
 - d. No Occupancy Auto-OFF: If no persons are in the room for set amount of time (60–180 minutes), MODE is automatically changed (OFF, COOL, or HEAT).
- I. Outdoor Air Ventilation Connection: Sheet metal knockout for optional connection to outdoor air ventilation duct.
- J. Field-Installed Unit Accessories:
 - 1. Accessory grille with integral occupancy and location sensor.

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2. Condensate pump capable of at least 10 feet of lift.
- K. Unit Controls:
1. Factory-Installed Sensors:
 - a. Unit inlet air temperature.
 - b. Coil entering refrigerant temperature.
 - c. Coil leaving refrigerant temperature.
 2. Interlock Control Sequence: Four digital inputs and three digital outputs for use in defined or customizable interlock sequences; relay adapter kits may be required. Required interlock sequence(s) include the following.
 - a. Backup heat control.
 - b. Humidifier control.
 - c. On/off control.
 - d. On/off and fault status.
 - e. Mode and fan status.
 - f. Indoor unit float switch connection.
 - g. Branch controller float switch connection.
 - h. Fan speed control.
 - i. Forced fan operation.
 3. Features and Functions:
 - a. Integral occupancy and location sensor.
 - b. Time delay.
 - c. Auto-restart.
 - d. Auto operation mode.
 - e. Manual operation mode.
 - f. Filter service notification.
 - g. Drain assembly high water level safety shutdown and notification.
 - h. Run test switch.

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L. Unit Electrical:

1. Field Connection: Single point connection to power entire unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.10 INDOOR, RECESSED, ONE-WAY CEILING-MOUNTED UNITS

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Capacity Control: DX coil by electronic modulating type valve with linear or proportional characteristics.
5. Internal Tubing: Copper tubing with brazed joints.
6. Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Factory Charge: Dehydrated air or nitrogen.
8. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.

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2. Condensate Removal: Unit-mounted integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.
 3. Field Piping Connection: Non-ferrous material.
- E. Fan and Motor Assembly:
1. Fan(s):
 - a. Direct-drive arrangement.
 - b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
 - c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
 - d. Wheels statically and dynamically balanced.
 2. Motor: PSC, Brushless DC or electronically commutated with permanently lubricated bearings.
 3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
 4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
 5. Vibration Control: Integral isolation to dampen vibration transmission.
- F. Filter Assembly:
1. Access: Bottom, to accommodate filter replacement without the need for tools.
 2. Media: Washable screen.
- G. Return/Discharge-Air Grille Assembly: Attached to bottom of unit cabinet.
1. Discharge Pattern: One-way throw.
 - a. Discharge Pattern Adjustment: Field-adjustable settings for up and down range of motion for individual vanes.
 2. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.
- H. Outdoor Air Ventilation Connection: Sheet metal knockout for optional connection to outdoor air ventilation duct.
- I. Field-Installed Unit Accessories: Condensate pump capable of at least 10 feet of lift.

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- J. Unit Controls:
1. Factory-Installed Sensors:
 - a. Unit inlet air temperature.
 - b. Coil entering refrigerant temperature.
 - c. Coil leaving refrigerant temperature.
 2. Interlock Control Sequence: Four digital inputs and three digital outputs for use in defined or customizable interlock sequences; relay adapter kits may be required. Required interlock sequence(s) include the following.
 - a. Backup heat control.
 - b. Humidifier control.
 - c. On/off control.
 - d. On/off and fault status.
 - e. Mode and fan status.
 - f. Indoor unit float switch connection.
 - g. Branch controller float switch connection.
 - h. Fan speed control.
 - i. Forced fan operation.
 3. Features and Functions:
 - a. Integral occupancy and location sensor.
 - b. Time delay.
 - c. Auto-restart.
 - d. Auto operation mode.
 - e. Manual operation mode.
 - f. Filter service notification.
 - g. Drain assembly high water level safety shutdown and notification.
 - h. Run test switch.

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K. Unit Electrical:

1. Field Connection: Single point connection to power entire unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.11 INDOOR, SUSPENDED, CEILING-MOUNTED UNITS

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

B. Cabinet:

1. Material: Painted or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Internal Tubing: Copper tubing with brazed joints.
6. Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Factory Charge: Dehydrated air or nitrogen.
8. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.

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2. Condensate Removal: Gravity. If a floor drain is not available at unit, provide unit with field-installed condensate pump accessory.
 3. Field Piping Connection: Non-ferrous material.
- E. Fan and Motor Assembly:
1. Fan(s):
 - a. Direct-drive arrangement.
 - b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
 - c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
 - d. Wheels statically and dynamically balanced.
 2. Motor: Brushless DC or electronically commutated with permanently lubricated bearings.
 3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
 4. Speed Settings and Control: Multiple or variable speed with speed setting adjustable via central or wall controllers when present.
 5. Vibration Control: Integral isolation to dampen vibration transmission.
- F. Filter Assembly:
1. Access: Bottom, to accommodate filter replacement without the need for tools.
 2. Media: Manufacturer's washable filter with antimicrobial treatment.
- G. Discharge-Air Grille Assembly: Mounted in front of unit cabinet.
1. Discharge Pattern: One-way throw.
 2. Discharge Pattern Adjustment: Field-adjustable limits for range of pattern.
 3. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.
- H. Return-Air Grille Assembly: Manufacturer's standard.
- I. Outdoor Air Ventilation Connection: Sheet metal knockout for optional connection to outdoor air ventilation duct.

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- J. Field-Installed Unit Accessories: Condensate pump capable of at least 10 feet of lift with drain pan level sensor and overflow switch.
- K. Unit Controls:
1. Factory-Installed Sensors:
 - a. Unit inlet air temperature.
 - b. Coil entering refrigerant temperature.
 - c. Coil leaving refrigerant temperature.
 2. Interlock Control Sequence: Four digital inputs and three digital outputs for use in defined or customizable interlock sequences; relay adapter kits may be required. Required interlock sequence(s) include the following.
 - a. Backup heat control.
 - b. Humidifier control.
 - c. On/off control.
 - d. On/off and fault status.
 - e. Mode and fan status.
 - f. Indoor unit float switch connection.
 - g. Branch controller float switch connection.
 - h. Fan speed control.
 - i. Forced fan operation.
 3. Features and Functions:
 - a. Time delay.
 - b. Auto-restart.
 - c. Auto operation mode.
 - d. Manual operation mode.
 - e. Filter service notification.
 - f. Drain assembly high water level safety shutdown and notification.
 - g. Run test switch.

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L. Unit Electrical:

1. Field Connection: Single point connection to power entire unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.12 INDOOR, HEAT RECOVERY CONTROL UNITS (HRCUs)

A. Description: Factory-assembled and tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

1. Specially designed for use in systems with simultaneous heating and cooling.
2. Systems shall include one or multiple units designed by variable refrigerant system manufacturer for field interconnection to make a single refrigeration circuit and multiple indoor units.
3. Units shall respond to calls for HEAT or COOL operation from indoor units by enabling refrigerant or water flow as equipment shown on Drawings require.
 - a. If flow direction from HRCU alternates, flow in COOL direction to units in HEAT mode during outdoor unit defrost sequence is not allowed.

B. Cabinet:

1. Galvanized-steel construction.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Internal Access:
 - a. Removable panels or hinged doors of adequate size.
 - b. Access to all internal components for inspection, cleaning, service, or replacement.

C. Drain Pan: If required by manufacturer's design, provide unit with non-ferrous drain pan with bottom sloped to a low point drain connection.

D. Assemblies and Specialties:

1. Specially designed by manufacturer for type of VRF HVAC system being installed, either two or three pipe.

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2. Each branch circuit shall have refrigerant and/or water control valve(s) to control flow.
3. Each branch port connection shall be fitted with an isolation valve to simplify service to any individual branch.

E. Unit Controls:

1. Factory-Installed Sensors:
 - a. Liquid inlet temperature.
 - b. Bypass exit area temperature.
 - c. Bypass outlet temperature.
 - d. Bypass inlet temperature.
 - e. High pressure sensor.
 - f. Medium pressure sensor.
2. Features and Functions: Self-diagnostics, fuse protection.

F. Unit Electrical:

1. Field Connection: Single point connection to power entire unit and integral controls.
2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.13 OUTDOOR, AIR-SOURCE HEAT RECOVERY UNITS

A. Description: Factory-assembled and tested complete unit designed for use in systems with simultaneous heating and cooling.

1. Systems shall consist of one unit, or multiple unit modules that are designed by variable refrigerant system manufacturer for field interconnection to make a single refrigeration circuit, heat recovery control unit(s), and multiple indoor units.

B. Cabinet:

1. Galvanized steel and coated with a corrosion-resistant finish.
 - a. Coating with documented salt spray test performance of 1000 hours according to ASTM B117 surface scratch test (SST) procedure.
2. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Compressor and Motor Assembly:

1. One or more positive-displacement, direct-drive and hermetically sealed scroll compressor(s) with inverter drive. Non-inverter compressors, where LRA applies, are not allowed.
2. Cold-Climate Compressor: Hot gas injection to allow increased compression ratio for extended periods without damage or excessive wear.
3. Protection: Integral protection against the following.
 - a. Refrigerant overcharge and undercharge.
 - b. High and low refrigerant pressure.
 - c. High refrigerant and oil temperature.
 - d. Liquid flood back.
 - e. Thermal and overload.
 - f. Voltage fluctuations.
 - g. Phase failure and phase reversal.
 - h. Short cycling.
4. Speed Control: Configurable to maintain refrigerant evaporating and condensing temperatures while varying refrigerant flow to satisfy cooling and heating loads.
 - a. Cooling mode fixed 32°F evaporator temperature.
 - b. Cooling mode fixed 43°F evaporator temperature.
 - c. Cooling mode variable 32-48°F evaporator temperature.
 - d. Heating mode high COP operation.
 - e. Heating mode high heating output operation.
5. Vibration Control: Integral isolation to dampen vibration transmission.
6. Oil Management: Timed sequence enabled during extended periods of reduced refrigerant flow to ensure proper lubrication over entire operating range. Sequences which rely on sensing oil level risk sensor failure or sensor placement not accounting for line length and are not allowed.
7. Crankcase heaters with integral control to maintain safe operating temperature.
8. Fusible plug.

- D. Heat-Exchanger Assembly: Documented salt spray test performance of 1000 hours according to ASTM B117 surface test (SST) procedure.
1. Plate Fin Coils:
 - a. Casing: Aluminum, galvanized, or stainless steel.
 - b. Fins: Aluminum or copper, mechanically bonded to tubes, with arrangement required by performance.
 - c. Tubes: Copper, of diameter and thickness required by performance.
 2. Zinc-Coated Aluminum Microchannel Coils:
 - a. Series of flat tubes containing a series of multiple, parallel flow microchannels layered between refrigerant header manifolds.
 - b. Construct fins, tubes, and header manifolds of aluminum alloy.
 - c. Provide coil panel heaters for heating operation below 0°F per Drawings.
- E. Heat-Exchanger Defrost Strategy:
1. Alternate methods based on ambient temperatures.
 - a. Hot-gas method to maximize efficiency during mild ambient temperatures. Method prolongs defrost sequence.
 - 1) Segmented coil (single-module systems) or alternating modules (twinned systems) to deliver simultaneous defrost and HEAT delivery indoors.
 - b. Reverse-cycle method to maximize comfort during extreme ambient temperatures. Method shortens defrost sequence.
 - 1) Leverage below 33.8°F for single-module systems and below 23°F for twinned systems to deliver shorter defrost cycles.
 2. Preheat Defrost Operation: Signal to indoor units operating in HEAT to increase space temperature before the start of defrost sequence.
- F. Heat-Exchanger Fan and Motor Assembly:
1. Fan(s): Propeller type.
 - a. Direct-drive arrangement.
 - b. Fabricated from non-ferrous components.

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- c. Statically and dynamically balanced.
- 2. Fan Guards: Removable safety guards complying with OSHA regulations. If using metal materials, coat with corrosion-resistant coating to match performance indicated for heat exchanger coil.
- 3. Motor(s): Brushless DC or electronically commutated with permanently lubricated bearings and rated for outdoor duty.
- 4. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
- G. Field-Installed Unit Accessories:
 - 1. Low Ambient Cooling Kit: Provide heat-exchanger coil wind deflectors and fan hood assembly for low ambient cooling operation to -10°F as indicated in Drawings.
 - 2. Snow/Hail Protection Kit: Provide heat exchanger coil guards and fan hoods to protect against hail damage.
 - 3. Refrigerant Filter/Cleaning System: Replaceable filter core in bypass arrangement from main suction flow to enhance installation quality assurance.
- H. Unit Controls:
 - 1. Enclosure: Manufacturer's standard, and suitable for unprotected outdoor locations.
 - 2. Factory-Installed Controller: Configurable digital control.
 - 3. Factory-Installed Sensors:
 - a. Refrigerant suction temperature.
 - b. Refrigerant discharge temperature.
 - c. Outdoor air temperature.
 - d. Refrigerant high pressure.
 - e. Refrigerant low pressure.
 - 4. Features and Functions: Self-diagnostics, time delay, auto-restart.
 - 5. Interlock control sequence: Customizable operation based on external input or contact closure. Required interlock sequence(s) include the following.
 - a. Multi-stage demand limit.

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- b. Low noise (nighttime) limit.
 - c. Lock COOL or HEAT mode.
 - d. Compressor on/off and fault status.
- I. Unit Electrical:
 - 1. Field Connection: Single point connection to power each unit module and integral controls.
 - 2. Disconnecting Means: Field-installed circuit breaker or switch, complying with NFPA 70.

2.14 VRF SYSTEM CONTROLS

- A. General Requirements:
 - 1. Network: Indoor units, HRCUs, and outdoor units shall include integral controls and connect through a manufacturer-selected control network.
 - 2. Network Communication Protocol: Manufacturer proprietary control communication between interconnected units.
 - 3. Integration with Building Automation System: ASHRAE 135, BACnet IP and certified by BACnet Testing Lab (BTL), including the following.
 - a. Ethernet connection via RJ-45 connectors and port with transmission at 100 Mbps or higher.
 - b. Integration shall include control, monitoring, scheduling, change of value notifications.
 - 4. Operator Interface:
 - a. Operators shall interface with system and unit controls through the following:
 - 1) Operator interfaces integral to controllers.
 - 2) Manufacturer-provided central controller.
 - 3) Integration with Building Automation System.
 - 4) Secure-cloud access through web browser software with 1-year prepaid service subscription, provide a separate quote for this item.
 - b. Users shall be capable of interface with controllers for indoor units' control to extent privileges are enabled. Control features available to users shall include the following:

- 1) On/off control.
 - 2) Temperature set-point adjustment.
 - 3) Fan speed control.
- c. Interface via secure-cloud access shall allow downloading of system diagnostic information, viewable system diagnostic charts, and email notification of error codes.
- B. VRF HVAC System Operator Interface via PC:
1. Central controller(s) connected local-area-network shall be accessible through standard web browser software requiring no manufacturer-specific software be installed on owner-furnished PC.
 2. Browser interface shall provide operator with a graphic user interface to allow monitoring and control of multiple central controllers from a single device location through point-and-click mouse exchange.
 3. Plan views shall show building plans with location of indoor units and identification superimposed on plans.
 4. Controls operation mode of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units. Operation modes available through central controller shall match those operation modes of controllers for indoor units.
 5. Schedules operation of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units. Schedules daily, weekly, and annual events.
 6. Changes operating set points of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units.
 7. Night setback feature to operate indoor units at energy-conserving heating and cooling temperature set-points during unoccupied periods.
 8. Supports Multiple Languages: English, French, or Spanish.
 9. Supports imperial and metric temperature units.
 10. Displays service notifications and error codes.
 11. Monitors and displays cumulative operating time of indoor units.
 12. Able to disable and enable operation of individual controllers for indoor units.
 13. Information displayed on individual controllers shall also be available for display.

C. Central Controllers:

1. Centralized control for all indoor and outdoor units from a single central controller location.
 - a. Include multiple interconnected controllers as required.
 - b. Include backlit, high-resolution color display touch panel.
2. Controls operation mode of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units. Operation modes available through central controller shall match those operation modes of controllers for indoor units.
3. Schedule operation of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units.
 - a. Sets schedule for daily, weekly, and annual events.
 - b. Schedule options available through central controller shall at least include the schedule options of controllers for indoor units.
4. Changes operating set points of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units.
5. Optimized start feature to start indoor units before scheduled time to reach temperature set-point at scheduled time based on operating history.
6. Night setback feature to operate indoor units at energy-conserving heating and cooling temperature set-points during unoccupied periods.
7. Able to disable and enable operation of individual controllers for indoor units.
8. Information displayed on individual controllers shall also be available for display through central controller.
9. Multiple RJ-45 ports for direct connection to a local PC and an Ethernet network switch.
10. Start/stop control capability for third-party equipment as required.
11. Accessory recess-mount case (for use in 3-1/2" wall cavity).

D. Wired Controllers and Sensors for Indoor Units:

1. Simple Controllers for Indoor Units:
 - a. Single controller capable of controlling multiple indoor units as group.
 - b. Integral room temperature sensor.

- c. Temperature Units: Fahrenheit and Celsius.
 - d. On/Off: Turns indoor unit on or off.
 - e. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only.
 - f. Temperature Display and Set-Point: Separate set points for Cooling, Heating. Adjustable in 1-degree Fahrenheit increments between.
 - g. Fan Speed Setting: Select between available options furnished with unit.
 - h. Airflow Direction Setting: If applicable to indoor unit style, select between available options furnished with the unit.
 - i. Service Notification Display: "Filter".
 - j. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
 - k. Low-voltage power required for controller shall be powered through non-polar connections to indoor unit.
2. Conventional Thermostat Interface and Thermostat:
- a. Provide 24V transformer to power thermostat where required.
 - b. Indoor Unit Modes: COOL, HEAT, FAN, and OFF (AUTO function only at thermostat level).
 - c. Three Input Terminals to Control Fan Speed Control:
 - 1) High.
 - 2) Medium.
 - 3) Low.
 - d. Auto recovery after power failure.
 - e. Limits central control (when present) to monitoring mode status and error alarm only.

2.15 VRF SYSTEM REFRIGERANT AND OIL

- A. Refrigerant: As required by VRF HVAC system manufacturer for system to comply with performance requirements indicated.
 - 1. ASHRAE 34, Class A2L refrigerant classification.
 - 2. R-32.

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- B. Oil: As required by VRF HVAC system manufacturer and to comply with performance requirements indicated.

2.16 VRF SYSTEM CONDENSATE DRAIN PIPING

- A. If more than one material is listed, material selection is Contractor's option.
- B. Copper Tubing:
 - 1. Drawn-Temper Tubing: According to ASTM B88 Type M.
 - 2. Wrought-Copper Fittings: ASME B16.22.
 - 3. Wrought-Copper Unions: ASME B16.22.
 - 4. Solder Filler Metals: ASTM B32, lead-free alloys, and water-flushable flux according to ASTM B813.
- C. Reducers: Where applied to piping connected to unit-mounted integral lifting mechanism, only eccentric reducers oriented horizontally are allowed.

2.17 VRF SYSTEM REFRIGERANT PIPING

- A. Refrigerant Piping:
 - 1. Copper Tube: ASTM B280, Type ACR.
 - 2. Wrought-Copper Fittings: ASME B16.22.
 - 3. Brazing Filler Metals: AWS A5.8/A5.8M.
- B. Refrigerant Tubing Kits:
 - 1. Factory-rolled and -bundled, soft-copper tubing with tubing termination fittings at each end.
 - 2. Standard one-piece length for connecting to indoor units.
 - 3. Pre-insulated with flexible elastomeric insulation of thickness to comply with governing energy code and sufficient to eliminate condensation.
 - 4. Factory Charge: dehydrated air or nitrogen.
- C. Assemblies and Specialties:
 - 1. Divided-Flow Specialty Fittings: Where required by VRF HVAC system manufacturer for proper system operation, VRF HVAC system manufacturer shall furnish specialty fittings with identification and instructions for proper installation by Installer.
 - 2. Refrigerant Isolation Ball Valves: Uni-body full port design with Schrader valve for refrigerant service, rated for maximum system temperature and

not less than 800 psig pressure, and factory tested under pressure to ensure tight shutoff.

2.18 VRF SYSTEM CONTROL CABLE

- A. General Requirements: Refer to and verify all wire and cabling requirements with the manufacturer's current installation and operation manuals to ensure compliance with the latest standards and specifications. Cables may not be spliced and shall be continuous from terminal to terminal. Do not splice cable.
- B. Low-Voltage Control Network Cabling:
 - 1. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
 - a. Shielded wire (2-core) 16 AWG - CVVS, CPEVS or MVVS.
 - b. PVC insulation and jacket.
 - c. Foil shielded.
 - d. Flame Resistance: Comply with NFPA 262.
 - e. Maximum cable distance (distance to farthest components) is 1,640 feet.
 - f. Maximum cable distance from OU to connected IU is 656 feet.
 - g. Maximum total cable length (sum of all network cabling) is 6,560 feet.
- C. Low-Voltage Wall-Mounted Controller Cabling to Indoor Units:
 - 1. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
 - a. 22 AWG, 2-conductor unshielded 7-stranded bare copper wire.
 - 1) Residential / multi-family style controllers require 4-conductor.
 - 2) Touch controllers with integral occupancy and light sensing controllers require low-voltage control network cabling to the network.
 - b. PVC insulation and jacket.
 - c. Flame Resistance: Comply with NFPA 262.
 - d. Maximum cable distance (distance from controller to indoor unit) varies by controller style. Refer to manufacturer Submittal or Installation Guides.

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- D. Transmission power booster provided if additional signal power is required based on connected devices. Coordinate with VRF manufacturer and install near middle of communication bus when required.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine products before installation. Reject products that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for piping and tubing to verify actual locations of connections before equipment installation.
- D. Examine roughing-in for ductwork to verify actual locations of connections before equipment installation.
- E. Examine roughing-in for wiring and conduit to verify actual locations of connections before equipment installation.
- F. Examine walls, floors, roofs, and outdoor pads for suitable conditions where equipment will be installed.
- G. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION, GENERAL

- A. Clearance:
 - 1. Maintain manufacturer's recommended clearances for service and maintenance.
 - 2. Maintain clearances required by governing code.
- B. Equipment Restraint Installation: Install equipment with seismic-restraint device. Comply with requirements for seismic-restraint devices specified in Section 13 48 00 - Sound, Vibration, and Seismic Control.

3.3 INSTALLATION OF INDOOR UNITS

- A. Install units to be level and plumb while providing a neat and finished appearance.
- B. Unless otherwise required by VRF HVAC system manufacturer, support ceiling-mounted units from structure above using threaded rods; minimum rod size of 3/8 inch.

- C. Adjust supports of exposed and recessed units to draw units tight to adjoining surfaces.
- D. Protect finished surfaces of ceilings, floors, and walls that come in direct contact with units. Refinish or replaced damaged areas after units are installed.
- E. In rooms with ceilings, conceal piping and tubing, controls, and electrical power serving units above ceilings.
- F. In rooms without ceiling, arrange piping and tubing, controls, and electrical power serving units to provide a neat and finished appearance.
- G. Provide lateral bracing if needed to limit movement of suspended units to not more than 0.25 inch.

3.4 INSTALLATION OF OUTDOOR UNITS

- A. Install units to be level and plumb while providing a neat and finished appearance.
- B. Install outdoor units on support structures indicated on Drawings.
- C. Pad-Mounted Installations: Install outdoor units on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 03 30 00 - Cast-In-Place Concrete.
 - 1. Attachment: Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 2. Grouting: Place grout under equipment supports and make bearing surface smooth.
- D. Roof-Mounted Installations: Install outdoor units on equipment supports. Anchor units to supports with removable, stainless-steel fasteners.

3.5 GENERAL REQUIREMENTS FOR PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping and tubing systems. Install piping and tubing as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping and tubing in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping and tubing at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping and tubing above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping and tubing to permit valve servicing.
- F. Install piping and tubing at indicated slopes.

- G. Install piping and tubing free of sags.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping and tubing to allow application of insulation.
- J. Install groups of pipes and tubing parallel to each other, spaced to permit applying insulation with service access between insulated piping and tubing.
- K. Install sleeves for piping and tubing penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 23 00 00 - Heating, Ventilation and Air Conditioning.

3.6 INSTALLATION OF SYSTEM CONDENSATE DRAIN PIPING

- A. General Requirements for Drain Piping and Tubing:
 - 1. Install a union in piping at each threaded unit connection.
 - 2. Install an adjustable stainless steel hose clamp with adjustable gear operator on unit hose connections. Tighten clamp to provide a leak-free installation.
 - 3. If required for unit installation, provide a trap assembly in drain piping to prevent air circulated through unit from passing through drain piping. Comply with more stringent of the following:
 - a. Details indicated on Drawings.
 - b. Manufacturer's requirements.
 - c. Governing codes.
 - d. In the absence of requirements, comply with requirements of ASHRAE handbooks.
 - 4. Extend drain piping from units with drain connections to drain receptors as indicated on Drawings. If not indicated on Drawings, terminate drain connection at nearest accessible location that is not exposed to view by occupants.
 - 5. Provide each 90-degree change in direction with a Y- or T-fitting. Install a threaded plug connection in the dormant side of fitting or future use as a service cleanout.
- B. Gravity Drains: Slope piping from unit connection toward drain termination at a constant slope of not less than one percent.
- C. Pumped Drains: If unit condensate pump or lift mechanism is not included with an integral check valve, install a full-size check valve in each branch pipe near unit connection to prevent backflow into unit.

3.7 INSTALLATION OF REFRIGERANT PIPING

- A. Refrigerant Tubing Kits:
 - 1. Unroll and straighten tubing to suit installation. Deviations in straightness of exposed tubing shall be unnoticeable to observer.
 - 2. Support tubing as specified in Section 23 00 00 - Heating, Ventilation and Air Conditioning.
 - 3. Prepare tubing ends and make mating connections to provide a pressure tight and leak-free installation.
- B. Select system components with minimum 650 psig pressure rating.
- C. Install piping as short and direct as possible, with a minimum number of joints and fittings.
- D. Arrange piping to allow inspection and service of equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 09 21 16 - Gypsum Board Assemblies if valves or equipment requiring maintenance is concealed behind finished surfaces.
- E. Install refrigerant piping and tubing in protective conduit where installed below ground.
- F. Install refrigerant piping and tubing in rigid or flexible conduit in locations where exposed to mechanical damage.
- G. Unless otherwise required by VRF HVAC system manufacturer, slope refrigerant piping and tubing as follows:
 - 1. Install horizontal hot-gas discharge piping and tubing with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Traps to entrain oil in vertical runs are not allowed.
 - 4. Inverted traps for twinned systems may be required by manufacturer.
 - 5. Liquid lines may be installed level.
- H. When brazing, remove or protect components that could be damaged by heat. Braze pipes with a dry nitrogen purge to avoid oxidation.
- I. Before installation, clean piping, tubing, and fittings to cleanliness level required by VRF HVAC system manufacturer.

J. Joint Construction:

1. Brazed Joints:

- a. Ream ends of tubes and remove burrs.
- b. Remove scale, slag, dirt, and debris from inside and outside of tube and fittings before assembly.
- c. Construct joints in accordance with AWS's "Brazing Handbook," "Pipe and Tube" Chapter.
- d. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze.
- e. The piping being brazed shall be purged of air to remove the oxygen and filled with one of the following inert gases: oxygen-free nitrogen, helium or argon. The piping system shall be purged with an inert gas for a minimum time corresponding to five volume changes through the piping system prior to brazing. The pre-purge rate shall be at a minimum velocity of 100 feet per minute (0.508 m/s). The inert gas shall be directly connected to the tube system being brazed to prevent the entrainment of ambient air. After the pre-purge, the inert gas supply shall be maintained through the piping during the brazing operation at a minimum pressure of 1.0 psi and a maximum pressure of 3.0 psi. The joint shall be brazed with a filler metal conforming to AWS A5.8.

2. Mechanically Pressed Joints:

- a. The installing contractor shall be fully trained and qualified by the manufacturer of the mechanically pressed joints to install the selected piping connections.
- b. Mechanical joints shall be installed in accordance with the manufacturer's instructions.

3. Flared Joints: Flared fittings shall be installed in accordance with the manufacturer's instructions. The flared fitting shall be used with the tube material specified by the fitting manufacturer. The flared tube end shall be made by a tool designed for that operation.

4. Soldered Joints: Use of soldered joints is prohibited within VRF systems.

3.8 INSTALLATION OF PIPING AND TUBING INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated. Installation to maintain a continuous vapor barrier.
- B. Insulation Installation on Pipe Fittings and Elbows:

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1. Install mitered sections of pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 2. When preformed valve covers are unavailable, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints, for horizontal applications. Seal with manufacturer's recommended adhesive.
1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- E. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless steel bands 12 inches (300 mm) o.c. and at end joints.
- 3.9 INSTALLATION OF DUCT, ACCESSORIES, AND AIR OUTLETS
- A. Where installing ductwork adjacent to equipment, allow space for service and maintenance.
 - B. Comply with requirements for metal and nonmetal ducts, flexible ducts, air duct accessories, diffusers and grilles specified in Section 23 00 00 - Heating, Ventilation and Air Conditioning.
- 3.10 IDENTIFICATION
- A. Identify system equipment, piping, tubing, and valves. Comply with requirements for identification specified in Section 23 00 00 - Heating, Ventilation and Air Conditioning.
- 3.11 FIELD QUALITY CONTROL
- A. Manufacturer's Field Service: Engage VRF HVAC system manufacturer's service representative to advise and assist installers; witness testing; and observe and

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inspect components, assemblies, and equipment installations, including controls and connections.

1. Field service shall be performed by a manufacturer-trained and authorized service representative of VRF HVAC system manufacturer whose primary job responsibilities are to provide direct technical support of its products.
2. Manufacturer-trained and authorized service representative shall provide on-site visits during construction at installation milestones indicated. System Installer shall coordinate each visit in advance to give manufacturer sufficient notice to plan the visit.
 - a. First Visit: Kick-off meeting.
 - b. Second Visit: At approximately 25 percent completion of system(s).
 - c. Third Visit: At approximately 50 percent completion of system(s).
 - d. Fourth Visit: At approximately 75 percent completion of system(s).
 - e. Fifth Visit: Final inspection before system startup.
3. Kick-off Meeting:
 - a. Meeting shall include system Installer and other related trades with sole purpose of reviewing VRF HVAC system installation requirements and close coordination required to make a successful installation.
 - b. Meeting shall be held at Project site and scheduled at a mutually agreed to time that occurs before the start of any part of system installation.
 - c. Meeting shall cover the following as a minimum requirement:
 - 1) Review of latest issue of Contract Documents, Drawings, and Specifications, relevant to VRF HVAC systems.
 - 2) Manufacturer's installation requirements specific to systems being installed.
 - 3) Review of all relevant VRF HVAC system submittals, including delegated-design submittals.
 - 4) Required field activities related installation of VRF HVAC system.
 - 5) Project team communication protocol, contact information, and exchange of responsibilities for each party involved, including manufacturer, supplier, system Installer, and other related trades.

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4. Site Visits: Activities for each site visit shall include the following.
 - a. Meet with VRF HVAC system Installer to discuss field activities, issues, and suggested methods to result in a successful installation.
 - b. Offer technical support to Installer and related trades as related to VRF system(s) being installed.
 - c. Review progress of VRF HVAC system(s) installation for strict compliance with manufacturer's requirements.
 - d. Advise and if necessary, assist Installer with updating related refrigerant calculations and system documentation.
5. Final Inspection before Startup:
 - a. Before inspection, Installer to provide written request to manufacturer stating the system is fully installed according to manufacturer's requirements and ready for final inspection.
 - b. All system equipment and operating components shall be inspected. If components are inaccessible for inspection, they shall be made accessible before the final inspection can be completed.
 - c. A factory-trained and authorized service representative shall provide a comprehensive inspection of all equipment and each operating component that comprise the complete system(s). Inspection shall follow a detailed checklist specific to each equipment and operating component.
 - d. Inspection reports for indoor units shall include, but not be limited to, the following:
 - 1) Unit designation on Drawings.
 - 2) Manufacturer model number.
 - 3) Serial number.
 - 4) Network address, if applicable.
 - 5) Each equipment setting.
 - 6) Mounting, supports, and restraints properly installed.
 - 7) Proper service clearance provided.
 - 8) Wiring and power connections correct.
 - 9) Line-voltage reading(s) within acceptable range.
 - 10) Wiring and controls connections correct.

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- 11) Low voltage reading(s) within an acceptable range.
 - 12) Controller type and model controlling unit.
 - 13) Controller location.
 - 14) Temperature settings and readings within an acceptable range.
 - 15) Condensate removal acceptable.
 - 16) Fan settings and readings within an acceptable range.
 - 17) Unit airflow direction within an acceptable range.
 - 18) If applicable, fan external static pressure setting.
 - 19) Filter type and condition acceptable.
 - 20) Noise level within an acceptable range.
 - 21) Refrigerant or hydronic piping properly connected and insulated.
 - 22) Condensate drain piping properly connected and insulated.
 - 23) If applicable, ductwork properly connected.
 - 24) If applicable, external interlocks properly connected.
 - 25) Remarks.
- e. Inspection reports for outdoor units shall include, but not be limited to, the following:
- 1) Unit designation on Drawings.
 - 2) Manufacturer model number.
 - 3) Serial number.
 - 4) Network address, if applicable.
 - 5) Each equipment setting, including compressor speed control.
 - 6) Mounting, supports, and restraints properly installed.
 - 7) Proper service clearance provided.
 - 8) Wiring and power connections correct.

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- 9) Line-voltage reading(s) within acceptable range.
 - 10) Wiring and controls connections correct.
 - 11) Low voltage reading(s) within an acceptable range.
 - 12) Condensate removal acceptable.
 - 13) Noise level within an acceptable range.
 - 14) Refrigerant piping properly connected and insulated.
 - 15) Condensate drain piping properly connected and insulated.
 - 16) For water-source outdoor units, water piping properly connected and insulated.
 - 17) For water-source outdoor units, proof of water flow checked for proper operation.
 - 18) Remarks.
- f. Installer shall provide manufacturer with the requested documentation including as-built piping lengths and technical support during inspection.
 - g. Installer shall correct observed deficiencies found by the inspection.
 - h. Upon completing the on-site inspection, manufacturer shall provide a written report with complete documentation describing each inspection step, the result, and any corrective action required.
 - i. If corrective action is required by Installer that cannot be completed during the same visit, provide additional visits, as required, until deficiencies are resolved, and systems are deemed ready for startup.
 - j. Final report shall indicate the system(s) inspected are installed according to manufacturer's requirements and are ready for startup.
- B. Perform the following tests and inspections with the assistance of manufacturer's service representative:
1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

3. Operational Test: Not less than 24 hours after electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Refrigerant and Hydronic Tubing Positive Pressure Testing:
1. Comply with more stringent of VRF HVAC system manufacturer's requirements and requirements indicated.
 2. After completion of tubing installation, pressurize tubing systems to a test pressure:
 - a. Refrigerant piping to a test pressure of not less than 600 psig using dry nitrogen.
 - b. Hydronic piping to a test pressure of not less than 43 psig.
 3. Successful testing shall maintain a test pressure for a continuous and uninterrupted period of 24 hours. Allowance for pressure changes attributed to changes in ambient temperature are acceptable.
 4. Prepare test report to record the following information for each test:
 - a. Name of person starting test, company name, phone number, and e-mail address.
 - b. Name of manufacturer's service representative witnessing test, company name, phone number, and e-mail address.
 - c. Detailed description of extent of tubing tested.
 - d. Date and time at start of test.
 - e. Test pressure at start of test.
 - f. Outdoor temperature at start of test.
 - g. Name of person ending test, company name, phone number, and e-mail address.
 - h. Date and time at end of test.
 - i. Test pressure at end of test.
 - j. Outdoor temperature at end of test.
 - k. Remarks.
 5. Submit test reports for Project record and to system manufacturer.

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D. Refrigerant Tubing Evacuation Testing:

1. Comply with more stringent of VRF HVAC system manufacturer's requirements and requirements indicated.
2. After completion of tubing positive-pressure testing, evacuate tubing systems to a pressure of 500 microns.
3. Successful testing shall maintain a test pressure for a continuous and uninterrupted period of one hour with no change.
4. Prepare test report to record the following information for each test:
 - a. Name of person starting test, company name, phone number, and e-mail address.
 - b. Name of manufacturer's service representative witnessing test, company name, phone number, and e-mail address.
 - c. Detailed description of extent of tubing tested.
 - d. Date and time at start of test.
 - e. Test pressure at start of test.
 - f. Outdoor temperature at start of test.
 - g. Name of person ending test, company name, phone number, and e-mail address.
 - h. Date and time at end of test.
 - i. Test pressure at end of test.
 - j. Outdoor temperature at end of test.
 - k. Remarks.
5. Submit test reports for Project record and to system manufacturer.
6. Upon successful completion of evacuation testing, system shall be charged with refrigerant.

E. System Refrigerant Charge:

1. System Installer shall consult system manufacturer to determine the correct system refrigerant charge based on as-built piping lengths.
2. Installer shall charge system following VRF HVAC system manufacturer's written instructions.

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3. Total refrigerant charge shall be recorded and permanently displayed at the system's outdoor unit.

3.12 STARTUP SERVICE

- A. Installer shall engage a factory-trained and authorized service representative of VRF HVAC system manufacturer to perform system(s) startup supervision.
 1. Complete startup service of each separate system.
 2. Complete system startup service according to manufacturer's written instructions.
- B. Startup checks shall include, but not be limited to, the following:
 1. Check control communications of equipment and each operating component in system(s).
 2. Check each outdoor unit's power supply is connected 12 to 24 hours before startup of system.
 3. Check each indoor unit's response to demand for cooling and heating.
 4. Check each indoor unit's response to changes in airflow settings.
 5. Check each indoor unit, HRCU, and outdoor unit for proper condensate removal.
- C. Installer shall accompany factory-trained and authorized service representative during startup service and provide manufacturer's service representative with requested documentation and technical support during startup service.
 1. Installer shall correct deficiencies found during startup service for reverification.
- D. System Operation Report:
 1. After completion of startup service, manufacturer shall issue a report for each separate system.
 2. Report shall include complete documentation describing each startup check, the result, and any corrective action required.
 3. Manufacturer shall electronically record not less than one hour of continuous operation of each system and submit with report for historical reference.
 - a. All available system operating parameters shall be included in the information submitted.

E. Witness:

1. Invite Architect, Owner, and Commissioning Agent to witness startup service procedures.
2. Provide written notice not less than 20 business days before start of startup service.

3.13 ADJUSTING

- A. Adjust equipment and components to function smoothly and lubricate as recommended by manufacturer.
- B. Adjust initial temperature set points. Adjust initial airflow settings and discharge airflow patterns.
- C. Set field-adjustable switches according to VRF HVAC system manufacturer's written instructions, and as indicated.

3.14 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of system Installer who are manufacturer's authorized service representative. Include two service visits for preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper equipment and system operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.15 DEMONSTRATION

- A. Engage a VRF HVAC system manufacturer's factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain entire system.
- B. Instructor: Instructor shall be factory trained and certified by VRF HVAC system manufacturer with current training on the system(s), equipment, and controls that are installed.
- C. Schedule:
 1. Schedule training with Owner at least 10 business days before first training session.
 2. Training shall occur before Owner occupancy.
 3. Training shall be held at mutually agreed date and time during normal business hours.
- D. Location: Owner shall provide a suitable on-site location to host classroom training.

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- E. Training Attendance: For record purposes, document training attendees at the start of each new training session. Record attendee's name, signature, phone number, and e-mail address.
- F. Training Format: Individual training modules shall include classroom training followed by hands-on field demonstration and training.
- G. Training Materials: Provide training materials in electronic format to each attendee.
 - 1. Offer online instructional videos showing general operation and maintenance that are coordinated with operation and maintenance manuals.
- H. Acceptance: Obtain Commissioning Agent's or Owner written acceptance that training is complete, and requirements indicated have been satisfied.

END OF SECTION

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SECTION 26 00 00**ELECTRICAL GENERAL PROVISIONS****PART 1 - GENERAL****1.1 DESCRIPTION****A. Work Included:**

1. This Section supplements all Sections of this Division and shall apply to all Work specified, indicated in the Drawings, and as required to provide for a complete installation of electrical systems for the Project.
 - a. Rough-in locations for fixtures and equipment shall be determined from the unit itself or from the approved shop drawings.
2. The work shall consist of the furnishing of all labor, materials, tools, equipment, transportation, and related items required for the proper installation and operation of the completed electrical systems for this Project (with the exception of work or materials specifically mentioned to be provided by others). It is intended to result in a finished equipment installation, fully connected and operational, including all electrically powered machines, apparatus, appliances, and devices furnished under other Divisions or outside of this Contract.

1.2 QUALITY ASSURANCE**A. Comply with pertinent provisions of the Owner's administrative requirements.****B. General Requirements:**

1. Work performed under this Division shall be installed by craftsmen skilled in the trade involved.
2. All control equipment for electrically operated equipment shall be furnished with the equipment.
3. Provide all electrical work required for the service and connection of electrically operated and equipment specified in other Divisions of the Specifications.
4. All electrical power, signal, and fire alarm systems shall be complete and ready for use.

C. Requirements of Regulatory Agencies:

1. Codes and Ordinances: All Work shall meet the requirements of the applicable governing codes.
2. All materials shall bear a UL, ETL or other nationally recognized testing laboratory label.

D. Factory Tests:

1. See each Section for the required factory tests and their procedures.
2. Test reports shall include, without limitation, the following:
 - a. Description of equipment tested.
 - b. Description of tests.
 - c. Test results.

1.3 APPLICATION

- A. Material, equipment, installation, and construction requirements and standards described in this Section are generally or specifically applicable to all the listed Sections.

1.4 REFERENCES TO AGENCIES AND ORGANIZATIONS

- A. References are made in this specification, and in the laws, ordinances and regulations governing work on this Project, to agencies and organizations which publish standards, conduct tests of materials or establish and recommend construction methods and procedures. Those most frequently mentioned (with their abbreviations) are:

ANSI	American National Standards Institute
CBM	Certified Ballast Manufacturers
CSI	Canadian Standards Association
ETL	Electrical Testing Laboratories
FM	Factory Mutual Association
IEEE	Institute of Electrical and Electronic Engineers
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
OSA	Office of the State Architect
OSHA	Occupational Safety and Health Administration
CEC	California Electrical Code

SFM	State Fire Marshal
UBC	Uniform Building Code
UL	Underwriters' Laboratories

B. The most recently published lists, recommendations, standards, codes, etc., of these or other organizations referenced shall apply. Exceptions:

1. When another specific edition or issue has been adopted or referenced by the agencies exercising authority over this Project.
2. If another edition or issue has been cited by reference in the Contract Documents.

1.5 DEFINITIONS

A. Definitions: Terms used in individual Sections of this Division are defined as follows.

1. Concealed: Hidden from sight; embedded in masonry, concrete, or earth, within ceiling, partition or wall construction or furred spaces, or exposed to view only in attics, shafts, underfloor or crawl spaces.
2. Conduit: Includes conduit, fittings, hangers, and all devices that make up a raceway system.
3. Drop: A vertical conduit extending downward that does not penetrate a floor.
4. Exposed: Not concealed as defined above.
5. Finished Space: A room or space that is not unfinished as described below. Any space ordinarily visible to public, including exterior space or surfaces.
6. Indicated: Shown or noted on the Drawings or mentioned in the Specifications.
7. Necessary: Essential to the satisfactory completion of the Work.
8. Other Divisions: Portions of specifications that do not include Division 26, designated by Division number.
9. Provide: Obtain, deliver, install, connect, and make fully operable, incorporating all labor, materials, equipment, apparatus, tools, and expense necessary to make ready for use in the manner intended by the design.
10. Required: Made necessary by application, need, or specified use.
11. Riser: A vertical conduit extending through more than one floor level.

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12. Section: Any one of the Sections of Specifications listed or designated by Section number.
13. Stub-up: A conduit turned up from within or below a floor slab to serve wiring in the area above.
14. This Division: Electrical Division of Specifications. A portion of the Specifications which includes all Sections of the 26 series.
15. Unfinished Space: A room or space that is ordinarily accessible only to building maintenance personnel; a room listed in finish schedule as having exposed and unpainted construction for walls, floors and ceiling; a room specifically mentioned as "Unfinished."
16. Wiring: Raceways, conductors, boxes, and all associated items.

1.6 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Shop Drawings and Product Data:
 1. Submit to the Architect copies of the following:
 - a. Manufacturer's printed instructions for operation and maintenance of electrical equipment including replacement parts lists. Each set shall be bound in an indexed loose leaf ring binder with permanent cover and permanent identification on edge.
 - b. Service and Operating Manuals for all equipment.
 - c. Single phase and Three phase voltage tests.
 - d. Grounding System tests.
 - e. Test reports.
 2. Contractor shall pay all costs of evaluation, revised design and installation for changes resulting from substitution of products. Acceptance of substitute products by Architect or Electrical Engineer does not change this requirement.
- C. Qualifications of electrical testing laboratory.

1.7 CODES

- A. Code Compliance:
 1. Work performed under this Division of Specifications is under jurisdiction of Los Angeles County Department of Public Works, and will be inspected for code compliance by that agency.

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- B. The requirements of Drawings and Specifications are the minimum that will be allowed under this Division. Building Laws and Codes must be satisfied when their requirements are greater, more stringent, or more restrictive.
- C. Nothing found in Drawings or Specifications shall be taken as authority to violate any Ordinance, Code or Law.

1.8 PERMITS, LICENSES AND INSPECTIONS

- A. Permits: Contractor shall pay for permits required by work under this Division.
- B. Inspections: Work shall be regularly inspected and recorded data indicating approval by County Inspector shall be available at Job site.
- C. Final Inspection: Upon completion and before acceptance of work, furnish Architect with written evidence of final inspection and approval by all Building and Safety authorities having jurisdiction.

1.9 DRAWINGS

- A. Diagrammatic Drawings:
 - 1. Locations of items on the Drawings may be distorted for purposes of clearness and legibility. Drawings are essentially diagrammatic and, although size and location of equipment is drawn to scale wherever possible, Contractor shall make use of all data in Contract Documents to plan the layout of his work, and verify this information at building site. Actual locations of architectural and mechanical items are shown on Architectural and Mechanical Drawings. Outlets shall be located in accordance with architectural design, and specific locations may be determined by Owner's representative at job site prior to installation.
 - a. Give special consideration to location of outlets in and around cabinet work and equipment.
 - b. Drawings may not always show offsets, bends, special fittings, or junction and pull boxes necessary to meet job conditions. These items shall be provided as required at no cost to the Owner and all added junction or pull boxes shall be shown on the "As-Built" drawings.
 - 2. Contractor shall verify requirements for power, control and signal raceway connections to equipment provided under other Divisions or separate contracts. Coordinate wiring installation with suppliers of the equipment.
- B. Routing of Raceways:
 - 1. Drawings generally indicate required size and termination points for conduits and raceways and may suggest routes to conform to structure, to avoid obstructions and to preserve clearances.

2. Drawings do not attempt to indicate all necessary bends or offsets and it shall be a responsibility of Contractor under this Division to install conduit in such a manner as to conform to structure, avoid obstructions, preserve headroom, keep openings and passageways clear, and keep accessible all equipment requiring inspection, maintenance or adjustment.
 3. Changes in size, quantity or terminations of raceways shall not be made without approval of Architect.
- C. Coordination with Other Trades:
1. Coordinate with work performed under other Divisions of the Specifications so that no interferences shall occur. Report any conflicts to Architect and obtain directions before proceeding.
 2. Outlets for connection to equipment shall be properly located by referring to shop drawings, manufacturer's recommendations, or by measuring actual equipment to be installed.
 3. Maintain close coordination with mechanical equipment installer, particularly as to quantity, electrical rating, location, size and arrangement of various pieces of equipment.
 4. Installed work which interferes with work of other trades shall be removed and rerouted at direction of Architect.
 5. No extra charges will be allowed for changes made necessary by interference with work of other trades.
- D. Mounting height dimensions are to center line of devices, fixtures and outlets from above finished floor or grade as applicable, unless otherwise noted.

1.10 EMERGENCY REPAIR

- A. Temporary Repairs: Owner reserves right to make temporary repairs as necessary to keep equipment in operating condition without voiding the Contractor's guarantee or relieving Contractor of his responsibility in accordance with General Conditions.

1.11 DAMAGE RESPONSIBILITY

- A. Responsibility for Damages: Contractor shall be responsible for damage to grounds, building or equipment furnished or installed under this Contract or previously existing.

1.12 SPARE PARTS, SPECIAL TOOLS

- A. Spare parts shall be provided to Owner as follows:
1. Spare fuses, one set of three of each size and type installed.

2. One complete set of spare pilot-light lamps of each type and size used on Project.
3. All special tools normally supplied by equipment manufacturer to install, adjust or service the equipment.

1.13 SYSTEM ACCEPTANCE

A. Final Review:

1. Contractor shall request a final review by Architect, Owner, and County personnel prior to system acceptance after:
 - a. Completion of installation of all systems required under the Contract Documents.
 - b. Satisfactory operation of all systems during operational test period.

B. Acceptance will be contingent on:

1. Completion of final review and correction of deficiencies.
2. Satisfactory completion of acceptance tests which shall demonstrate compliance with performance and technical requirements of Contract Documents.
3. Satisfactory submission of drawings required by Contract Documents.
4. Provision of operations, parts, service, and maintenance manuals required.
5. Provision of spare parts required by Contract Documents.
6. Completion of instructions to Owner's representatives for all systems.
7. Satisfactory final inspection by Building and Safety authorities having jurisdiction.

1.14 UTILITY CONNECTIONS

A. Public Utility Requirements:

1. Contact serving agencies and act in compliance with their requirements for electric and telephone services, and pay all charges connected therewith.
2. Comply with rules, regulations, and standards of serving public utilities.
3. Make all submittals to utilities necessary to obtain their approval for the equipment and facilities to be installed.
4. Deviations from Contract Drawings and Specifications, required by utilities, shall be approved by Architect before installation of work.

5. Notify utility companies when work commences. Refer to Owner's administrative requirements for reimbursement of permanent utility services payments.

1.15 REFERENCES

- A. References made in any of the Electrical Sections, including addenda, to standards, codes, specifications or recommendations of various technical societies, trade organizations, or governmental agencies, shall mean the edition in effect at the time of awarding contracts for the work of this Project. (See Article 1.4.)
- B. Work shall be done in accordance with the California Electrical Code, Title 24, part 3, CCR as supplemented or modified by Los Angeles County, and electrical ordinances or codes of other authorities having jurisdiction. Except, where requirements of Specifications and Drawings exceed those of ordinances or codes, Specifications and Drawings shall govern.

1.16 GUARANTEES

- A. Equipment and materials provided under this Contract shall be new and free from defects and shall be guaranteed for a period of one year from date of acceptance of the Work.
- B. Should any trouble develop during the one-year period due to defective material or faulty workmanship, Contractor shall provide necessary materials and labor to correct the trouble, without cost to the Owner.
- C. Defective material or inferior workmanship noticed at time of installation shall be corrected immediately to the satisfaction of Architect or Owner's representative.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Products and Materials shall be as described in pertinent Sections of Specifications.

2.2 MATERIALS AND EQUIPMENT

- A. Wherever possible, materials and equipment used in this work shall be of same brand of manufacture throughout for each class of material or equipment.
- B. Materials shall be new and shall be listed by and bear the UL label where subject to such listing. Comply with ANSI, IEEE and NEMA Standards, where applicable.

2.3 MATERIAL STANDARDS

- A. All Work shall meet the requirements of the governing codes and requirements of the following:
 1. NEMA.

2. ANSI.
 3. IEEE.
 4. IPCEA.
 5. NEC.
 6. UL.
- B. The label or listing by UL, ETL or other nationally recognized testing laboratory shall appear on all materials and equipment for which standards have been established by those laboratories.
- C. Where applicable codes establish label or approval requirements, furnish all materials and equipment with either the required labels affixed or the necessary written approval.
- D. Provide the type and quantity of electrical materials and equipment necessary to complete work, and all systems in operation, tested and ready for use.
- E. Provide and install all incidental items that belong to the work described and which are required for complete systems.

PART 3 - EXECUTION

3.1 COORDINATION OF CONTRACT DOCUMENTS

- A. The drawings and such writing, figures and details which appear upon them shall be considered as illustrating the project requirements. Any work or materials shown on the drawings and not mentioned in the specifications, or the reverse, shall be provided the same as if appearing in both.

3.2 QUALITY CONTROL

- A. Supervision: Contractor shall furnish services of a foreman experienced in the work of each Section under this Division, who shall be constantly in charge of progress of work, with necessary journeymen, helpers, and laborers required to unload, install, connect, adjust, start, operate and test work involved, in accordance with the Specifications.
1. Comply with manufacturer's instructions of recommendations unless otherwise noted or specified.
- B. Workmanship: The arrangement and quality of the work and the finished appearance of the installation shall be equivalent to or better than that being found in the majority of projects of similar scope and complexity. NECA 1 - Standard for Good Workmanship in Electrical Construction will be a basic guideline in this matter.

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- C. Cooperation: Contractor shall examine and be familiar with all of the Contract Documents, the project requirements, and scope of all work which involves electrical systems. Install work cooperatively with all the trades.
- D. Verification: Contractor shall verify before making connections that electrical characteristics of equipment furnished under other Divisions match the wiring provided. Report discrepancies to the Architect and obtain direction before proceeding.

3.3 EXCAVATION AND BACKFILL

- A. General:
 - 1. Comply with requirements of Civil Drawings.
 - 2. Do excavation and backfill required to install work of this Division both inside and outside the building envelope.
 - 3. Perform excavation and backfilling in accordance with Civil Drawings.
 - 4. Observe and comply with all safety rules and regulations.

3.4 PAINTING

- A. All equipment shall be provided with factory-applied protective finish, unless otherwise specified.
- B. If factory-finish on any equipment furnished by Contractor is damaged in shipment or during construction of building, equipment shall be refinished by Contractor to satisfaction of Architect.

3.5 SLEEVES, OPENINGS AND MOUNTING PROVISIONS

- A. Sleeves and Inserts: Provide metal sleeves, inserts and openings necessary for installation of electrical work. Provide flashing, water-proofing and sealing in accordance with methods described in other applicable sections of Specifications.
- B. Openings: Contractor shall examine drawings to ascertain that proper provisions have been made for the work. If such provisions are not made in time, Contractor shall bear extra costs incurred in any cutting and patching required to accommodate this work.
- C. Concrete Work:
 - 1. Special forming, recesses, chases, pits, pads and curbs, as necessary for proper reception and installation of electrical equipment, as shown on Drawings, or as required, shall be provided under other Divisions of the Specifications, but locating same shall be a responsibility of this Division. Provide the necessary timely information to other trades to assure execution of this work.

2. Furnish embedded anchor bolts and sleeving, provide dimensional drawings and verify accuracy of installation.

- D. Structural Members: Cutting, boring, or notching of structural members shall not be done without approval of the Architect. Any modification must be fully described and justified in writing for Architect's consideration.

3.6 ACCESS PANELS

- A. Access doors and panels required for the work of this Division shall be furnished under this Division but installed as a part of the work of Division 9.

3.7 CUTTING AND PATCHING

- A. Contractor shall bear responsibility for cutting and patching of rough or finish work necessary for installation of materials under this Division.
- B. Patching shall be of the same material, finish and workmanship as the original work, and if required by the Architect, performed by workers of the trades originally involved.

3.8 ACCEPTANCE TESTS

A. General:

1. Before acceptance tests are performed, Contractor shall demonstrate to Architect that systems and components are complete.
2. Systems shall be operable and capable of maintaining continuous uninterrupted operational service during test and demonstration periods.
3. Control systems shall be operable with calibration and settings adjusted.

B. Compliance Test:

1. Conduct such tests of any portion of installation as may be necessary to show full compliance with Contract Document requirements.
2. Tests shall be made in presence of Architect.
3. Costs of test shall be borne by Contractor, and Contractor shall provide all instruments, equipment, labor, and materials to complete tests.
4. Additional tests may be required at any time between installation of work and end of one year guarantee period if unusual conditions or malfunctions occur.
5. Should these tests expose any defective materials or poor workmanship, or variance with requirements of Specifications, Contractor shall make changes and remedy defects at his own expense.

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6. Where an independent testing agency is required, testing company shall meet Federal OSHA criteria for a testing laboratory or shall be a member of the National Electrical Testing Association (NETA).
- C. Operational Tests:
1. After systems have been installed, connections made and tests completed, Contractor shall make arrangements with Architect to operate systems continuously for a period of two 24-hour working days.
 2. Contractor shall notify Architect in writing two weeks in advance of operational period.
- D. The Contractor shall obtain an independent testing laboratory that will provide all instrumentation and tests on the electrical system and equipment as hereinafter described and further directed by the Engineer. The test(s) shall be performed after the completion of all electrical systems covered under this Section of the Specifications. All tests shall be recorded, documented, and submitted to the Engineer of Record for review.
1. Test for Phase to Ground Conditions:
 - a. Open main service disconnect.
 - b. Isolate the system neutral from ground by removing the neutral disconnect link located in the service switchboard.
 - c. Close all sub-main disconnects.
 - d. Close all branch feeder circuit breakers.
 - e. Measure the resistance of each phase to ground. A properly calibrated "megger" type test instrument is to be used. The test voltage shall be 500 volts.
 - f. Record all readings after a one-minute duration and document into a complete report.
 2. Isolating Grounds:
 - a. In the event that low resistance grounds are found in the system, they shall be isolated and located by testing each circuit individually, as outlined in 3.10 D.1. Make proper corrections to restore the resistance values to an acceptable value.
 - b. Method of obtaining ground resistance shall be in accordance with the latest edition of IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System on this subject.

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- F. All instrumentation and personnel required for testing shall be furnished by the Contractor.
- G. Read and record ampere and line voltage measurements under full load on all panels and switchboard feeders, and motor circuits over 10 horsepower and/or 14 amperes. Record measurements at the equipment served and submit to the Engineer for review.
- H. If, in the opinion of the Engineer, the voltages and regulations are not within acceptable limits, make arrangements with the serving utility for proper electrical service. Verify that such has been provided.

3.9 SEISMIC RESTRAINTS

- A. Electrical equipment and materials shall be fastened to structure so as to resist movement due to seismic forces.
- B. Requirements shall be as specified the State of California and the County of Los Angeles Codes and Ordinances, and work shall comply with detailed provisions if shown on the Drawings or stated elsewhere in these Specifications.

3.10 DISCREPANCIES

- A. Where conflicting requirements appear in Contract Documents and a resolution is not obtained from Architect before bidding date, the course of action which provides the greatest safeguard to persons and property becomes the contractual requirement.
- B. Discrepancies discovered during construction shall immediately be brought to the attention of the Architect and work shall not proceed on the unresolved portions until direction is obtained from the Architect.

3.11 JOB-SITE SAFETY

- A. Contractor shall comply with all requirements of governing agencies including OSHA regulations (CAL-OSHA in California) to provide for safety to personnel during the execution of all work under this Contract.

3.12 LABELING

- A. All individually mounted circuit-breakers, EXO switches, starters, gutters and control devices shall be clearly and permanently labeled with stencil or other approved method identifying their exact function, circuits, and equipment controlled (see also NEC Article 110 - Requirements for Electrical Installations).

3.13 SEPARATION OF SYSTEMS

- A. It is intended to install all systems of different voltage or frequency characteristics in separate raceways, boxes, and enclosures. This separation shall be maintained throughout the Project except where specifically shown or directed to be done otherwise.

1. All systems shall be enclosed in metallic raceway systems unless specifically required or permitted by these Specifications to be non-metallic.

3.14 APPLICABILITY OF CODE REQUIREMENTS

- A. All materials installed under any Section of this Division shall comply with the provisions of Chapter 3 - Wiring Methods and Materials of NFPA 70 (National Electrical Code) unless specifically noted otherwise.

3.15 WORK REQUIRED OF OTHER TRADES

- A. If labor union jurisdictional practices require any work specified in this Division to be performed by workmen of other than the electrical trades, the Contractor shall be responsible for satisfactory coordination and completion of all such work, including payment of all costs of labor, materials, permits and related items.

3.16 FINAL SUBMITTAL

- A. At the conclusion of the work, Contractor shall submit to the Architect a complete set of all approved shop drawings and equipment submittals. These will become part of the Owner's records along with the record drawings and service manuals previously described.

3.17 ASBESTOS, POLYCHLORINATED BIPHENAL (PCB) OR HAZARDOUS WASTE

- A. It is understood and agreed that this Work does not contemplate the handling of asbestos, PCB or any hazardous waste material. If asbestos, PCB, or any hazardous waste material is encountered, notify the Owner immediately. Do not disturb, handle, or attempt to remove.

3.18 PROTECTION, CARE AND CLEANING

A. Protection:

1. Provide adequate means for, and protect, finished parts of materials and equipment against physical damage from whatever cause during progress of this work and until final completion.
2. Sensitive electrical equipment shall not be installed until major construction work is completed.

B. Care:

1. During construction, cap raceways, cover boxes and equipment so as to prevent entrance of sand, dirt, and other debris.
2. Protect equipment against moisture, plaster, cement, paint, or work of other trades by covering it with polyethylene sheets.
3. Provide storage space required to prevent condensation of moisture on or within equipment.

C. Cleaning: After installation has been complete, Contractor shall clean systems as follows.

1. Conduit, raceways, and unpainted equipment: Clean exterior of piping and equipment exposed in completed structure, removing rust, plaster, cement and dirt. Remove grease, oil, and similar materials by wiping with clean rags and suitable solvents.
2. Cabinets, Enclosures, and Other Items with Factory-Painted Finish: Remove all construction residue and leave surfaces clean and polished. Clear all debris from within cabinets and enclosures.
3. All raceways shall be clean and unobstructed throughout their interiors.
4. All lighting fixtures shall be cleaned of dust, dirt fingerprints and extraneous matter.

3.19 CLEAN-UP

A. Comply with pertinent provisions of the Owner's administrative requirements.

B. Clean-Up and Haul Away:

1. Upon completion of specified work and at other times during progress of work, when required, Contractor shall remove surplus materials, rubbish and debris resulting from work.
2. Entire building and involved portion of Site, insofar as work of this Division is concerned, shall be left neat, clean and in condition acceptable to the Architect.

C. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

3.20 TRAINING

A. The Contractor shall provide a period of sixteen (16) hours for the necessary training programs and instructions to the Owner's personnel.

END OF SECTION

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SECTION 26 05 00**ELECTRICAL****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Documents affecting the work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
- B. This Section supplements all Sections of this Division and shall apply to all work specified, indicated in the Drawings, and as required to provide for a complete installation of electrical systems for the Project.
 - 1. Rough-in locations for fixtures and equipment shall be determined from the unit itself or from the approved shop drawings.

1.2 QUALITY ASSURANCE

- A. General Requirements:
 - 1. Work performed under this Division shall be installed by craftsmen skilled in the trade involved.
 - 2. Provide all control equipment for electrically operated equipment except when equipment is furnished with control equipment.
 - 3. Provide all electrical work required for the service and connection of electrically operated and controlled equipment specified in other Divisions of the Specifications.
 - 4. All electrical power, signal, fire alarm and communication systems shall be complete and ready for use.
- B. Requirements of Regulatory Agencies:
 - 1. Codes and Ordinances: All work shall meet the requirements of the applicable governing codes.
 - 2. All materials shall bear a UL, ETL or other nationally recognized testing laboratory label.
- C. Factory Tests:
 - 1. Refer to each Section for the required factory tests and their procedures.
 - 2. Test reports shall include, without limitation, the following:
 - a. Description of equipment tested.
 - b. Description of tests.

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- c. Test results.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Shop Drawings and Product Data:
 - 1. Submit to the Owner six (6) certified copies of the following:
 - a. Manufacturer's printed instructions for operation and maintenance of electrical equipment including replacement parts lists. Each set shall be bound in an indexed loose leaf ring binder with permanent cover and permanent identification on edge.
 - b. Service and Operating Manuals for all equipment.
 - c. Three phase voltage test.
 - d. Grounding System tests.
 - e. Test reports.
 - 2. Contractor shall pay all costs of evaluation, revised design and installation for changes resulting from substitution of products. Acceptance of substitute products by Owner or Electrical Engineer does not change this requirement.
- C. Submit qualifications of electrical testing laboratory.

1.4 EXCAVATION, CUTTING AND PATCHING

- A. All excavating, trenching and back filling required for the work of this Division shall be done in accordance with the applicable requirements of the Civil Drawings. All excavating and backfilling, repaving all cuts and providing and maintaining all protective measures for the excavation shall be in accordance with the Civil Drawings.
- B. Field verify all openings indicated on the Drawings. Provide all cutting and patching required for electrical work.

1.5 LOCATION AND ROUTING

- A. The Drawings indicate diagrammatically the desired location or arrangement of conduit runs, outlets, equipment, etc. and shall be followed as closely as possible. Execute the work so as to secure the best possible installation in the available space and overcome local difficulties due to space limitations or interference with structural conditions.
- B. Locations shown on Architectural Reflected Ceiling Drawings or on Wall Elevations shall take precedence over Electrical Drawing locations.

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- C. Verify dimensions and the correct location of equipment before proceeding with the roughing-in of connections.
- D. Lighting fixtures in mechanical spaces and machine rooms are shown in their approximate locations only. Do not install light outlets or fixtures until mechanical piping and ductwork are installed; then lighting fixtures shall be installed in locations best suited for equipment arrangement and as approved by the Owner. Verify locations of fixtures in machine rooms before installation.
- E. All scaled and figured dimensions are approximates of typical equipment of the class indicated. Before proceeding with any work, check and verify all dimensions, sizes, etc., with the Drawings to ensure that the equipment being installed will fit into the spaces provided.
- F. Locations of Openings: Locate all chases, shafts and openings required for the installation of the electrical work during framing of the structure. Perform any cutting and patching required as approved due to incorrectly located or omitted openings, at no additional cost to the Owner. Cutting or drilling in any structural member is prohibited without prior written approval of the Owner.
- G. Access to Equipment: Locate starters, switches, receptacles and pull boxes to provide easy access for operation, repair and maintenance. If concealed, provide access doors.

1.6 MATERIAL STANDARDS

- A. Materials and equipment shall be new.
- B. All work shall meet the requirements of the governing codes and requirements of the following:
 - 1. NEMA.
 - 2. ANSI.
 - 3. IEEE.
 - 4. ICEA.
 - 5. NEC.
 - 6. UL.
- C. Items for similar application shall be of the same manufacturer.
- D. The label or listing by UL, ETL or other nationally recognized testing laboratory shall appear on all materials and equipment for which standards have been established by those laboratories.
- E. Where applicable codes establish label or approval requirements, furnish all materials and equipment with either the required labels affixed or the necessary written approval.

- F. Provide the type and quantity of electrical materials and equipment necessary to complete the work, and all systems in operation, tested and ready for use.
- G. Provide and install all incidental items that belong to the work described and which are required for complete systems.

1.7 TESTING

- A. The Contractor shall obtain an independent testing laboratory that will provide all instrumentation and tests on the electrical system and equipment as hereinafter described and further directed by the Engineer. The test(s) shall be performed after the completion of all electrical systems covered under this Section of the Specifications. All tests shall be recorded, documented and submitted to the Engineer for review.
 - 1. Test for phase to ground conditions.
 - a. Open main service disconnect.
 - b. Isolate the system neutral from ground by removing the neutral disconnect link located in the service switchboard.
 - c. Close all sub-main disconnects.
 - d. Close all branch feeder circuit breakers.
 - e. Measure the resistance of each phase to ground. A properly calibrated "megger" type test instrument is to be used. The test voltage shall be 500 volts.
 - f. Record all readings after a one minute duration and document into a complete report.
 - 2. Isolating Grounds: In the event that low resistance grounds are found in the system, they shall be isolated and located by testing each circuit individually, as outlined in 1.7.A.1. Make proper corrections to restore the resistance values to an acceptable value.
- B. Method of obtaining ground resistance shall be in accordance with the latest edition of the James G. Biddle manual (Plymouth Meeting, Pennsylvania) on this subject.
- C. All instrumentation and personnel required for testing shall be furnished by the Contractor.
- D. Read and record ampere and line voltage measurements under full load on all panels and switchboard feeders, and motor circuits over 10 horsepower and/or 14 amperes. Record measurements at the equipment served and submit to the Engineer for review.

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- E. If, in the opinion of the Engineer, the voltages and regulations are not within acceptable limits, make arrangements with the serving utility for proper electrical service. Verify that such has been provided.

1.8 ASBESTOS, POLYCHLORINATED BIPHENAL (PCB) OR HAZARDOUS WASTE

- A. It is understood and agreed that this Work does not contemplate the handling of asbestos, PCB or any hazardous waste material. If asbestos, PCB or any hazardous waste material is encountered, notify the Owner immediately. Do not disturb, handle or attempt to remove.

1.9 ELECTRICAL WORK CLOSE OUT

- A. Prepare the following items and submit to the Engineer before Final Acceptance:
 - 1. Two copies of all test results as required under this Section.
 - 2. Two copies of local and/or state code enforcing authorities' final inspection certificates.
 - 3. Copies of as-built record drawings as required under the Owner's administrative requirements and this Section.
 - 4. Two copies of all receipts transferring portable or detachable parts to the Owner, when requested.
 - 5. Notify the Engineer in writing when installation is complete and a final inspection of this work can be performed. In the event any defect or deficiencies are found during this final inspection, they shall be corrected to the satisfaction of the Owner before Final Acceptance is issued.

1.10 TRAINING

- A. The Contractor shall provide a period of sixteen (16) hours for the necessary training programs and instructions to the Owner's personnel.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated wire conductors for circuit voltage, 600 volts or less, shall be copper, minimum size #12 AWG. Control wiring may be #14 AWG minimum except where otherwise shown.
- B. Conductors shall have UL approved 600-volt insulation of type specified below or elsewhere in the Specifications.
 - 1. Branch Circuits - Lighting and Power.
 - a. #10 AWG and smaller, solid wire type THW or THHN/THWN, THHN.
 - b. #8 AWG and larger, stranded type THW or THHN/THWN.

2. Feeders: Lighting and power, type THW or THHN/THWN.
3. Connectors for #10 conductor and smaller UL listed for 600 volts, UL approved for use with copper, cone shaped, expandable coil spring insert, insulated with a nylon shell and two wings placed opposite each other to serve as a "built-in" wrench. Shell shall be molded one-piece as manufactured by Ideal Electrical "Wing-Nut," or 3M "ScotchLok".
4. Connectors for #8 AWG and larger shall be screw pressure lugs made of high strength structural aluminum alloy and UL approved for use with copper wire. ABB Installation Products "Sta-Kon" or Burndy "Quik-Lug".
5. All conductor insulation shall be color coded to indicate phase leg, voltage and use. If color-coded wire is unavailable, color banding (minimum 2" wide) shall be required where conductors are visible. This color-coding is acceptable only in size AWG #8 and larger.
7. Conductor insulation type, size and UL approval shall be printed with permanent white (or black for white insulation) paint on all conductor insulation continually repeating.
8. Wiring through fluorescent fixtures in continuous rows shall be type THHN.
9. Provide all conductors used for power, lighting, control signal and communications systems, operating at 600 volts and below, with a minimum insulation rating of 600 volts.
10. Minimum Size Conductors: #12 AWG copper, unless otherwise indicated.
11. All conductors shall be new and shall have been manufactured within 12 months of the date of delivery to the site and continuously stored where protected from the heat or weather.
12. Vertical cable supports shall be O-Z-Gedney type "M", Adalet "CVS" series, or Hubbell "VME" series.
13. Deliver all conductors to the Site on their original cable reels or in their original unbroken packages.
14. Provide all conductor packages and cable reels plainly marked or tagged with UL labels, AWG size, voltage rating, insulation type, type of stranding, manufacturer's name, and month and year when manufactured.
15. Insulating Tape - Plastic Self-adhering. Minnesota Mining and Manufacturing "Scotch" #33 Electrical tape.
16. Conductor tags shall be premarked, self-adhesive wrap-around cloth type manufactured by EZ Code.

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17. Conductor ties shall be plastic with cinching holders, as manufactured by Panduit or Thomas & Betts.
18. Conductor sealant shall be silicone type Dow # 795.

2.2 INTERIOR PULLBOXES AND WIREWAYS

- A. Sheet steel pullboxes shall be fabricated of the gauge of sheet metal required by the NEC, galvanized after fabrication, furnished with required knockouts and removable screw cover. Finish with prime coat ready for painting, where exposed to public view; ANSI 61 light gray in other locations. Covers for pullboxes larger than 30" shall be two sections with handles.
- B. Provide cast iron pullboxes with gasketed screw cover and drilled and tapped holes as required.
- C. Provide galvanized sheet metal wireway and gutters with standard factory finish. Provide wireways with hinged coverplate and accessories as required for full cable access, manufactured by Circle AW or Wire Guard Systems.
- D. Dimensions of pullboxes for high-voltage cables shall be a minimum of 25 percent larger than standard NEC code size boxes for 600-volt wire.

2.3 NAMEPLATES AND WARNING SIGNS

- A. Fabricated nameplates shall clearly state the following:
 1. Manufacturer's name and equipment design ratings including current, voltage, KVA, HP, bus bracing rating or as applicable.
 2. System usage and purpose, system nominal voltage, equipment rating KVA, amperes, as applicable. Designation data per Drawings or supplied with shop drawings.
 3. Panel designation, voltage and phase.
- B. Manufacturer's Device Nameplates: Device usage, purpose, or circuit number; manufacturer and electrical characteristic ratings including the following.
 1. Circuit Breakers: Voltage, continuous current, maximum interrupting current and trip current.
 2. Switches: Voltage, continuous current, horsepower or maximum current switching. If fused, include nameplate stating, "Fuses must be replaced with current limiting type of identical characteristics."
 3. High Voltage Switches and Transformers: Voltage, continuous current and maximum current switching, located to be visible after installation.
- C. Equipment nameplate material shall be engraved, laminated, plastic or Micarta type with white letters engraved through the black background.

- D. Warning signs shall be minimum 18-gauge steel, white porcelain enamel finish with red lettering. Lettering shall read "DANGER - HIGH VOLTAGE," with "DANGER" in 1-1/2" letters and "HIGH VOLTAGE" in 1" letters. Warning signs shall be included on door or immediately above door of all electrical equipment rooms, vaults or closets containing equipment energized above 150 volts to ground.
- E. Other equipment nameplates or warning signs required by the Contract Documents, or added at the equipment manufacturer's or Contractor's discretion, shall be fabricated and installed according to the guidelines specified in this Section.

2.4 GROUNDING SYSTEMS

- A. Insulated Conductors: Green conductors with 600 volt insulation, annealed copper conductors, sized according to NEC except minimum No. 12 AWG size.
- B. Bare Conductors: Medium-hard drawn stranded copper, sized according to NEC except minimum No. 12 AWG size.

PART 3 - EXECUTION

3.1 CONDUCTOR INSTALLATION

- A. The following color code prevails for all branch circuits and feeders:
 - 1. Neutral: White for all voltages.
 - 2. Ground: Green for all voltages.
 - 3. Phase A: Black for 208/120 volts, and 120/240 volts.
 - 4. Phase B: Red for 208/120 volts, and 120/240 volts.
 - 5. Phase C: Blue for 208/120 volts, and 120/240 volts.
 - 6. Three-way travelers - orange for 208/120 volts.
 - 7. For switch legs provide individual color for each leg.
- B. Identify all feeders as to phase or leg in each panelboard with identifying tape a minimum of two inches wide, color coded according to Paragraph 3.1.A above.
- C. For conductors installed in areas subjected to temperatures exceeding 140° F, including terminating in incandescent lighting fixtures and installed through or into housings containing ballasts, provide type THHN.
- D. For conductors installed in exposed conduit outside of buildings and conduit within or just under roofing material, provide type THHN.
- E. Control Circuits for Mechanical Equipment: Use 600 volt UL type THWN conductors except where subject to abnormally high temperatures such as on or near heating elements. Under these conditions, use UL type THHN.

- F. Make all branch circuit and fixture joints for #10 AWG and smaller wire with connectors as specified in Subparagraph 2.1.B.3 above.
- G. Make all branch circuit joints of #8 AWG and larger with screw pressure lugs as specified in Subparagraph 2.1.B.4 above, and insulate with electrical tape to 150% of the insulating value of the conductor insulation.
- H. Tape all connections made with non-insulated type connectors with insulating tape to 150 percent of the insulating value of conductor insulation.
- I. Each circuit shall correspond to the branch circuit number indicated on the panel schedule shown on the Drawings unless otherwise approved by the Owner.
- J. For control wiring, conform to the wiring diagrams shown on the Mechanical Drawings and the manufacturer's wiring diagrams to control the equipment in the manner specified in Division 23 of the Specifications. Color-code all control wiring.
- K. Where conductors in conduit pass through exterior walls, a sealing compound of moisture-resistant material shall be applied in the ends of the conduits to seal around the conductors. Sealant shall be Dow Corning #795 or General Electric #SCS 1000.
- L. Tag all conductors of power circuits and the various signal and sound systems. Conductors shall be tagged in each junction box, pull box, wireways or auxiliary gutter and at each device, motor outlet, panelboard, switchboard or other conductor termination. Tag shall show feeder number, size, phase and origin.
- M. Megger tests shall be taken on all feeder conductors and on all conductors for motors over 15 HP. Tests shall be made prior to connection of equipment. Conductors testing below manufacturer's standard shall be replaced without additional cost to the Owner.
- N. Wiring within all equipment enclosures shall be neatly grouped and tied together.
- O. Pigtails shall be extended from branch wiring in outlet boxes for attachment to devices. Loops in through wiring will not be acceptable.
- P. Conductors in outlet boxes shall have a minimum of 8 inches of extra conductors.
- Q. Tag all conductors in junction boxes, pull boxes, and wireways, indicating panelboard and circuit number.

3.2 INTERIOR PULLBOXES AND WIREWAY INSTALLATION

- A. necessary to facilitate the pulling of wires and cables.
- B. Securely fasten to structural members or channel supports.
- C. Do not install pullboxes in public areas unless specifically indicated on Drawings.
- D. Install sheet metal pullboxes in dry protected locations.

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- E. Install cast iron pullboxes in wet and damp locations. Boxes shall be flush with grade or slab.
- F. Furnish tight fitting bore or punch holes, through which rigid conduit shall be secured to boxes with a double lock nut and bushing.
- G. Label covers of interior wireways and pullboxes. Tag all conductors to identify circuits and origin.
- H. Label all high-voltage pullboxes with a red plastic laminated nameplate with white core letters inscribed "HIGH VOLTAGE" on pullbox cover.

3.3 NAMEPLATE AND WARNING SIGN INSTALLATION

- A. Nameplates shall be mounted by self-tapping, threaded screws and bolts, or by rivets.
- B. Signs shall be permanently mounted with cadmium plated, steel screws or nickel-plated brass bolts.

3.4 GROUNDING SYSTEM INSTALLATION

- A. Connecting Methods:
 - 1. Inaccessible Locations: Make connections by exothermic welding.
 - 2. Accessible Locations: Make connections with approved bolted-through type solderless bronze grounding devices.
- B. System Ground:
 - 1. System Neutral: Connect neutrals for the following equipment to the ground system.
 - a. Transformers.
 - b. Diesel generators.
 - 2. Resistance: Assure maximum 5-ohm ground resistance at all transformers.
- C. Equipment Ground:
 - 1. Non-Current Carrying Metal Parts: Ground non-current carrying metal parts of electrical apparatus and equipment provided under the work of any Division of the Specifications.
 - 2. Raceways: Connect all interrupted metallic raceways with insulated ground conductors. Provide an insulated ground conductor in each non-metallic raceway and connect to metallic terminations at each end.
 - 3. Piping Systems: Bond all metallic piping systems to the building steel to ensure ground continuity. Provide jumpers at all isolating fittings.

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- D. Laboratory Ground:
1. Electrodes: Install 20 feet long XIT electrodes with copper housing and electrolytic filler, complete with exothermically connected ground conductor pigtail, ground clamp, bentonite backfill, and protective box.
 2. Grounding Panels: Install in electrical rooms as indicated.
 3. Resistance: Ensure maximum five (1) ohm resistance to established ground.
 4. An Acceptable Manufacturer: Lyncole XIT Grounding.
- E. Static Ground System: The static ground system shall be a green insulated conductor which is attached to the distribution panel ground bus and which provides a termination for Test Bench Grounding Post terminals.
- F. Isolated Ground System: The isolated ground system shall be a green, with yellow tracer, insulated conductor which is isolated from ground everywhere except for the single point main ground of the power distribution system involved.
- G. Concrete-Encased Electrode: In lieu of a driven ground and when approved, a UFER ground system may be installed. The grounding conductor shall connect the panel ground bus directly to the concrete foundation according to the following table.

UFER GROUNDING TABLE

Conduit

Panel Size	Bare Copper	Length	Sleeve Size
Up to 200	No. 4	20 ft.	3/4 inch
201 to 300	No. 2	25 ft.	3/4 inch
301 to 450	No. 1/0	30 ft.	1 inch
450 to 600	No. 2/0	35 ft.	1 inch
600 to 1600	No. 3/0	50 ft.	1 inch
Over 1600	No. 500 MCM	80 ft.	1-1/4 inch

END OF SECTION

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SECTION 26 05 33.13**CONDUIT FOR ELECTRICAL SYSTEMS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
- B. Provide and install conduits and raceways as shown on the Drawings and as specified.

1.2 REFERENCES

- A. ANSI/NEMA C80.5 - Electrical Rigid Metal Conduit - Aluminum (ERMC-A).
- B. NFPA 70 - National Electrical Code (NEC).

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Rigid Metallic Conduit and Fittings: Provide standard weight steel that is hot-dipped galvanized or sherardized inside and out, with threaded connectors and couplings. Electro galvanizing is not permitted. Intermediate Metal Conduit (IMC) will not be permitted.
- B. Electric Metallic Tubing (EMT) and Fittings: Provide tubing of high-grade steel with exterior protective coating of zinc applied by the electrogalvanized process. Interior of surface shall be coated with aluminum lacquer or enamel. EMT shall be dipped in a chromic acid bath to chemically form a corrosion-resistant protective coating of zinc chromate over galvanized surface. Fittings shall be watertight compression type, wrench tightened connectors and couplings.
- C. Aluminum Conduit: Provide standard weight conduit conforming to Federal Specification ANSI C80.5, with threaded connectors and fittings.
- D. Flexible Steel Conduit: Provide conduit manufactured from single strip, standard weight steel, galvanized on all four sides prior to conduit fabrication. Flexible aluminum conduit will not be allowed.
- E. Flexible Conduit Connectors and Couplings: Provide die cast fittings of the type that screw into the inside of the conduit, with threaded edges at 90 degrees to the fitting body to insure a force fit.
- F. Flexible Liquidtight Steel Conduit and Fittings: Liquidtight conduit shall be manufactured from single strip standard weight steel, galvanized on all four sides prior to conduit fabrication, and shall be provided with an extruded PVC cover. Liquidtight fittings shall provide positive ground continuity. Include ground conductor. Sealtite Flexible Type "UA" or "Flex-Seal" Type "XL" with Appleton Flexible fittings,

Series "ST", T & B 5200 Series or equal by Thomas & Betts (Part of ABB). Flexible conduit shall be cut at right angles for installation.

- G. Rigid Plastic Conduit and Fittings: Provide heavy wall, virgin PVC Schedule 40 with self-extinguishing additive, conforming to UL requirements.
- H. PVC Jacketed Conduit: Rigid steel conduit and fitting with a 20 mil extruded PVC jacket. The jacket shall have high tensile strength, shall be highly resistant to corrosion and shall not oxidize or deteriorate or shrink when exposed to sunlight and weather. The jacket shall be flame retardant and shall not support combustion.
- I. Traffic Signal Conduits: Furnish and install two 1" C.O., one from the Apparatus Room and one from the Station Office to weatherproof junction box at property line, as shown on the Drawings.
- J. No conduit shall be smaller than 1/2-inch unless otherwise indicated on the Drawings.
- K. Sleeves shall be zinc coated galvanized steel pipe or 18 gauge galvanized sheet metal.
- L. Sealant: Fire rated equal to wall or ceiling penetrated. Silicone foam 3M Fire Barrier 2001 or Hilti FS-ONE MAX and CP 606.
- M. Anchors not cast into concrete shall be expansion shield type, Phillips "Red Head," or Hilti anchors.
- N. Conduit seals shall be Crouse-Hinds Type "EYS" or "EZS", Appleton Type "ESUF" or "ESUM" with sealing compound as recommended by the manufacturer for hazardous or refrigerated areas.
- O. Expansion couplings shall be O-Z-Gedney Type "AX" or "DX" or Crouse-Hinds Type "XJ" or "XD", complete with bonding jumper.
- P. Conduit unions shall be "Erickson" couplings manufactured by Thomas and Betts or Type 4-Series manufactured by O-Z-Gedney.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Size of Conduits:
 - 1. The size of the conduits for the various circuits shall be as indicated on the Drawings and as required by NEC for the size and number of conductors to be pulled therein. NEC requirements shall prevail where fill is not shown on Drawings.
 - 2. Open ends of conduits shall be capped until ready to pull in conductors.

B. Rigid Steel Conduit:

1. Use for all sizes where directly exposed to weather; where subject to abnormal conditions of heat, cold, moisture, humidity, fumes and hazardous elements; where installed exposed below 7-1/2 feet, in areas where subject to mechanical injury including mechanical and equipment rooms; for high voltage (above 600 volts) and low voltage (up to 600 volts) volt feeders inside of building and in concrete slabs on grade.
2. For all bends in conduit 1-1/4-inch and larger, use large radius factory made bends or field fabricate with a power bender.
3. Cut threads on conduit to standard taper and to a length such that all bare metal exposed by the threading operation will be completely covered by the couplings or fittings used. Securely tighten all threaded connections. The ends of all conduits shall be cut square and reamed to full size with a tapered burring reamer.
4. Use conduit unions to connect two rigidly held conduits. Running thread will not be accepted.

C. Rigid Plastic Conduit:

1. Use for all conduit installed underground five (5) feet outside of building lines, except sweeps and risers shall be PVC-coated steel. Do not use in or under building.
2. Make all fittings in plastic conduit watertight with approved solvent-weld cement specifically manufactured for the purpose. Apply heat for bends so that conduit does not distort or discolor. Use a spring mandrel as required to assure full inside diameter at all bends.

D. EMT and Aluminum Conduit: Use for all sizes up to 2 inches maximum trade size in dry locations, as in stud partitions and furred ceiling spaces. Conduits shall be continuous from outlet to outlet to panel except where rigid steel conduit is required or indicated. EMT shall not be run exposed. Neither aluminum nor EMT shall be installed in concrete. EMT and aluminum conduit shall not be used for feeders to panelboards, motor control centers and switchboards. EMT shall not be used in mechanical and electrical equipment rooms.**E. Flexible Steel Conduit:**

1. Install only where indicated and for short motor or vibrating equipment connections, minimum 36 inches long, or for connections to recessed fixtures from junction or pullboxes. Maximum length for any application shall be 6 feet.
2. Provide liquidtight flexible conduit with separate insulated, stranded copper equipment ground conductor for connections in areas exposed to the weather, damp or wet locations and connections to motors and transformer enclosures, regardless of location.

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F. PVC Jacketed Steel Conduit:

1. Use for all sizes in soil below the building.
2. For all bends in conduit 1-1/4-inch and larger, use large radius factory made bends or field fabricate with a power bender.
3. Cut threads on conduit to standard taper and to a length such that all bare metal exposed by the threading operation will be completely covered by the couplings or fittings used. Securely tighten all threaded connections.
4. Wrap all joints with two layers of 10 mil PVC tape.
5. Replace all conduit and fittings which have a damaged PVC coating at no additional cost to the Owner.

G. Conduit Placement:

1. Support conduits 1-inch and larger with pipe clamps either suspended from structural slabs with a rod at least 3/8-inch diameter with adjustable pipe ring, or mounted on wall from channel supports. Attach to concrete with Phillips "Red Head" or Hilti drilled anchors. Where two or more conduits 1-1/2 inch and larger are suspended from ceiling, use trapeze type hanger suspended from rods.
2. Where rigid metal conduits and electrical metallic tubing are supported from building members, supports shall be installed as follows:
 - a. Conduit Sizes:
 - 1) 3/4" to 1-1/4" Inclusive: Within 18" of each outlet and on either side of couplings and fittings, and at a spacing not to exceed 8 feet.
 - 2) 1-1/2" and Larger: Within 3 feet of each junction or pull box and terminal cabinet, and at a spacing not to exceed 8 feet.
 - b. When rigid conduits are supported from trapezes, the supports shall be spaced not more than 8 feet apart.
 - c. Conduit trapezes shall consist of fittings by Unistrut or Kindorf, in accordance with the manufacturer's printed recommendation.
3. Secure exposed conduit runs on concrete, plaster or other construction in place with cast conduit clamps affixed with metallic expansion anchors or toggle bolts, and cadmium plated machine or lag screws.
4. Do not strap or fasten rigid conduit to mechanical equipment, or to equipment subject to vibration or mounted on shock absorbing bases.

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5. Use insulated bushings and locknuts on all conduits where entering pull boxes, junction boxes, outlet boxes, cabinets and similar enclosures, and for all signal and telephone conduit terminated in cabinets or backboards.
6. Conduits terminating where termination is subject to moisture or where conduit penetrates exterior wall or roof shall be sealed with Manville "Duxseal" or Minnesota Mining and Manufacturing Co. "Scotchfil".
7. Provide a nylon or a 3/32-inch OD polyethylene line rated at 200 pounds tensile strength in all conduits more than 5 feet in length left empty for future use.
8. Tag all empty conduits at each accessible end with a permanent tag identifying the purpose of the conduit and the location of the other end. In wet, corrosive outdoor or underground locations use brass, bronze, or copper 16 gauge tags or lead tags secured to conduit ends with #16 or larger galvanized wire. Inscribe on the tags, with steel punch dies, clear and complete identifying information.
9. Provide expansion and deflection fittings where two rigidly supported conduits may move in relation to each other at expansion joint crossings.
10. From each panel which is flush mounted in a wall, stub from top of the panel, a minimum of 4-3/4-inch conduits to the nearest ceiling space or other accessible location and cap for future use.
11. Provide independent support for all conduits rising from floor for motor connections if over 18 inches above floor. Do not support to motor, to ductwork or mechanical equipment.
12. Conduits which are installed above dry type suspended ceilings shall not be secured to ceiling support wires. Support such conduit independent of ceiling suspension systems.
13. Keep bends and offsets in conduit runs to an absolute minimum. Replace all deformed, flattened or kinked conduit at no additional cost to the Owner.
14. Ream the ends of all conduits.
15. Seal all conduits from exterior outlets at first interior junction to prevent moisture from entering the building through the conduit.
16. All exposed conduit shall be installed parallel to and perpendicular to the building structure.
17. Conduit shall be minimum size 3/4-inch where concealed in floor or underground.
18. Encase all non-metallic and metallic feeder conduit installed underground in a 3-inch concrete envelope. Extend concrete envelopes a minimum of 3 inches beyond all external sides of all outermost conduits. Space the external

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surfaces of all conduit within a bank at a minimum of 3 inches apart. All data, telephone, and intercommunication circuits contained within non-metallic conduit shall have a minimum separation of 6 inches from any light or power circuits that parallel them within a bank. Metallic conduits containing high voltage feeders under the building shall be PVC coated and encased in concrete.

19. Use manufactured concrete or plastic spacers to assure required concrete coverage. Concrete shall be 2500 psi. Concrete for conduit and duct banks containing high voltage cables (above 480 volts line-to-line) shall have "red oxide" sprinkled on top of the wet concrete to provide a distinctive red color to the concrete envelope, and the conduits shall be rigid steel. Use PVC Schedule 40 encased in concrete as described in the above paragraph for signal system runs outside the building. When PVC is used, all sweeps and elbows shall be galvanized rigid steel coated with PVC. All extensions of PVC conduits under the building shall be PVC coated rigid galvanized conduit. At building entry point provide tags on all conduits clearly stating "CAUTION--HORIZONTAL RUNS EXTERIOR TO BUILDING ARE PLASTIC. GROUND CONDUCTOR REQUIRED FOR THIS ENTIRE RUN."
20. Duct lines shall have a continuous slope downward toward manholes and away from buildings with a pitch of not less than 4 inches in 100 feet. Changes in direction of runs exceeding a total of 10 degrees, either vertical or horizontal, shall be accomplished by long sweep bends having a minimum radius of curvature of 25 feet, except that manufactured bends may be used at ends of short runs of 100 feet or less, and then only at or close to the end of run.
21. Exposed conduit larger than 1 inch shall be suspended with pipe hangers. Pipe hangers for individual conduits shall be Grinnell #108 and #110R or Super Strut #M-718-5R, malleable iron split pipe rings suspended from hanger rods. Rods shall be 3/8-inch for 2-inch and smaller conduits, and 1/2-inch for 2-1/2-inch and larger conduits. Hangers and racks shall be attached to concrete with insets, set at the time the concrete is poured and to steel members with beam clamps or machine bolts.
22. Conduit clamps and hanger rods attached to concrete structures shall be secured by machine bolts or rods screwed into anchors. Anchors not cast into the concrete shall be expansion shield type, Phillips "Red Head" or Hilti.
23. A separate conduit shall be installed for each homerun indicated on the Drawings.
24. Sleeves: Wherever conduits pass through concrete walls, furnish and install sleeves of ample size to permit installation of conduit. Sleeves shall be installed prior to pouring of concrete and shall have ends flush with the wall or extend 2 inches above floor surfaces. Verify locations with the Architect.
25. Finish around Sleeves: Rough edges shall be finished smooth. Space between conduit and sleeves where conduit passes through exterior walls shall be sealed to permit movement of conduit, but prevent entrance of water.

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- Space between conduit and sleeves where conduit passes through fire rated interior walls and slabs shall be sealed with approved materials to provide a fire barrier conforming to the requirement of the applicable Codes.
26. Wherever conduit extends through roof, furnish and install galvanized sheet metal flashing. Flashing shall extend six inches above roof.
 27. Install conduit seals in all conduits entering or leaving hazardous areas, refrigerated rooms and clean rooms.
 28. Except as otherwise indicated on the Drawings, bends in conduit 2 inches or larger shall have a radius of curvature of the inner edge, equal to not less than ten (10) times the internal diameter of the conduit. Any deviations from this radius shall be approved by the Architect. Wire or cable bends in junction or pull boxes shall be made with a long radius. Bends for 600-volt cable shall have a radius of not less than five (5) times the diameter of the cable. Nesting of conduits shall be made when two or more conduits are run in parallel. High voltage feeder conduit runs (above 600 volts), telephone and data conduit runs shall not have more than two 90° long radius bends. All other conduit runs (below 600 volts) shall not have more than three 90° long radius bends between pull boxes, junction boxes or terminal cabinets.
 29. Conduit shall not be run closer than 6 inches to any hot water pipe, steam pipe, heater flue or vent.
 30. Provide condulets for exposed runs of conduits where junctions, 90° bends or offsets are required, whether such condulets are indicated on the Drawings or not. Conduit bends will not be permitted around the corners of beams, walls or equipment. All condulet covers shall be accessible. Condulets 2 inches or larger shall be Crouse-Hinds Type "LBD" or Appleton "LBD".
 31. All control apparatus, outlet boxes, junction and pull boxes, and other similar equipment shall be installed and maintained in accessible positions and locations.
 32. Conduits in furred spaces shall be routed to clear access openings.
 33. Where steel conduits enter a concrete floor below a surface mounted panelboard, they shall be encased in a concrete curb of sufficient height to match the height of the finished base tile.
 34. Holes for conduits through existing concrete walls or floors shall be made by the "core-drill" method.
 35. Upon completing the installation of any run of conduit, the runs shall be tested to see that they are free from all obstructions and have a smooth interior. Each end of each conduit run shall be plugged with "pennies" and bushings, and left plugged until ready to pull circuit wires.

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36. A 6-inch square by 2-foot deep concrete block with an embedded brass nameplate shall be installed over the ends of all spare conduits stubbed out of the building indicating the origin of the conduits.

END OF SECTION

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SECTION 26 05 38**EXTERIOR PULLBOXES AND MANHOLES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
- B. Provide exterior pullboxes and manholes as shown on the Drawings and as specified.

1.2 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Shop Drawings and Product Data: The following list includes the required shop drawings that shall be submitted.
 - 1. Reinforcing iron dimensions and placement.
 - 2. Concrete dimensions.
 - 3. Dimensions of pull irons and gauges.
 - 4. Cable rack irons dimensions and mounting method.
 - 5. Interior dimensions.
- C. Structural calculations for compliance with H20 loading.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Precast Concrete Pullboxes and Manholes: Concrete pullboxes shall be Parkway or Traffic Type as required for specific area, of the sizes shown, precast in sections, with cover marked "Electric" or "T" and with brass hex head screws. Boxes shall be Associated or Brooks.
 - 1. Manholes shall be equipped with the following:
 - a. Copper-weld ground rod measuring 3/4-inch x 10-feet.
 - b. Two (2) 48-inch cable rack irons on each side of wall.
 - c. Pull irons shall be 1/2-inch diameter galvanized Steel.
 - d. 36" Joint 10" STD V.C. Drain Tile.
- B. Damp-proofing Material: A-C Horn Company "Dehydratine" No. 4.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install precast manholes and pullboxes of sizes required on the Drawings.
1. Place duct and conduit entries six inches above floor of hand holes. Provide end bells in all duct entrances.
 2. Place pulling irons on opposite walls and below horizontal centerlines of ducts and bricked-up openings, and in bottom. Install pulling irons with each end hooked around a reinforcing bar.
 3. Dampproof exterior walls and tops of below-grade manholes and pullboxes with two (2) coats of damp-proofing material.
 4. Install a floor drain into a sump containing two cubic yards of crushed rock; minimum size 48 inches deep and 36 inches diameter. Provide 36-inch length of 8-inch diameter tile pipe extending down into the sump. Provide a grille over the top opening of pipe.
 5. Install ground rod 3/4" x 8' minimum in every manhole and concrete pullbox. Locate near a wall with 6-inch projection above floor for ground clamps. If rock bottom is encountered, bury ground rod in horizontal trench with projection into manhole. Permanently ground all metal equipment cases, cable racks, etc., in manholes and pullboxes.
 6. Provide a 6-inch deep sand base under each pullbox and a 18-inch gravel sump under each manhole.
 7. Identify all power and signal cables by tagging in all manholes and pullboxes. Tie securely to cables with nylon cord or insulated type TW wire. Tie so turns of wires do not form a closed electrical circuit.

END OF SECTION

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SECTION 26 09 43
LIGHTING CONTROL SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide all labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of a complete system for the control of lighting and other equipment as indicated on the Drawings and as further defined herein.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.

1.2 REFERENCES

- A. 2022 Building Energy Efficiency Standards (Includes Title 24).
- B. NEC Article 725 - Class 2 and Class 3 Power-Limited Circuits.
- C. UL 916 - Standard for Energy Management Equipment.
- D. UL 924 - Standard for Power Equipment and Emergency Lighting.

1.3 SYSTEM REQUIREMENTS

- A. The system shall include but not be limited by the following:
 - 1. Pre-wired, microprocessor controlled relay panels with electrically held, electronically latched relays controlled via a complete list of communications based accessories including digital switches, digital photocells, Digital Time Clock (DTC) and interface cards to dimming systems, building automation systems, thermostats, and any contact closure or analog based device.
 - 2. Microprocessor Controlled Digital Relay Lighting Control system with RS 485 Bus communications.
 - 3. Electrical subcontractor to provide all components including phone line to modem.
- B. Requirements are indicated elsewhere in these Specifications for work including, but not limited to, raceways and electrical boxes and fittings required for installation of control equipment and wiring. They are not the work of this Section.
- C. Contractor shall coordinate all of the work in this Section with all of the trades covered in other Sections of the Specification to provide a complete and operable system.

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1.4 QUALITY ASSURANCE

- A. Control wiring shall be in accordance with the NEC requirements for Class 2 remote control systems, Article 725, and manufacturer's specification.
- B. Lighting control panels shall be ETL listed to UL 916. LCPs controlling emergency circuits shall be ETL listed to UL 924.
- C. The lighting control system shall also comply with California Title 24.
- D. Manufacturer Qualifications: Firms regularly engaged in manufacture of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than five (5) years.
- E. A licensed electrician shall functionally test each system component after installation, verify proper operation and confirm that all relay panel and switch wiring conform to the wiring documentation.

1.5 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Shop Drawings: Submit dimensioned drawings of lighting control system and accessories including, but not necessarily limited to, relay panels, switches, DTC, photocells, and other interfaces. Drawings to indicate exact location of each device.
- C. Product Data: Submit for approval 6 copies of manufacturer's data on the specific lighting control system and components. Submittal shall be in both electronic and hard copy formats. To prevent departures from approved system operation, electronic file submitted shall be able to be directly downloaded to the specified system at manufacturer facility. Submit a complete bill of materials with part numbers, description and voltage specifications.
- D. One Line Diagram: Submit a one-line diagram of the system configuration indicating the type, size and number of conductors between each component if it differs from that illustrated in the riser diagram on the Drawings. Submittals that show typical riser diagrams are not acceptable.

1.6 EXTRA MATERIALS

- A. Provide two (2) spare relays per Lighting Control Panel.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Products shall be manufactured by Lighting Control & Design or General Electric.

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2.2 MATERIAL AND COMPONENTS

A. Relay Panels shall be made up of the following components:

1. NEMA rated enclosure with screw cover or hinged door. Provide rain tight or oil tight and other NEMA rated versions as required.
2. 16 AWG steel barrier shall separate the high voltage and low voltage compartments of the panel and separate 120v and 277v.
3. Panel input power shall be capable of accepting 120v or 277v without rewiring.
4. Control electronics in the low voltage section shall be capable of driving 2 to 48 relays, controlling any individual or group of relays, providing individual relay overrides, providing a master override for each panel, storing all programming in non-volatile memory, returning system to current state after power is restored, providing programmable blink warn timers for each relay and every zone, and controlling Normally Open (NO) or Normally Closed (NC) relays.
5. Lighting control system shall be digital and consist of a Master LCP with up to 48 individual relays, Slave LCPs with up to 48 individual relays in each panel, a Micro LCP with up to 4 individual relays, digital switches and digital interface cards. All system components shall connect and be controlled via a single Category 5, 4 twisted pair cable, providing real time two-way communication with each system component. Analog systems are not acceptable.

B. Standard Output Relays:

1. Electrically held, electronically latched SPST relay.
2. Relays shall be individually replaceable. Relay terminal blocks shall be capable of accepting two (2) #10AWG wires on both the line and the load side. Systems that do not allow for individual relay replacement or additions are not acceptable.
3. Rated at 20 Amp, 277VAC Ballast, Tungsten, HID, 1 HP at 120 Vac, 2 HP at 240 Vac.
4. Relays to be rated for 250,000 operations minimum at 20a lighting load, use Zero Cross circuitry and be Normally Closed (NCZC). All incandescent circuits shall be energized by use of a Normally Closed SoftStart™ (NCSS) relay rated at 100,000 operations at full 20a load. No exceptions.
5. Optional relay types available shall include Normally Open (NO) relay rated for 100,000 operations, a 600v 2-pole NO and NC and a Single Pole, Double Throw (SPDT) relay.

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C. Switches:

1. All switches shall be digital and communicate via RS 485. Contact closure style switches shall not be acceptable. Any switch button function shall be able to be changed locally (at the DTC or a PC) or remotely, via modem, Internet or Ethernet.
2. Switches shall be available in 1 through 6-button version with engravable buttons, red LED annunciation for each button and a constantly ON green LED locator.
3. Switches may be programmed to be Momentary ON, Momentary OFF, Toggle or Maintained. These functions shall be able to be changed locally (at the DTC or a PC) or remotely, via modem.
4. Contractor to verify all switch types and quantities per Drawings and Specifications.
5. Accessories available to include digital key switch and digital key enable switch.

D. DTC - Digital Electronic Time Clock:

1. A Digital Time Clock (DTC) shall control and program the entire lighting control system and supply all time functions and accept interface inputs.
2. DTC shall be capable of up to 32 schedules. Each schedule shall consist of one set of ON and OFF times per day for each day of the week and for each of two holiday lists. The schedules shall apply to any individual relay or group of relays.
3. The DTC shall be capable of controlling up to 126 digital devices on a single bus and capable of interfacing digitally with other individual busses using manufacturer supplied interface cards.
4. The DTC shall accept control locally using built in button prompts and use of an 8 line 21-letter display or from a computer or modem via an on-board RS 232 port. All commands shall be in plain English. Help pages shall display on the DTC screen.
5. The DTC shall be run from non-volatile memory so that all system programming and real time clock functions are maintained for a minimum of 15 years with loss of power.
6. Software shall be pre-installed to accept standard Unity Graphical Management Software (GMS) pages. GMS software shall provide via local or remote PC a visual representation of each device on the bus, show real time status and the ability to change the status of any individual device, relay or zone.

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7. Pre-Installed modem shall allow for remote programming from any location using a PC. Modem to include all necessary software for local or remote control.
 8. DTC shall provide system wide timed overrides. Any relay, group or zone that is overridden ON, before or after hours, shall automatically be swept OFF by the DTC a maximum of 2 hours later.
- E. Interfaces: For future expansion capability, system to have available all of the following interfaces. Verify and install only those interfaces indicated on the Drawings.
1. A dry contact input interface card that provides 14 programmable dry contact closure inputs. Use shielded cable to connect input devices to interface card.
 2. Interface card providing digital communication from one system bus to another system bus, allowing up to 12,000 devices to communicate.
 3. An exterior (PCO) or interior (PCI) photocell that provides readout on the DTC screen in number values analogous to foot-candles. Each photocell shall provide a minimum of 14 trigger points. Each trigger can be programmed to control any relay or zone. Each trigger shall be set through programming only. Photocells which require the use of setscrews or which must be programmed at the photocell control card shall be not acceptable.
 4. An interface card that allows the DTC to control up to 32 digital XCI brand thermostats. Programming of thermostats to be able to be done locally (at the DTC or a PC) or remotely, via modem, Internet or Ethernet.
 5. A voice prompted telephone override interface module. Interface module shall accept up to 3 phone lines and allow up to 3 simultaneous phone calls. Voice prompted menu and up to 999 unique pass codes shall be standard with each interface module.
 6. Software pre-installed to run Unity GX Graphical Management Software (GMS-GX) pages. GMS-GX software shall provide via local or remote PC a visual representation of a specific area or the total area of the Project. GMS full graphic pages shall be designed to the Owner's specifications.

2.3 MODES OF OPERATIONS

- A. DTC - Digital Electronic Time Clock: DTC shall control any relay or group of relays by the following modes. No exceptions.
1. ON only, OFF only, Maintained with timer and OFF sweep warning (Blink warn), Maintained with timer (No blink warning).
 2. Timers adjustable from 1 minute to 4 hours. When the scheduled program in the DTC is ON the associated timers are disabled. When the scheduled program in the DTC is off and a relay or zone is overridden, the DTC will

put that relay or zone into the timer mode and automatically sweep off at the end of the programmed timer period (Maximum 2-Hour Timed Override).

3. All DTC settings, schedules, photocell trip points, temperature settings, longitude and latitude, time zone offset to sunrise and sunset and any other Owner settings shall be able to be changed though software locally (at the DTC or a PC) or remotely, via modem, Internet or Ethernet.

B. Switches:

1. All system switches shall be digital and daisy chained on a single category 5, 4 twisted pair cable with all LCPs.
2. Any switch button shall be able to control any relay or group of relays anywhere on the system in the following modes:
 - a. ON, OFF, Mixed (some relays ON some OFF), Toggle (first push ON, next OFF etc.), Maintain.
 - b. Timer ON with a time set from 1 minute to 4 hours.
 - c. Timer ON with OFF sweep warning, (blink warning 5 min or as programmed prior to OFF sweep.)
 - d. Timer ON with Horn Warning (Horn output turns ON for the warning 5 min or as programmed prior to OFF sweep.)
 - e. Any switch function shall be able to be changed locally (at the DTC or a PC) or remotely, via modem, Internet or Ethernet.
 - f. Any relay, group or zoned that is overridden ON, before or after hours, shall automatically be swept OFF by the DTC a maximum of 2 hours later.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. The specified lighting control system shall be installed by the electrical subcontractor who shall make all necessary wiring connections to external devices and equipment, to include photocell. Electrical subcontractor to wire per manufacturer instructions.
- B. Cabinets:
 1. Mount relay control cabinets adjacent to respective lighting panelboard. Cabinet shall be surface or flush mount, per Drawings.
 2. Wiring between relay control cabinet and panelboards to be per local codes and acceptable industry standards. Neatly lace and rack wiring in cabinets.

3. During construction process, protect all interior components of each relay panel and each digital switch from dust and debris.
- C. Wiring:
1. Do not mix low voltage and high voltage conductors in the same conduit. No exceptions.
 2. Ensure low voltage conduits or control wires do not run parallel to current carrying conduits.
 3. Place manufacturer supplied "terminators" at each end of the system bus per manufacturer instructions.
 4. Neatly lace and rack wiring in cabinets.
 5. Plug in Category 5, 4-twisted pair patch cable that has been field tested with a recognized cable tester at the indicated RJ45 connector provided with each lighting control device, per manufacturer instructions.
 6. Use Category 5, 4 twisted pair patch cable for all system low voltage connections. Additional conductors may be required to compensate for voltage drop with specific system designs. Use shielded cable for dry contact inputs to lighting control system.
 7. Do not exceed 4000 ft-wire length for the system bus.
 8. All items on the bus shall be connected in sequence (daisy chained). Star and spur topologies are not acceptable.
- D. Switches:
1. Provide outlet boxes, single or multi-gang, as shown on the Drawings for the low voltage digital switches. Mount switches as per Drawings. Supply faceplates per Drawings and Specifications.
 2. Electrical subcontractor is specifically responsible to supply and install the required low voltage cable, Category 5, 4 twisted pair, with pre-assemble RJ45 connectors and snagless boots (commonly referred to as a Cat 5 patch cable) between all switches and panels. Field-test all Cat 5 patch cable with a recognized cable tester. All low voltage wire to be run in conduit, per local codes.
- E. Any damage done to electronic components due to non-protection shall be the sole responsibility of the installing subcontractor.
- F. Under no circumstances will any extra be authorized for payment to the electrical subcontractor or Contractor due to the electrical subcontractor's lack of knowledge or understanding of any and all prevailing codes or specified manufacturer's installation requirements.

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3.2 DOCUMENTATION

- A. Each relay shall have an identification label indicating the originating branch circuit number and panelboard name along with the relay number as indicated on the Drawings. Each line side branch circuit conductor shall have an identification tag indicating the branch circuit number.
- B. Provide a point-to-point wiring diagram for the entire lighting control system. Diagram must indicate exact mounting location of each system device. This accurate "as built" shall indicate the loads controlled by each relay and the identification number for that relay, placement of switches, and location of photocell. Original to be given to owner, copies placed inside the door of each LCP.

3.3 SERVICE AND SUPPORT

- A. Telephone factory support shall be available at no additional cost to the EC or Owner both during and after the warranty period. Factory to pre-program the lighting control system per plans and approved submittal, to the extent data is available. The specified manufacturer, at no added cost, shall provide additional programming via modem as required by the EC or Owner for the operation life of the system. Manufacturer warrants that the DTC software can be upgraded and monitored remotely. Upon request manufacturer to provide remote dial up software at no added cost to system owner. No exceptions.
- B. Provide a factory technician for on-site training of the owners' representatives and maintenance personnel. Coordinate timing with General Contractor.

3.4 CLEANING

- A. Remove dirt and debris from all LCP enclosures.
- B. Clean photocell lens as recommended by manufacturer.
- C. Clean all switch faceplates.
- D. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

3.5 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Provide extra version of manufacturer's operating software and include graphical interface software.
- B. Provide 2 extra sets of as-built and operating manuals.

END OF SECTION

SECTION 26 24 13**SWITCHBOARDS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
- B. Furnish and install switchboards as shown on the Drawings and complete, as specified.

1.2 REFERENCES

- A. IEEE C37.20 Series - Switchgear Assemblies.
- B. NECA 402 - Standard for Installing and Maintaining Motor Control Centers.
- C. NEMA PB 2 - Deadfront Distribution Switchboards.
- D. NFPA 70 - National Electrical Code (NEC).
- E. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures.
- F. UL 891 - Switchboards.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Factory Tests: Switchgear tests - IEEE C37.20 Series.
 - 1. Certified copies of design tests, production tests, and conformance tests of the switchgear shall be submitted.
 - 2. Review comments shall be received before delivery of equipment to the Project site.
 - 3. In lieu of the above tests, a report of these tests previously performed on identical units of each rating will be acceptable.

1.4 APPLICABLE STANDARDS

- A. The switchgear equipment shall be designed, tested and assembled in accordance with ANSI, IEEE, NEMA and UL requirements.
- B. The switchgear equipment shall comply with local utility company standards.

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PART 2 - PRODUCTS

2.1 BUSSING

- A. Horizontal and vertical busses shall be full length. Buses shall have a minimum withstand rating equal to available fault current indicated on Drawings, but in no case shall the rating be less than 50,000 amperes, symmetrical.
- B. Provide interconnected full capacity neutral bus in each section with the same ratings and construction as the phase busses.
- C. Provide interconnected ground bus in each section.
- D. Provide space and all hardware and mounting attachments for future devices as indicated on the Drawings.
- E. Main horizontal bussing shall be full capacity in all switchboard sections.
- F. Vertical buss may be tapered, to not less than one third the ampacity rating of the main horizontal buss, but in no case shall the vertical buss be of less capacity than the sum of the frame size ampacities of overcurrent devices mounted in the respective sections including any indicated spares and spaces.
- G. The switchboard bussing shall be of sufficient cross-sectional area to meet UL Standard 891 on temperature rise. Bus shall be copper. The through bus shall have provisions for the addition of future sections. The through bus supports, connections and joints are to be bolted with grade 5 hex head bolts and belleville washers to minimize maintenance requirements.

2.2 CIRCUIT BREAKERS

- A. Circuit protective devices as indicated on the Drawings. All devices shall have an interrupting capacity not less than the maximum available fault current at the circuit breaker as indicated on the Drawings, but in no case shall the interrupting capacity be less than 42,000 ampere symmetrical for 240 volt or 208/120 volt devices. Provide padlock-off devices on each device. Breakers shall provide time overcurrent and instantaneous circuit protection.
- B. Circuit breakers shall employ a stored energy, quick make-quick break, trip free operating system on each phase, with common trip. Breakers shall comply with UL 489 latest revision. Circuit breakers noted as "100%" on the Drawings shall be rated to carry the breaker full rated (100%) ampere load continuously. Provide conductor lugs on circuit breakers to accept conductor sizes shown on Drawings.
- C. Performance requirements for circuit breakers conforming to the following applications:
 - 1. 100 ampere frame size and smaller.
 - 2. 100 ampere and smaller trip.

- D. Circuit breaker shall be molded case thermal-magnetic trip.

2.3 MAIN SWITCHBOARD

- A. Switchboard shall be floor-mounted, dead-front, dead-rear type, front and rear aligned, self-supporting, consisting of one or more vertical sections with group mounted non-drawout circuit protective devices, instrumentation and control wiring as indicated on the drawings and as specified herein.
- B. Switchboards shall be manufactured by Square D.
- C. Switchboard shall be designed, built and tested in accordance with applicable portion of the latest editions of NEMA PB 2, Underwriters Laboratories Standard 891 and the National Electrical Code.
- D. Switchboard sections shall be floor standing self-supporting, of the universal frame type using die-formed, 12-gauge steel members bolted and welded together. Provide removable side and rear plates with formed edges all around. Provide ventilation openings required to maintain minimum operating temperature. Provide removable steel cover plates for all usable device spaces. Provide lifting means and provisions for moving by means of rollers or skids to installation location. Bolt individual sections together to form a single rigid switchboard assembly. Provide full height, hinged, vertical wire way metal covers, on each verticle wireway of each distribution section of the switchboard, containing group mounted feeder protective devices.
- E. Switchboard shall include, but not be limited to, the following:
 - 1. Cable tap pull box.
 - 2. Feeder protective devices.
 - 3. Copper bussing.
 - 4. "Power Logic" energy measurement system.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install switchboards in accordance with manufacturer's written instructions, NEC requirements for switchboards, and applicable portions of NECA 402.

3.2 CONNECTING METHODS

- A. Bolt switchboards to floor and wall where wall exists. Where units are free standing provide pre-formed steel channel or angle iron bracing to nearest wall or building structural member. Switchboard anchoring shall be designed for a 1.0 gravity lateral acceleration of the equipment. Submit structural calculations and details.

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3.3 TESTING (ADDITIONAL REQUIREMENTS)

- A. Adjustable settings shall be set and tested after the equipment installation is complete, for proper operation at set pickup and/or dropout points, by an independent test laboratory. Testing shall comply with the equipment manufacturer's recommendations. Submit three copies of all test results to the Architect. Correct any deficiencies and retest.

3.4 IDENTIFICATION (ADDITIONAL REQUIREMENTS)

- A. Manufacturer shall stencil the equipment name on each device and equipment section to correspond to the identification of the Drawings.
- B. Devices mounted in equipment controlling protective devices shall be provided with nameplates indicating device controlled or monitored.

END OF SECTION

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SECTION 26 24 16**PANELBOARDS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
- B. Provide and install panelboards as shown on the Drawings and complete as specified.

1.2 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Shop Drawings and Product Data: The following list includes the required shop drawing information that shall be submitted.
 - 1. Thickness, gauges and finish of materials.
 - 2. Types of materials and bus bracing.
 - 3. Circuit breaker ratings, interrupting capacities and FS compliance.
 - 4. Sheet metal enclosure construction and sizes and UL approval.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Provide panelboard cabinets flush or surface mounted as noted on the Drawings, with hinged lockable door, typewritten index card holders under plastic cover, aluminum bussing, and main lugs or main protective device as indicated on the Drawings. Panels shall have concealed hinge, latch and flush locks, keyed to operate from one key, and permanent type plastic or metal numbers on adjacent trim removable only from back of trim, to identify the branch circuit breakers. Bussing shall be minimum 225 amperes and, except where feeder breaker protecting panel 100 ampere or less, the bussing may be 100 ampere. Panelboards with a height greater than 3 feet shall have three trim bolts each side.
- B. Lighting, power and distribution panelboards shall be three-phase, four-wire, S/N 480/277 or 208/120 volt. Panelboards shall be Square D Type "NEHB" or "NQOD". All panelboards shall be equipped with a ground buss and double lugs or main circuit breaker, as indicated on Drawings.
- C. All boxes shall be formed of galvanized metal, chemically cleaned, and all breaks in galvanizing shall be painted with metallic aluminum paint. Minimum size shall be 20 inches wide by 5-3/4 inches deep unless noted otherwise on the Drawings. All trims and doors shall be chemically cleaned. Front door and trim shall be finished with

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ANSI #61 light gray paint for surface or semi-recessed mounting and shall be finished with a prime coat for flush mounting.

- D. Provide a zinc chromate primer factory finish on the exposed trim of all flush mounted panels in corridors, offices and other public spaces.
- E. Protective devices, main, branch or sub-feed shall be bolt-on type circuit breakers as shown on the Drawings or panel schedules. Circuit breakers in panelboards shall be rated to interrupt the fault current available at panelboards, as shown on the Drawings or otherwise indicated. As a minimum, all circuit breakers shall be rated 10,000 amperes symmetrical.
- F. Equip each circuit feeding high intensity discharge lamps with NEC lock-off device, unless lamps are within sight of panelboard or have local switch. Non-switched emergency light circuits, fire alarm and control circuits shall include "lock-on" devices.
- G. Where a contactor, relay or time switch is indicated to be included with or adjacent to a panelboard, it shall be in a separate box and mounted under a separate hinged lockable door. Where a panelboard or box has more than one door, a barrier and divider bar shall be installed between doors. Relays, time switches and control devices may be grouped under one door, but not with a contactor.
- H. For all lighting and power panelboards, circuit breakers shall be 20A minimum, except when used as a feeder to controls or one motor with full load current of 10 amperes or less, heavy duty, Square D Type "QOB" or "EH/EHB".

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation of adjacent panelboards shall be such that top trims are level and at the same height, unless specifically noted otherwise. Protection device heights shall be a maximum of 6 feet 6 inches to the handle for panelboards over 29 inches in height, and 5 feet 6 inches in panelboards 29 inches high or less, except where adjacent to taller panelboards.
- B. From each flush mounted panelboard route 4-3/4" empty conduits into accessible ceiling space.
- C. All lighting and power panelboards shall be rigidly supported independently of conduit with Unistrut #P1000 channel or Kindorf #B-900.
- D. Panelboards located in mechanical areas shall have weatherproof gaskets on trims and doors.
- E. Obtain County's room numbering system and include these room numbers in final typewritten panelboard directories.
- F. Install nameplates as specified in Section 26 05 00 - Electrical.

END OF SECTION

SECTION 26 27 16**ELECTRICAL CABINETS AND ENCLOSURES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
- B. Provide and install cabinets as shown on the Drawings and as specified, complete.

1.2 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Shop Drawings and Product Data: The following list includes the required shop drawing information that shall be submitted.
 - 1. Cabinet construction and finish.

PARTS 2 - PRODUCTS**2.1 MATERIALS**

- A. Cabinets shall be flush or surface mounted type as indicated. Cabinets shall be constructed of the gauge of sheet steel required by the NEC, with hinged lockable doors, common keyed with panelboards, equipped with 3/4" fire retardant plywood backboard; terminal blocks for connection; index card holders; and cards mounted behind heavy plastic on the inside of the cabinet doors. Size as indicated on the Drawings. Finish with a zinc chromate primer when located in interior or exterior areas exposed to public view and ANSI 61 factory enamel when located in janitors' closets, mechanical rooms, and electrical equipment rooms. Furnish cabinets manufactured by Circle "AW", or equal by Hoffman. Minimum depth of cabinets shall be 6".
- B. Cabinets for spare fuses shall be as manufactured by Bussman Manufacturing Co. or Gould Shawmut, with suitable shelving to accommodate quantity and size of fuses to be stored.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Securely fasten to structural members or channel supports.
- B. Furnish and install nameplates in accordance with Section 26 05 00 - Electrical.

END OF SECTION

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SECTION 26 27 19
MULTI-OUTLET ASSEMBLIES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
- B. Provide and install outlet and junction boxes as shown on the Drawings complete and as specified.

1.2 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Shop Drawings and Product Data: The following list includes the required shop drawings that shall be submitted.
 - 1. Outlet and junction box construction, size and finish.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Outlet boxes and covers shall be galvanized pressed steel and plugged holes, and shall be hot dipped galvanized or sherardized. All boxes shall be of NEC size for the number of wires or conduits passing through or terminating therein, but in no case shall any box be less than 4 inches square by 2-1/8 inches deep, unless specifically noted as smaller on the Drawings. For boxes concealed in walls or ceiling, provide the solid gang, galvanized or sherardized pressed steel knockout type. Sectional boxes shall not be used.
- B. Light fixture outlet boxes shall be equipped with fixture-supporting device, as required by the unit to be installed.
- C. Exposed boxes in mechanical areas or exposed to weather shall be cast iron weatherproof boxes with grounding terminal, threaded hubs and gaskets, Type "FS" or "FD" Series, manufactured by Crouse-Hinds or Appleton. Pot metal boxes are not acceptable.
- D. Telephone and intercom outlets shall be a minimum of 4-11/16 inches square by 2-1/8 inches deep.
- E. Outlet boxes in hazardous areas shall be cast metal with threaded hubs, approved for class of hazardous area where installed.
- F. Switch Outlets: Use solid gang boxes for three or more switches for mounting behind a common single plate.

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- G. Condulets shall be cast iron with threaded hubs. Type "FS" or "FD" series, manufactured by Crouse-Hinds or Appleton.
- H. Floor boxes shall be cast metal with adjustable height boxes, Hubbell #B-2537 or Wiremold #800 CI Series.
- I. Acoustic pads shall be pliable, putty-like pads, 1/4-inch thick, Lowry Pads.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide all boxes necessary for installation of the electrical work in compliance with NEC requirements.
- B. Secure recessed boxes for ceiling outlets with galvanized steel bar hangers, specifically manufactured for the purpose, to ceiling channels to permit the installation of the box.
- C. Single gang wall outlet boxes located at metal studs shall be screwed to the stud with sheet metal screws.
- D. Single or multiple wall outlet boxes located between studs shall be secured in place to bar hangers between studs.
- E. Nails shall not be used to support outlet boxes.
- F. Secure recessed, pressed steel boxes in place with steel hangers specifically manufactured for the purpose. Fully or partially hammer driven screws are not permitted.
- G. Use extension rings with blank covers for making exposed conduit connections to flush wall or ceiling boxes.
- H. For boxes not specified or indicated, use boxes and mounting height as required by equipment and recommended by equipment manufacturer.
- I. For outlets flush in exterior walls, use weatherproof joints and connections all around. Outlets shall have cast covers and be fitted with gaskets.
- J. Do not locate outlet boxes not containing a circuit device in any public space. Place these boxes in storage rooms, electrical closets or above accessible ceilings.
- K. Place boxes which must be exposed to public view in a location approved by the Architect. Provide covers or plates to match adjacent surfaces as approved by the Architect.
- L. Covers for flush outlets shall fit flat against plaster or other finished surface.
- M. Where both emergency and normal circuits feed a single light fixture, provide an outlet box for each system.

- N. For boxes installed in concrete, provide the type specifically designed for the purpose to prevent entrance of concrete and to permit placement of box and conduit without displacing reinforcing steel.
- O. Use boxes sized to legally accommodate all devices and conductors contained therein. Use no box smaller than 4 inches square by 2-1/8 inches deep unless otherwise indicated.
- P. Securely fasten all outlet boxes to the structural members. In concrete or drywall construction, set recessed boxes so that the front of the plaster ring or front of the box for those without plaster rings is not more than 1/4 inch behind the final finished surface. Set all recessed boxes in other types of construction so that the fronts are flush with the finished surface. Where these settings are not achieved, provide a 24-gauge or heavier galvanized steel liner flush with finished surface.
- Q. Provide UL approved factory made knockout seals in the boxes where unused knockouts are not intact. Provide recessed threaded plugs in all unused hubs of cast boxes.
- R. Label the cover of each accessible junction box with panel and circuit designation and function.
- S. Paint the outside and inside of all boxes containing fire alarm devices with red paint.
- T. Boxes shall not be mounted back-to-back in any wall; minimum offset shall be 16 inches.
- U. Provide acoustic blanket or membrane around all outlet boxes and switches located in party walls of offices.
- V. Provide and maintain sufficient access and working space to permit access and safe maintenance to all boxes.

END OF SECTION

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SECTION 26 27 26**WIRING DEVICES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
- B. Provide and install wiring devices as shown on the Drawings and complete, as specified.

1.2 REFERENCES

- A. AISI - American Iron and Steel Institute.
- B. FS W-C-596H - General Specification for Connector, Electrical, Power.
- C. FS W-S-896/2F - Switches, Toggle and Lock, Flush Mounted (AC).

1.3 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Shop Drawings and Product Data: The following list includes the required shop drawings that shall be submitted.
 - 1. Each device indicating Federal Specification Number, amperage and voltage rating, materials, color and manufacturer's catalog sheet.
 - 2. Each device plate indicating materials and thickness or gauge of materials, color and manufacturer's catalog sheet.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. All devices shall conform to NEMA standards, shall be UL listed and labeled and shall be "Specification Grade", meeting the requirements of FS W-C-596H and switches meeting the requirements of FS W-S-896/2F. Color shall be ivory for all finished areas and brown for all unfinished areas.
- B. Switches:
 - 1. Wall switches shall be fully enclosed, quiet type tumbler switches rated 20 amperes, 277 volt, bakelite or composition.
 - 2. Quiet switches, 20-ampere type, may be used in quiet locations at full rating for inductive or non-inductive loads and incandescent or fluorescent lighting loads.

3. Single Pole Quiet Switches: General Electric 5951, Bryant 4901, Hubbell 1221, Eaton Arrow Hart 1991, or Pass & Seymour 20AC1.
 4. Double Pole Quiet Switches: General Electric 5952, Bryant 4902, Hubbell 1222, Eaton Arrow Hart 1992, or Pass & Seymour 20AC2.
 5. Three-way Quiet Switches: General Electric 5953, Bryant 4903, Hubbell 1223, Eaton Arrow Hart 1993, or Pass & Seymour 20AC3.
 6. Four-Way Quiet Switches: General Electric 5954, Bryant 4904, Hubbell 1224, Eaton Arrow Hart 1994, or Pass & Seymour 20AC4.
 7. Wall switch and pilot lights shall be flush mounted combination wall type with switch and pilot light equipped with a 4-watt, 125-volt candelabra base lamp. The pilot light shall have a green jewel with brass rim flush mounted in the wall plate.
- C. Receptacles:
1. Single and duplex convenience receptacles shall be U-grounded type, 125 volts, side and back wired with binding screws only. Rating 15 or 20 amperes as indicated, Hubbell 5262 Series, P & S 5262, or Leviton 5262 Series.
 2. The grounding contact shall be internally connected to the frame (unless isolated ground type) with ground terminal for external ground.
 3. Special receptacles shall be as indicated on Drawings by NEMA configuration.
 4. Ground fault receptacles shall be 20 amperes, 125 volt, duplex, three wire grounding test and reset buttons. Suitable for feed-through wiring, Leviton "Sure-Gard III, 6399", Hubbell 5262 GF Series, or General Electric GF 5242.
 5. Wiring devices in exposed weatherproof boxes shall be the devices specified in this Section, and shall be installed in "FS" or "FD" series condulets with weatherproof cast metal covers and gaskets as required.
- D. Floor Outlets:
1. Where floor outlets are shown, boxes shall be Wiremold 800CILCK Series, Steel City Series #78, or Hubbell #B-2537. Where 120 or 208 volts are used, standard NEMA receptacles, suitable for the service, shall be used. Receptacles shall be General Electric, Bryant, Hubbell, Eaton Arrow Hart or Sierra, with ampere and voltage ratings as required.
 2. All switch, convenience, telephone and signal outlets, except as otherwise noted or specified, shall be covered with Hubbell #SIN, satin finish, 0.040-inch, type 302 stainless steel plates.

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E. Plates:

1. Provide stainless steel plates for all switches, receptacles, junction boxes, telephone and other outlets.
2. Provide engraved or etched plates for all lock switches, pilot light switches, switches from which equipment or circuit controlled cannot be readily seen, and for switches as indicated.
3. Stainless steel plates shall be AISI Type 302, with beveled edges, 0.040" thick with satin finish. Leviton "Smoothie" or Hubbell #SIN.
4. Where outlets are indicated to be weatherproof, provide an AISI Type 302 stainless with double-hinged covers.
5. Galvanized steel plates shall be square or rectangular and hot dipped galvanized or sherardized, beveled edges and 0.040" thick.
6. Provide plates equipped with close fitting openings for the exact device to be used. Provide plates for telephone outlets equipped with bushed openings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mount switches at +42" above finished floor and vertically in all locations unless indicated otherwise.
- B. All convenience and telephone outlets mounted 15" above the floor shall be installed vertically. Install receptacle with the grounding terminal up. All 3-wire duplex receptacles mounted more than 15 inches above the floor shall be installed horizontally with the grounding terminal to the left.
- C. NEC sized (#12 minimum) bonding jumper shall connect grounded outlet box to receptacle grounding terminal on all flush mounted units except isolated ground receptacles.
- D. Align and plumb all devices and plates. Plates shall fit flat against wall and tight against device surface without strain on plate.
- E. Each class of device shall be furnished by one manufacturer for total Project. Mixing devices of different suppliers will not be permitted.

END OF SECTION

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SECTION 26 28 00**LOW-VOLTAGE CIRCUIT PROTECTIVE DEVICES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
- B. Provide and install switches, disconnect and safety, as shown on the Drawings and complete, as specified.

1.2 REFERENCES

- A. FS W-S-865 - Switch, Box, Enclosed, Surface-Mounted.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Shop Drawings and Product Data: The following list includes the required shop drawings that shall be submitted.
 - 1. Complete equipment shop drawings.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. All disconnect switches shall be the "Heavy Duty" type and shall meet the latest edition of FS W-S-865.
- B. Provide all disconnect switches with devices enabling the switch to be locked in the open and closed positions.
- C. Manual motor starters shall be motor rated tumbler switches minimum rated 2 HP, 240 volts, three-phase or single phase, with overload heaters as specified or shown to protect equipment served.
- D. Externally operable safety switches shall have quick-make, quick-break mechanism, capable of switching 10 times the switch rating, and with cover interlocks with defeat mechanism for maintenance. Provide switches with number of poles, ampere, voltage and HP rating, types of enclosures and fusible or nonfusible as indicated and as required for the particular application. Disconnect switches shall be heavy-duty type unless otherwise indicated. Provide NEMA I enclosures for interior locations and NEMA 3R enclosures for exterior or wet locations unless otherwise indicated. Switches having a dual rating when used with dual element fuses shall have rating so indicated on the metal plate. Fuses, where required, shall be UL listed current limiting type RK1, with rejection type fuse holder.

- E. Manufacturers: General Electric, Westinghouse, or Square D.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install switches, disconnects and safety where indicated on the Drawings.
- B. Securely fasten to structural members or channel support.
- C. Install manual motor starters flush mounted for switching motors 3 HP and smaller in finished areas.
- D. Install manual motor starters, surface mounted in equipment rooms and nonfinished areas. Where installed above ceilings access panels shall be provided.

END OF SECTION

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SECTION 26 32 13.13**DIESEL-ENGINE-DRIVEN GENERATOR SETS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide a complete standby power system, including power plant powered by diesel engine driven generator and operated by means of a signal from automatic transfer switch.
- B. Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.

1.2 REFERENCES

- A. IEEE - Institute of Electrical and Electronics Engineers.
- B. SCAQMD - South Coast Air Quality Management District.
- C. UL 1008 - Standard for Transfer Switch Equipment.

1.3 SYSTEM DESCRIPTION

- A. The system shall be complete, tested and meet all the functional requirements of a fully automatic emergency power source serving full load power stabilized at rated voltage and frequency within 8 seconds after normal power source failure.
- B. The diesel engine generating set shall be fully automatic and shall be complete with starting and control equipment, extra quiet muffler, skid mounted fuel tank, batteries, weatherproof housingsound attenuating enclosure and other equipment necessary to provide a complete, fully automatic system.

1.4 QUALITY ASSURANCE

- A. Provide written certification that the supplier of the diesel engine generating set is a factory authorized distributor or dealer with complete spare parts in stock, and that parts and service will be available 24 hours, 365 days per year, within 50 miles of the Project Site.
- B. Arrange for the services of a factory erection engineer for checking installation, making specified and all other tests recommended by the manufacturer or required by the Architect.
- C. In addition, provide initial start up and instruct operating personnel in operating the unit through all its functions to ensure that it is performing in accordance with the intentions of the Specifications.

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PART 2 - PRODUCTS

2.1 POWER PLANT

- A. Rating shall be based on continuous power rating of generator and with capabilities to carry 115% full load for two hours without damage to engine, generator or components and with capabilities of largest motor starting while carrying full connected load at an altitude of 350 feet above sea level. Full load power rating shall be continuous and as indicated on the Drawings. Largest motor shall be as indicated on the Drawings.
- B. Provide a common base for unit capable of skidding into place.
- C. Minimum 18" flexible section in all electrical, fuel and exhaust lines at connection to power plant.
- D. Flexible steel disc coupling to engine generator.
- E. Lifting brackets.
- F. Factory finish in corrosion-resistant light gray.
- G. Necessary filters, after-burners or equipment as required so that all local, state and governmental environmental protection agencies' regulations are met with regard to anti-pollution during start as well as run period for emergency power plant.
- H. Vibration isolator springs with seismic bracing.
- I. Restraint brackets to prevent vertical or horizontal movement of over 1/2" during seismic shock for generator set, and muffler.

2.2 ENGINE

- A. The engine shall be four-cycle design, naturally aspirated or turbo charged with after cool, having no inherent unbalanced reciprocating forces. Operating speed shall be 1800 rpm.
- B. Starting by battery driven starter. Include charging generator with voltage regulator; cranking sequence which will give four start attempts before locking out over cranking protection.
- C. Governor shall be electronic as required to maintain generated frequency at 60 Hz at 75% full load within a steady state band width of $\pm 0.25\%$. Frequency shall not vary over 3% from no load to full load. Governors using engine crankcase lube oil will not be acceptable. Include a safety backup centrifugal type limiting speed governor as part of the fuel system to limit speed to 100% of rated RPM. Governor shall be Woodward EG-3P with Woodward 2301 speed control.
- D. Provide fuel and lubrication systems for diesel engine, complete with replacement element type air cleaner, primary and secondary fuel filter and oil filter, full pressure lubrication system with positive displacement lube oil pump and spring loaded bypass

valve, lube oil cooler, engine driven fuel transfer pump, fuel storage sub-base tank of $\pm$ 450-gallon capacity mounted underneath engine, site gate, and automatic flat switch to maintain fuel level.

1. The sub-base tank shall be weatherproof, suitable for outdoor installation. Assure proper coordination of fuel system components with the engine requirements so that a complete plant system will be installed to fulfill the requirements for the emergency system. Sub-base tank shall be UL listed for generator set mounting, Pryco 100.
- E. Provide a cooling system with sufficient capacity for cooling engine when generator is delivering 100% full load for two hours at ambient of 135 degrees F. at an altitude of 350 feet. Include water circulating pump and thermostatic valve to maintain recommended engine temperature; radiator with drain and air vent and fan with protective guard; two jacket water corrosion resistant heating elements. Radiator shall be filled with anti-freeze solution of strength as recommended by manufacturer. Radiator shall be mounted on the engine-generator set. The radiator fan shall have protective shroud and have capacity to overcome back-pressure of air duct and louvers.
- F. The exhaust system shall consist of black standard weight iron pipes from the engine with 18" flexible connections between engine and muffler. The exhaust muffler shall be of four-chamber construction with high degree silencing materials and shall be suitable for use outdoors. Exhaust muffler shall be installed on housing in a manner such that their weight is not supported by the engine. Rain cap shall be installed on discharge end.
- G. Provide a battery for engine start, 12 volt DC with a capacity of not less than 160 ampere hours at 20 hour rate. The battery shall also be sized for starts of 30 second cranking duration each, with ambient of 15 degrees F., mounted on earthquake-proof tray within weatherproof housing with all necessary battery cables, hydrometer and separate battery charger with high rate and trickle charge and with DC voltmeter, DC ammeter and circuit for low voltage alarm. Battery shall be lead calcium type.
- H. Auxiliary switches for over speed trip and automatic over speed shut down by air for control at a speed 10% greater than the normal specified operating RPM. The engine shall shut down on over speed, low oil pressure, high oil temperature and high water temperature by means of auxiliary switches, actuating signal lights and alarms.
- I. Temporary batteries may be used for testing, but new, unused batteries shall be furnished after final testing is complete and before acceptance. New batteries shall be used for one generator start to demonstrate adequacy of final battery installation.

2.3 GENERATOR

- A. Manufacturers: Cummins Onan, Caterpillar, or Kohler.
- B. The generator shall have a direct exciter in accordance with IEEE standards for 50 degree C rise in engines.

- C. 120/208 volt, three-phase, 60 Hz, four-wire rated at 0.8 power factor stand-by service, complying with NEMA standards.
- D. Brushless, balanced four pole revolving field type with rotating rectifier exciter mounted on end of shaft, single ball bearing support to starter housing, rotor connected by semi-flexible steel disc coupling to engine flywheel to assure permanent alignment free of injurious torsional vibrations at speeds up to 125 percent of synchronous.
- E. Generator insulation shall be in accordance with latest NEMA standards using minimum Class F materials for 70 degrees C rise.
- F. Voltage regulator of static solid state design to give ± 1 percent regulation from no-load to full load; instantaneous voltage dip less than 20 percent of rated when full load at rated power factor suddenly applied; and recovery to stable operation of voltage within one percent of rated within four seconds. Manual adjustment of ± 5 percent of normal to be included by a lockable device or screwdriver slot in rheostat shaft. All voltage sensing shall be in three phase.
- G. Provide shielding of generator, exciter and regulator to prevent radio frequency interference.

2.4 CONTROL EQUIPMENT

- A. Panel mounted with vibration isolators to plant frame.
- B. Panel to include self-illumination from generator circuit.
- C. Panel Devices: Frequency meter; running time meter; automatic voltage regulator exciter, field rheostat, voltage regulator rheostat, voltage regulator switch; AC voltmeter, ammeter and respective three-phase selector switches; three current transformers; manually operated molded case 100 percent rated circuit breaker; engine water temperature gage with high temperature cutout and red warning light; engine oil pressure gage with low pressure cutout and red warning light, over speed cutout with red warning light; over-crank red indicator light; low battery labeled "OFF", "AUTOMATIC" and "TEST", with red indicating light when switch in other than automatic position; vernier throttle or speed control to permit manual adjustment 1/4 Hz; nameplates giving designations of all devices and one reading "WARNING": RETURN TO AUTOMATIC POSITION FOR GENERATOR TO FUNCTION"; automatic plant exerciser for weekly operation with necessary engine cool down timing control; instrument scales shall not exceed 150 percent of unit full-load rating; all devices wired through terminal blocks so signal and alarm circuit can be readily wired to remote locations. The voltage regulator shall be capable of maintaining voltage at the terminals of the generator within two percent through the range of one-quarter load to full load.

2.5 ENGINE CONTROL REQUIREMENTS

- A. The engine shall be provided with an automatic control device which starts the engine upon closure of a remote pair of contacts in the transfer switch. The automatic control shall incorporate in its basic design octal base, plug-in relays on time delay

devices. Time delay devices shall be either of the magnetic movable armature type or electric motor driven. A four-position switch shall be provided, labeled "OFF", "AUTOMATIC", "MANUAL" and "TEST". In the "OFF" position, the control shall start the engine in the event of power failure or remote program timing. In the "MANUAL" position, the engine control devices relating to the continuous operation shall be directly connected to the voltage source and the engine capable of starting in the conventional manner by push-buttons. A fault within the automatic control shall 90 seconds, at which time the control shall be disabled by an over crank, low oil pressure, high water temperature, low water temperature, below 70 degrees F., or over speed. The engine shall shut down immediately when the generator is not switched to load. In the event that the automatic control switch is not in the "AUTOMATIC" position, or the output circuit breaker is in "OFF" or tripped position, a signal light with the nameplate "NON-AUTOMATIC" shall be energized.

2.6 AUTOMATIC TRANSFER SWITCH

- A. The automatic transfer switch shall be complete with all accessories, 120/208 volt, 3-phase, 4-wire with solid neutral and shall maintain system compatibility with the electrical requirements of the emergency generating set.
- B. A manufacturer's representative shall conduct a complete system operational test for the Architect and the operating personnel. The automatic transfer switch shall be warranted free from defects in material and workmanship for a period of two (2) years after it is first placed in service. It shall be listed by Underwriter's Laboratories, Inc. (Standard 1008). The manufacturer shall furnish schematic and wiring diagram for the particular automatic transfer switch and a typical interconnection wiring diagram for the entire standby system.
- C. The automatic transfer switch shall be rated for continuous operation in ambient temperatures of -25° F (123° C) to +125° F (+51.5° C). The transfer switch shall be rated for all classes of load, both inductive and non-inductive and tungsten lamp load at 250 volts. The automatic transfer switch shall be designed, built and tested to close on an inrush current up to and including 20 times the continuous rating of the switch without welding or excessive burning of the contacts. The transfer switch shall be capable of switching load up to and including 15 times the continuous rating of the switch and capable of enduring 6000 cycles of operation, at rated current, at a rate of 6 cycles per minute, without failure. One cycle shall consist of one complete opening and closing of both sets of contacts on an inrush current of 10 times the continuous rating of the switch.
- D. The motor operated transfer switch shall be mechanically held on both line and generator sides. It shall be electrically and mechanically interlocked (walking beam interlock) to positively prevent the load from being simultaneously energized by normal and emergency power. A manual operator shall be provided to manually transfer (switch) the mechanism in either direction. The special silver alloy, separate load and arcing contacts shall be enclosed in arc chambers that confine and extinguish breaking arcs in less than one-half cycle (1/120 of a second) and prevent phase to phase or phase to ground arcing. Stored energy, quickmake-quickbreak switching control. The automatic transfer switch, with terminal and neutral bar lugs compatible with both copper and aluminum conductors, shall be factory installed in a nonventilated NEMA enclosure.

- E. Voltage sensors and time delays of 5 minutes or less shall be solid state, plug-in devices. The control relays shall be dust covered, plug-in devices. These control accessories shall mount on a dead front, swing out control accessory panel to avoid shock hazard while adjusting control functions, but will swing out exposing the wiring to facilitate servicing. Indicating lamps and meters shall be set in a front mounted meter panel to be visible without opening doors.
- F. The automatic transfer switch shall:
1. Monitor each ungrounded line with calibrated dial, adjustable voltage, and solid-state sensors to sense a decrease of voltage below a setpoint, or a loss of voltage on any phase of the normal power source. Voltage sensors shall be temperature compensated to 2% maximum deviation over the temperature range 25° F (-32° C) to +175° F (79° C).
 2. Signal the engine generator set to start in the event of a power interruption. A solid-state time delay (adjustable from 0.5 to 10 seconds) shall delay this signal to avoid nuisance start-ups on momentary voltage dips or power outages.
 3. Retransfer the load to the line after normal power restoration. A time delay (adjustable from 0 to 30 minutes) shall delay this retransfer to avoid short-term normal power restoration.
 4. Provide an automatic bypass to retransfer the load from generating set to normal source if generating set output interrupts after normal source restores voltage.
 5. Signal the engine generator to stop after load retransfer to normal source. A solid-state time delay on stop (adjustable from 0.5 to 5 minutes) shall permit engine to run unloaded to cool down before shutdown.
 6. Provide a 2-amp, SCR voltage regulated, current limited float charge to maintain fully charged cranking batteries.
 7. Provide a test switch to stimulate interruption of power from the normal source.
 8. Provide an exerciser clock to automatically start the generating set at regular intervals and allow it to run for a given time period, programmable by the Owner.
 9. Provide a switch "with load" or "without load" to test or exercise as follows:
 - a. "Without Load", the generating set runs unloaded.
 - b. "With Load", the automatic transfer switch transfers load to generating set, after time delay, the same as it would for a normal source interruption.

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10. Provide a device to electrically disconnect the control section from the transfer switch for maintenance service during normal operation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The engine-generator set shall be mounted on a rigid steel chassis suitable for installation on spring isolators.
- B. Bolt the isolators to anchors fastened in the floor slab. The bolts shall be in place when concrete is poured to prevent filling of anchor holes. The generator frame shall be grounded to distribution grounding system.
- C. Ground the generator's neutral solidly to a system ground electrode.
- D. Provide seismic restraints to limit vertical and horizontal movement to 1/2" during seismic shock for the generator set and the floor mounted day tank and muffler.
- E. Upon approval of the preliminary performance, the set, complete with equipment and controls, shall be delivered to the Site and installed at least 30 days before completion of the Contract. Wiring diagrams for the complete installation shall be framed and mounted on the removable access panel on side of housing.
- F. After complete emergency facilities are connected, load tests shall be run as required by this Section to the maximum actual load available from connected equipment including elevators. Schedule the test with the Architect so that final test may be witnessed.
- G. Readings required during both preliminary and final tests requested in this Section shall be taken and shall include the following:
 1. Frequency.
 2. Voltage.
 3. Current.
 4. Wattage.
 5. Ambient temperature.
 6. Water temperature.
 7. Exhaust air temperature.
 8. Generator frame temperature.
 9. Oil pressure and temperature.
- H. Protection: Provide protection facilities and procedures to prevent damage and deterioration.

- I. Complete the SCAQMD permitting requirement as indicated on the Drawings.

3.2 INSTRUCTIONS AND MAINTENANCE

- A. Instruct the Owner's personnel in the proper use, operation and maintenance of the set. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in the procedures to be followed in checking for the source of an operational failure or malfunction.
- B. Make a final check of generator operation just prior to date of acceptance of the Work. Determine that all operating devices are functioning as required.
- C. Maintenance Period: Starting at the time of acceptance of Work, provide complete systematic inspection and maintenance monthly for the guarantee period. Furnish trained experts and equipment to check, adjust, lubricate and otherwise maintain the generator set in operation without defects or deterioration. Replace or repair materials and parts which become defective or deteriorated for any reason. Coordinate all inspection and maintenance visits with Owner's Representative. Provide reports to Owner's Representative on each maintenance visit indicating clearly work test was done, and parts replaced.
- D. Furnish a factory-trained engineer for a minimum of two working days, or as needed to satisfy Owner's Representative that the system is functioning properly.

END OF SECTION

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SECTION 26 50 00**LIGHTING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
- B. Provide and install lighting fixtures, lamps, and ballasts as shown on the Drawings and as specified, complete.

1.2 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Shop Drawings and Product Data: The following list includes the required shop drawing information that shall be submitted.
 - 1. Manufacturer's catalog sheets of standard fixtures, indicating materials, gauges, dimensions, standard finishes available, weights, and UL approval of fixtures.
 - 2. Shop drawings of special fixtures shall contain the same information as required for standard fixtures.
 - 3. Pictures or cuts of all lighting fixtures, with distribution curves and complete photometric data including CU tables.
 - 4. Structural calculation for fixture hangers and supports of fixtures in excess of 25 pounds.
 - 5. Manufacturer's catalog sheets indicating input and load electrical characteristics, ambient temperature rating, noise level rating, mounting methods and UL listing for use with required lamps. Ballast data for High Intensity Discharge (HID) light fixtures shall indicate wattage change for a given line voltage change, indicated in percent.

1.3 GUARANTEE

- A. Lighting Fixture Ballasts: Furnish to Owner a written guarantee against all defects in materials and workmanship, including without limitation failure to operate for three (3) years from date of acceptance.

1.4 EXTRA MATERIALS

- A. Provide additional two (2) of each type of light fixtures installed for the Project, for Owner's use in lighting maintenance.

- B. Furnish extra materials packaged with protective covering for storage and identified with labels clearly describing contents.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Lighting fixtures shall have all parts and fittings necessary to completely and correctly install the fixtures. All fixtures shall be equipped with lamps of the size and type specified. All fixtures shall be the standard product of fixture manufacturer unless otherwise shown, and shall be UL or other nationally recognized testing laboratory approved.
- B. Where both catalog number and description, either narrative or pictorial are indicated, the requirements of the description shall take precedence and prevail.
- C. All fixtures of one type shall be of one manufacturer and of identical finish and appearance.
- D. Complete units and all electrical components for L.E.D., high intensity discharge, fluorescent, incandescent, and special fixtures shall bear the approval labels. Labels shall not be placed on fixtures at locations where visible after installation.
- E. Fixture types shall be as indicated on the Drawings.
- F. All plastic panels shall be 100% pure virgin acrylic, shall be completely de-staticized and shall be free from dust, dirt, grease, paint, debris, etc. Plastic shall be Röhm GmbH "Plexiglas," or Lucite® (aka Optix-L).
- G. Recessed fixtures in suspended ceilings shall be free of light leaks above and below ceiling. Temperature of fixture shall not exceed UL or other nationally recognized testing laboratory Standards.
- H. Reflectors, cones or baffles shall be free of spinning lines, ripples or any marks or indentations caused by riveting or other assembly techniques. No rivets, springs or other hardware shall be visible after installation.
- I. Lamp sockets shall be rigidly and securely attached to the fixture enclosure or husk to insure safe operating temperature as recommended by lamp manufacturer.
- J. All exposed metal parts of exterior lighting fixtures shall be stainless steel, anodized aluminum or have 4-mil zinc coating applied after fabrication and before finish. Screws and fastening shall be stainless steel. Painted finishes shall be as specified in schedules.
- K. Lamps shall be as manufactured by General Electric Co., Phillips, or Sylvania.
 - 1. Lamps shall be new and of wattage and type indicated or as required for the particular fixture installed.

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2. Incandescent lamps shall be 130 volt 2500 hour rating, inside frost, with medium base for lamps 200 watts and smaller and mogul base for 300 watts or larger, except as noted on Drawings.
3. Fluorescent lamps shall be rapid start type with ultra low mercury content. All lamps shall be 3000°K, except as noted, and shall have minimum rating of 2850 lumens. Lamps shall be as shown on the Drawings.
4. 34 or 35-watt energy saving lamps shall not be used for applications where temperature is apt to fall below 60° F. This includes, without limitation, outdoor applications, storage rooms, etc.
5. Provide HID lamps of type and wattage as shown on the Drawings. Lamps shall be compatible with fixture ballast.
6. Provide LED drivers of type and wattage as shown on Drawings. Diodes shall be compatible with fixture driver.

L. Ballasts:

1. Provide all fluorescent fixtures with ballasts which are ETL approved, CBM certified, high power factor, Class P thermally protected by dual system, and with "A" sound rating. Provide fluorescent fixture ballasts designed to accommodate FO32 T8 lamps, except where specified otherwise. Ballasts shall be electronic solid state type by Advance. Ballast shall have radio interference suppression.
2. Provide high power factor ballasts for high-pressure sodium fixtures, UL labeled and designed for operation with the specific lamp recommended by the fixture manufacturer. Ballasts shall allow maximum ($\pm$) 6% lamp wattage change.
3. Ballasts for exterior fixtures shall be low temperature type.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All fixtures installed in gypsum board ceilings or plaster soffits shall be provided with metal frames. Fixtures in concrete shall have steel housing with bitumastic paint finish and approved for use in concrete. Fixtures shall be compatible with type of ceiling.
- B. All adjustable lighting fixtures shall be aimed and set in the presence of the Owner's Inspector.
- C. Exterior fixtures requiring exposed exterior boxes shall be mounted on cast boxes equipped with gaskets as specified in Section 26 27 19 - Multi-Outlet Assemblies.
- D. Backing for surface mounted light fixtures shall be structural channel or angle iron with 5/16-inch bolts, except where mounted directly to concrete structures, in which

case anchors and suspension shall be used. The exact method of support shall be as approved by the Architect.

- E. Lighting fixtures which are to be mounted in continuous rows of two or more fixtures shall have at least two bolts or other interlocking devices, as approved by the Owner's Inspector at each connection to provide for positive and true alignment of the fixtures.
- F. Louvers, diffusers or lenses shall not be installed in lighting fixtures until such time as all glazing has been completed and all construction work involving plastering, grinding, sanding, painting, etc., and final clean-up sweeping and dusting have been completed.
- G. Reflector surfaces and lamps in all lighting fixtures shall be cleaned of accumulated dust, dirt, plaster, paint, etc., before the installation of the louvers, diffusers, or lenses.
- H. Recessed lighting fixtures shall be independently supported by #12 AWG wires to specified anchors in the slab above. A 2-foot x 4-foot fixture shall require four (4) wires; a 1-foot x 4-foot fixture shall require four (4) wires. One (1) wire shall be attached to surface mounted fixtures. All wires shall have 1-inch slack.
- I. Provide all lighting fixtures recessed in a ceiling which has a fire resistant rating of one hour or more with box enclosures which have a fire rating equal to that of the ceiling. The space from the fixture to the enclosure shall be 1-inch for fluorescent and 3-inch for incandescent fixtures.
- J. Verify weights and recommended mounting methods of all decorative fixtures with manufacturers, and furnish and install supports. Fixtures weighing more than 20 pounds shall be supported independently of the outlet box.
- K. Install lamps in all fixtures:
 - 1. Replace all lamps used during construction with new lamps prior to final acceptance of the Project.
 - 2. Clean all lamps after installation.
- L. After the installation is completed, remove and replace any ballasts which are judged by the Owner's Inspector to be excessively noisy.

3.2 CLEANING

- A. Clean up and repair any damage to the finished building caused by installation of the light fixtures.
- B. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

SECTION 26 60 01**CEILING FANS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide and install ceiling fans and accessories where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 09 21 16: Gypsum Board Assemblies.
 - 2. Section 26 27 26: Wiring Devices.
 - 3. Section 26 50 00: Lighting.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Submit manufacturer's product literature and installation instructions.

1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Do not deliver ceiling fans until spaces to receive them are clean, dry, and ready for ceiling fan installation. Deliver materials to Site in manufacturer's original, unopened containers with labels identifying product and manufacturer's name.
- C. Storage: Store materials in a clean dry area.
- D. Handling: Protect materials and finish during installation and handling to prevent damage.

1.5 COORDINATION

- A. Coordinate with other trades as required for a timely and smooth execution of work.
- B. Verify all dimensions for proper fit and attachment of all parts.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide Energy Star® rated ceiling fans manufactured by Delta T LLC, dba Big Ass Fans.
 - 1. For Exercise Room: Model “i6” with six aircraft-grade aluminum airfoils spanning a total diameter of 72”, equipped with a compact Bluetooth remote control and SenseME™ Technology. Electronically commutated motor (ECM) rated for 100 - 277 VAC, single phase. Universal mount with downrod. Provide optional Bluetooth wall control in addition to standard remote control.
 - 2. For Reserve Apparatus Room: Model “Essence” with eight high volume, low speed airfoils of precision extruded, anodized aluminum alloy, spanning a total diameter of 12’, with eight upswept winglets. Equipped with a fan extension tube and low-voltage wired remote wall control. Permanent magnet brushless motor, 120 VAC, single phase, 50/60 Hz.
 - 3. Options:
 - a. Airfoil Color: Black.
 - b. Light Option: No light.
- B. Provide other materials and miscellaneous items, not specifically described but required for a complete and proper installation, subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive ceiling fans. Notify Architect if areas are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

3.2 INSTALLATION

- A. The fans shall be installed by a factory-certified installer according to manufacturer’s Installation Guide, which includes acceptable structural dimensions and proper sizing and placement of angle irons for bar joist applications.
- B. Install complete with all necessary backing materials and anchors as required. Locate all components firmly into position, level and plumb.

3.3 CLEANING AND PROTECTION

- A. Clean fan surfaces after installation, according to manufacturer’s written instructions.
- B. Provide final protection and maintain conditions in a manner that ensure that ceiling fans are without damage or deterioration at time of Substantial Completion.

- C. Clean up and repair any damage to the finished building caused by installation of the ceiling fans.
- D. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

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SECTION 27 00 00
COMMUNICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide all labor, material, equipment, and testing necessary and complete for communications systems where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to the following.
 - 1. Alarm Lighting System.
 - 2. Alarm Light Activating System.
 - 3. Television Antenna System.
 - 4. Telephone and Intercommunication System.
 - 5. Radio selective call system.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 27 30 00: Voice Communications.
 - 2. Section 28 13 00: Security Access Control System.
 - 3. Section 28 31 00: Fire Detection and Alarm.

1.2 GENERAL REQUIREMENTS

- A. In addition to all stipulations in other portions of the Specifications, all concerned shall comply with the following special conditions pertaining to communications systems.
- B. Phone company installs a 25-pair cable to Communications Room.
- C. CAT 5-E cables for voice and data cables run from Communications Room to where each phone/data jack is required.
- D. Phone company installs SVC cable from street into Fire Station via the 4" conduit provided. They terminate their cables on the 8' x 8' backboard and provide grounding per current code.

1.3 SPECIAL CONDITIONS

- A. The specified equipment shall be furnished and installed by a subcontractor who can show proof of having satisfactorily engineered and installed comparable systems within the past five years, and who holds all legally required licenses including the General Electrical C-10.

- B. Confirm that within reasonable distance of the Jobsite there is an established agency which stocks a full complement of parts and offers service during normal working hours on all equipment to be furnished, and that the agency will supply parts to the Owner without delay and at reasonable cost.
- C. All material and equipment shall be new and unused, shall have been manufactured within eighteen months prior to installation, and shall be listed by Underwriters Laboratories where applicable.
- D. All individual components and composite systems shall be designed for continuous operation without undue heating or change in rated values, and shall be properly fused.
- E. All terminations and connections throughout the system(s) shall have:
 - 1. Solder terminals, telephone-type punch terminal strip, or machine wire wrapped terminals in cabinets.
 - 2. Crimp connectors at outlet boxes (note: Crimp stranded wire only).
 - 3. Screw type, or plug and socket connections at all equipment. All conductors in conduit continuing more than one wire shall be labeled on each and with "E-Z markers" or equivalent. Conductors in cabinets shall be carefully formed and harnessed so that each drops off directly opposite to its terminal. Cabinet terminals shall be numbered and coded. Parallel running groups of exposed conductors shall be enclosed in vinyl sleeves to form single cables.
- F. All controls, function switches, etc., shall be clearly labeled on all equipment panels. This labeling shall be permanently etched or engraved in the panels or neat nameplates engraved on two layers plastic and affixed with epoxy may be used.
- G. Use stranded wire and flexible cable for all connections to equipment not permanently attached to walls, floors, or racks.
- H. Conduit and Outlets:
 - 1. Thin wall conduit shall be used. However, if it is necessary to use flex duct, approval must be obtained from County of Los Angeles Internal Services Department (ISD) and the next larger size flex duct shall be used. The flex duct must be well anchored at all bends and runs between bends must be straight and non-zigzagging through studding joints, etc.
 - 2. Size: All communications conduits shall be 3/4 inch inside diameter, unless otherwise specified on the shop drawings. In no case shall conduit smaller than 3/4 inch be installed without written permission of the County of Los Angeles Internal Services Department (ISD).

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3. Pull Lines: Install a nylon pull line in each conduit at the time of installation.
4. Identification: All conduits shall be clearly identified at all terminals or cabinets as to its terminating end.
5. Procedures:
 - a. Individual conduit runs shall not have more than the equivalent of two (2) 90-degree bends. If, at the time of installation, it is found that any conduit run exceeds two 90 degree bends the County of Los Angeles Internal Services Department (ISD) shall be contacted to determine the size, type and location of the pull box that must be installed.
 - b. The radius of any conduit bend shall not be less than ten (10) times the diameter of conduit.
 - c. Open ends of conduit shall be plugged during construction of the building to prevent the entrance of moisture or foreign material. If moisture or foreign material is found at the time the telephone cables are being installed, it shall be the responsibility of the communications subcontractor to thoroughly clean the conduit before installation will proceed.
 - d. All conduits shall be securely fastened in place, free from burrs, defects, or obstructions that could interfere with the installation of telephone cables.
 - e. All conduits, unless otherwise specified on the Drawings, shall terminate on the designated telephone backboard either three (3) inches above the floor or six (6) inches below the ceilings.
 - f. All conduits shall be reamed and when entering pullboxes, cabinets, or outlets, secured locknuts or bushings.
 - g. All conduits not terminating in terminals cabinets or outlet boxes shall be provided with bushings and capped.
 - h. All underground communications conduit shall have a minimum earth cover of eighteen (18) inches, except where subjected to vehicular traffic (to include road right of way) the minimum of three (3) inches of concrete or twelve (12) inches of dirt.
6. Communications Outlets: All communications outlets shall be installed at the same height above the finished floor, unless otherwise specified on the Drawings, as the electrical outlets.
 - a. Outlet boxes for single conduit entrance shall be 4-11/16 inches square by 2-1/8 inch deep.

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- b. Plaster rings are required and cover plates provided shall be one (1) hole bushed type.

1.4 SYSTEM RESPONSIBILITY

- A. Furnish and install all non-specified equipment required to make each system fully functional as per stated intent, without additional cost to the Owner. This shall include major components if required.

1.5 GUARANTEE

- A. all equipment and systems for a period of one year following acceptance by the Owner. The guarantee shall include parts, labor, prompt field service, and pick-up and delivery. Routine non-warranty maintenance or emergency repairs made by qualified Owner technicians shall void the guarantee.
- B. During the guarantee period, respond only to calls for service made by the County of Los Angeles Internal Services Department (ISD) or Los Angeles County Fire Department and keep the Owner fully informed as to problems which develop in equipment or systems and as to steps taken to rectify those problems.

1.6 DATA TO BE SUBMITTED BY THE COMMUNICATIONS SUBCONTRACTOR

- A. Preliminary: Within thirty days after Contract Award, and prior to the purchase of any equipment, submit to the Architect for approval eight (8) copies each of the following.
 - 1. A material list with names of manufacturers, model numbers, and technical information on all equipment he proposed to install.
 - 2. Complete system circuit diagrams, block diagrams, and shop drawings which clearly illustrate how all components relate and how they are interconnected.
 - 3. A statement listing every technical and operations parameter wherein the submitted equipment varies from that originally specified. If the submitter fails to list a particular variance and his submittal is accepted, but subsequently deemed by the Owner to be unsatisfactory because of the unlisted variance, the submitter must replace or modify such equipment at once and without cost to the Owner.
- B. Final: Before Final Acceptance of the Work, secure approval of the County of Los Angeles Internal Services Department (ISD) as a condition of final acceptance. Submit the following.
 - 1. Engineering drawings depicting layout and interconnection of all system components, and as-built conduit layout.
 - 2. One set of Xerox on bond paper and electric file of all single line block diagrams.

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PART 2 - PRODUCTS

2.1 EQUIVALENT EQUIPMENT AND MATERIAL

- A. Manufacturer's name and model numbers are used herein only as a means of establishing standards of quality and performance. Comparable equipment of standard manufacture and established reputation, which meets the requirement outlines above, may be submitted to the County of Los Angeles Internal Services Department (ISD) for approval. Refer to 1.6.A.

2.2 ALARM LIGHTING SYSTEM

- A. Provide a conductor run connecting each alarm light fixture with a home run for each circuit to sub-panel containing appropriate circuit. Provide a minimum 3/4" conduit with conductor from each sub-panel to R.C. panel.
- B. Typical Fixture Operation: Two tubes of a four tube fixture or one tube of a three tube fixture.
- C. Layout: Dormitory and Office Hallways leading to Apparatus Room. Center row and map lights in Apparatus Room. Entire fixture nearest to Day Room T.V. area.
- D. If Station contains a Battalion Chief their system shall operate independently from the Station and shall include one light in their dorm, and one in hallway leading to Apparatus Room.

2.3 ALARM-LIGHT ACTIVATING SYSTEMS

- A. The auxiliary alarm system shall consist of relay controlled lights and bells which are activated by radio signal. It shall be the responsibility of the communications subcontractor to furnish and install a satisfactory operating system utilizing equipment and wiring described herein and set out on the shop drawings.
- B. All wiring shall be neatly done, and shall terminate on terminal strips. Each control wire shall be labeled with legible identification tags.
- C. Equipment: As shown on the Drawings.

2.4 TELEVISION ANTENNA SYSTEM

- A. Descriptions: This system shall consist of a roof mounted antenna, tap off outlets as indicated on Drawings, and splitter/impedance matching cables for connection of television sets.
- B. Material and Installation Notes:
 - 1. Television Antenna shall be all channel VHF/UHF with 75-ohm output for coaxial download. Jerrold PXB 50, or equal by Winegard or Blonder-Touge.

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2. Antenna lead-in cable shall be 75 ohm coaxial, with foam dielectric. Belden 8228.
3. The first television outlet shall be an all channel tap-off Jerrold UT -18 with UT -Pi cover plate or equal by Winegard or Blonder-Tongue.
4. The last outlet shall be self-terminating all channel tap-off Jerrold STO-75F or equal by Winegard or Blonder-Tongue.
5. Antenna Mast: Provide as required for complete installation.
6. Wall outlet shall be a standard single gang conduit box. Conduit shall be one inch metal or PVC.
7. Outlet-to-television set connecting cable shall be RG59/U Coax, Belden 8228, with two each Jerrold G-56 connectors and a Jerrold SSX-1314 splitter/transformer. Cable length shall be four feet.

2.5 TELEPHONE AND INTERCOMMUNICATION SYSTEM

- A. Conduit and wiring service from street to Communications Room located in building.
- B. Rigid Conduit with Pull-Lines to Telephone and Data Outlets in the Office, Dayroom and Workrooms: Location to be determined during design. System furnished and installed by the local telephone company and not included in Contract.
- C. Provide a 911 telephone and locate adjacent to front door.
- D. Intercommunication System for Los Angeles County Fire Department approved system (Radio Selective Call System).

2.6 RADIO SELECTIVE CALL SYSTEM

- A. Intent:
 1. The Fire Station receives dispatch calls by means of a Selective Call Unit (SCU). This unit receives a digital message through a digital radio system. This triggers an alarm tone that is sounded throughout the station by the Public Address system, which is a part of the Selective Call Unit (SCU). It also triggers a dry contact to start a 3-minute timer for selected light fixtures, the Alarm-Lights. It then receives a voice dispatch message through a UHF voice radio system and broadcasts this message through the SCU Public Address system. The same unit may also interface to a microphone or to a telephone dial page connection, for everyday SCU Public Address functions. This secondary unit receives its alarms over a VHF radio system. Another future connection that is allowed for is from a telephone Alarm Ringer circuit to the SCU Public Address system.

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2. The Selective Call Unit and the secondary VHF unit will be located near the Communication Gutter (CG), the Relay Cabinet (RC) and the Communication Cabinet (CC), in the Communications Room.
3. An on/off volume control switch is to be located at doors leading to outside areas where speakers are provided.

B. Scope:

1. The work described in this part of the specification includes the furnishing of all materials, equipment, supplies and labor, and the performing of all operations necessary to prepare the station for the installation of the radio selective call system. The above includes the supply and installation of the complete station loudspeaker system.
2. The installation of the SCU unit shall be completed by the County of Los Angeles Internal Services Department (ISD), who will be responsible for finalizing all connections to the system and providing the radio selective call unit.

C. Installation:

1. Except as noted, the electrical subcontractor shall install, provide conduit and pull wire to the RC and CC panels. The subcontractor's work also includes:
 - a. Furnishing and installing of the items described below under "Items to be provided by the electrical subcontractor".
 - b. Furnish and install a control wiring conduit system as shown on the Drawings.
 - c. Furnish, install and connect a complete speaker system, which includes conduit, wire, enclosures, speakers and speaker control devices. Speaker wiring to be provided at RC panel.
 - d. Furnish and install a 120 VAC double, duplex receptacle mounted in the radio equipment (RC) cabinet.
 - e. Furnish, install and connect alarm lighting wiring as indicated on Drawings, with home run to RC and CC cabinets. Alarm light timers are to be installed and connected by Los Angeles County Fire Department.
 - f. All conduits to be minimum 3/4" rigid with no flex.

D. Items to be provided by the electrical subcontractor:

1. The main SCU and VHF Alert Unit are provided by the County of Los Angeles Internal Services Department (ISD). However, the following items are to be provided by the electrical subcontractor:

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- a. Antenna mounting pipes.
- b. Transmission line conduits.
- c. Ground system.
- d. Station Control Unit wall box.
- e. Communications Gutter, Relay Cabinet and Communications Cabinet.
- f. Signal conduits.
- g. Speaker boxes and speakers.
- h. Speaker cut-off switch and volume control(s).
- i. Audio wires.
- j. Power outlets.

E. Antenna Mounting Pipes:

1. Three antenna-mounting pipes are required for the Selective Call Units (in addition to these there are broadcast radio, television antennas and satellite antennas described elsewhere). The three pipes are to be mounted in line with at least 10-foot spacing. The middle pipe shall have a sweep on the top with a radius of at least 12 inches, to be used to mount the VHF antenna. One of the two others shall have the same sweep, and shall be capped, to be used to mount the digital system UHF antenna.
2. These pipes shall be made of 1-1/2 inch rigid pipe, and mounted so as to extend 4 feet above the highest point of the roof. Install as close as possible to the planned location of the SCU. Antenna pipes shall extend below the roof to allow for solid mounting connecting the pipes to the station's ground system and the installation of the antenna transmission line by the County of Los Angeles Internal Services Department (ISD). The lower part of the pipes extends below the roof in order to be secured to roof framing members. Pipes may be curved to allow securing, but shall not have a bend sharper than 90 degrees from the roofline to the opening in the attic area. The minimum bending radius shall be greater than 20 inches. A ground cable shall be installed as specified below.

F. Transmission Line Conduits: For the three transmission lines the following conduits are required.

1. Three 2-inch conduits from a 12 x 12 x 6 wall box, adjacent to the SCU wall box, about 18 inches above the floor to the attic or crawl space area.

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2. One 2-inch conduit from the CC to the attic or crawl space area. The minimum bending radius shall be greater than 20 inches. The transmission lines shall be routed through these conduits and on through the crawl space and/or attic areas to the antenna pipes. It is preferred NOT to run these lines through conduits all the way except where space is inaccessible. No conduit is required for antenna cable runs in attics and crawl spaces when and only when all of those void areas are classified as non air return plenums and are hidden from view and not exposed to mechanical damage. When used for longer runs, the conduits shall not have more than 180 degrees of bend from the roof attic area to the SCU without a straight pull or breakout box of at least 8 inches opening size, installed in a straight run section of the conduit at or near the conduit bend. Bending of antenna cables inside pull boxes is not allowed. Install conduits during construction before installing the dry wall. These conduits shall be straight runs as much as possible, and shall take the shortest route. The minimum bending radius of the conduits shall be 20 inches. Only 90-degree elbows with at least 20-inch radius bend curve are acceptable. L-type conduit connectors are not allowed.
 3. Install pull ropes from the UHF antenna masts to the 12 x 12 x 6 antenna wall box beside the SCU wall box and from the VHF antenna mast to the conduit to the CC/RC panel gutter.
- G. Ground System: The grounding system shall have one 5/8 in x 8 ft ground rod. The ground rod shall be driven as near as possible to the SCU location. Six inches of rod shall be left exposed above the surface of the finished floor. All antenna masts shall be connected together using one #2 AWG bare stranded copper wire and clamps. This wire is installed from the ground rod location, adjacent to SCU and antenna wall box to the rooftop attic area where it enters the attic area and is connected to the antenna masts, and terminates at terminal strip in CC panels with as few bends as possible. The wire shall be continuous, without breaks, from the ground rod to the CC panels. The #2 AWG wire shall be properly secured with a support to the structure. A #6 AWG solid bare copper wire shall be connected to a lower clamp of the ground rod. The #6 AWG wire shall enter the SCU wall box and connect to a stud with a terminal lug, for future connection to the SCU. The copper ground wires shall be continuous without any splices.
- H. Selective Call Unit (SCU) Wall Box and Antenna (ANT) Wall Box: Furnish and install two electrical boxes 12 inches high x 12 inches wide x 6 inches deep, with removable screw cover on the wall near the SCU location. The box bottom shall be installed 12 inches above the floor. One box will house the electrical interface between the SCU and the station wiring. Provide 1/2 inch plywood backing in box. The County will provide the terminal strips inside the box. The second box shall provide connection point from antenna cables to SCU unit. The boxes may be installed in the wall but protruding at least 2 inches to accommodate cable entry into the bottom. Refer to paragraph below titled "Signal Conduits" for conduits terminated at this SCU wall box.

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- I. Communications Gutter, Relay Cabinet and Communications Cabinet:
1. Communications Cabinet (CC): Furnish and install a cabinet and backboard per this specification and as shown on the Drawings.
 - a. Backboard: Install a 3/4" plywood backboard full size on the rear (opposite door) interior side of the cabinet.
 - b. The cabinet shall be 18" wide by 18" high x 6" deep as shown on the Drawings.
 - c. Installation: The cabinet shall be mounted on the surface of the wall. No recessed mounting is required.
 - d. Location: The location of the cabinet shall be as shown on the Drawings and in a manner that will insure three (3) feet of unobstructed work area with the cabinet doors open.
 2. Relay Cabinet (RC): Furnish and install a cabinet and backboard per these Specifications and as shown on the Drawings.
 - a. Backboard: Install a 3/4-inch plywood backboard full size on the rear interior side of the cabinet.
 - b. Installation: The cabinet shall be mounted on the surface of the wall. No recessed mounting is required.
 - c. Location: The location of the cabinet shall be as shown on the Drawings and in a manner that will insure three (3) feet of unobstructed work area with the cabinet doors open.
 3. Communication Gutter (CG): Furnish and install a 6" x 6" x 72" electrical gutter per these Specifications and as shown on the Drawings.
 - a. Installation: The gutter shall be mounted on the surface of the wall. No recessed mounting is required.
 - b. Location: The location of the gutter shall be as shown on the Drawings.
 - c. Connections: The gutter shall be connected to the RC and CC with four 2" conduits, two in each cabinet.
- J. Signal Conduits: The following 3/4-inch signal conduits are required.
1. Three conduits from the SCU wall box to the CG. SCU wall box to be labeled "SCU 97-6".
 2. Three conduits from SCU box to the CG. SCU box and CG to be labeled "SCU 97-8".

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3. One conduit from CG to all outside speakers via an/off switch (located at exit doors). Each switch outside speaker box and CG to be labeled "SCU 97-9".
 4. One conduit from CG to all speakers, including the ones in the office and BC quarters. Each inside speaker box and CG to be labeled "SCU 97-10".
 5. Two conduits from the CG to the CC.
 6. Two conduits from the CG to the RC.
 7. ONLY if applicable, one conduit from the CG to junction box at Battalion Chief's quarters (for inside speaker audio). CG and junction box to be labeled "SCU 97-11".
 8. ONLY if applicable, one conduit from the junction box at Battalion Chiefs quarters to volume control box. Volume control box and junction box to be labeled "SCU 97-12".
 9. ONLY if applicable, one conduit from the junction box at Battalion Chiefs quarters to ceiling speaker box. Speaker box and junction box to be labeled "SCU 97-13".
 10. ONLY if applicable, one conduit from the CG to 2" x 4" wall alarm annunciator box in Battalion Chief's quarters. CG and alarm annunciator to be labeled "SCU 97-14".
- K. Speaker Boxes, Speakers, and Speaker Controls:
1. Speakers: Speaker kit with required number of speakers.
 - a. Indoor speakers shall be Jensen C840, Quam 8C5PAX8, or equal 8-Ohm speakers by Electrovoice or Dukane.
 - b. Ceiling recessed speaker enclosures shall be Lowell XCP84 or Quam ERD-8, with Lowell RS8A baffle or Quam BR8A baffle. Ceiling speaker mount shall be Quam SSB-2.
 - c. Wall mount enclosures shall be Bogen Communications WB8. Each speaker shall be furnished with a Jensen 700CVA or Quam TBL70, 70-Volt-line matching transformer. Connect the two-watt tap of each transformer to the 70-Volt-line.
 - d. Outside speakers shall be Electrovoice University Sound PA430T 70-Volt-line speakers, Rauland-Borg 3602 or equal by Jensen. Speaker connection to building shall be completely weatherproof with no exposed cables. Install speaker enclosures clear of door operating equipment.

2. Speaker Controls:
 - a. Outside speaker cut-off switch shall be located at exit door to areas served by speakers.
 - b. Outside speaker cut-off switch shall be Eaton Cutler-Hammer 8295K108.
- L. Audio Cables:
 1. Speaker Cable: Trade and UL style number 8877, two conductors, No. 16 AWG bare copper PVC insulation, parallel conductors, PVC jacket.
 2. Microphone Cable: Trade and UL style number 8722, four conductors, No. 20 AWG tinned copper, aluminum shield over two conductors, No. 22 AWG drain wire, PVC insulation, PVC jacket.
 3. Cable Installation: 8677 type speaker cable is to be installed as follows.
 - a. Two 8677 type cables from the SCU wall box to the CC (for inside speaker out, and for space out). SCU wall box and CC to be labeled "SCU 97 -A" and "SCU 97-8" respectively.
 - b. One 8677 type cable for the SCU wall box to the RC (for night light contacts). SCU wall box and RC to be labeled SCU 97-C".
 - c. One 8677 type cable from cut-off switch at exit doors to CC. Cut-off switch and CC to be labeled "SCU 9 -E".
 - d. One 8677 type cable from cut-off switch at exit doors to outside speakers. Cut-off switch and all outside speaker boxes to be labeled "SCU 97-F".
 - e. One 8677 type cable from CC to all inside speakers, except the one in the BC quarters. CC and all inside speaker boxes to be labeled "SCU 97-H".
 - f. Only if applicable, one 8677 type cable from CC to junction box in Battalion Chief quarters (for inside speaker audio). CC and junction box to be labeled "SCU 97-I".
 - g. Only if applicable, one 8677 type cable from junction box in Battalion Chief quarters to volume control. Volume control box and junction box to be labeled "SCU 97-J".
 - h. Only if applicable, one 8677 type cable from junction box in Battalion Chief quarters to ceiling speaker. Speaker box and junction box to be labeled "SCU 97-K".
 - i. Only if applicable, one 8677 type cable from SCU wall box through the CG and CC to 2" by 4 " wall alarm annunciator box in Battalion

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Chief quarters. SCU wall box, CC and the alarm annunciator box to be labeled "SCU 97-L".

4. Cable Installation: 8722 type microphone cable is to be installed as follows.
 - a. Three 8722 type cables from the CC to SCU wall box (one for VHF radio audio and contact, one for alarm ringer audio and contact, and the other for dial page audio and contact). SCU wall box and CC to be labeled "SCU 97-M", SCU 97-N", and 'SCU 97-O" respectively.
- M. Power Outlets: Install two (2) each 20 amp single receptacles connected to dedicated 20 amp circuit breakers, near the location of the new SCU. Install one (1) each 20 amp duplex receptacle connected to a dedicated 20 amp circuit breaker in the RC panel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Temporarily install all electronic equipment for the final test of the equipment and systems, and then remove and store all equipment which is not built-in until occupancy by Owner personnel. Return and make complete and final installation and check-out.

3.2 FLASHING

- A. Properly flash all supports, angles and roof penetrations and set in mastic.
- B. Do not penetrate roof within 18" of other penetrations, vertical curbs, or parapets to allow for independent flashing.

3.3 ACCEPTANCE TEST AND FOLLOW-UP

- A. Final tests and inspection shall be held in the presence of a representative of the County of Los Angeles Internal Services Department (ISD) and Los Angeles County Fire Department to their satisfaction. Supply personnel, and if required, auxiliary equipment for the tests without cost to the Owner.
- B. If requested to do so, supply personnel to train Owner's employees in operation and maintenance of the systems installed without cost to the Owner. Training time shall not exceed a total of eight (8) hours unless specified otherwise.

END OF SECTION

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SECTION 27 30 00
VOICE COMMUNICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide backboards, cabinets, cable trays and conduits for telephone systems as shown on the Drawings and as specified, complete.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Backboards shall be 3/4 inch exterior grade plywood, size as indicated on Drawings. Backboards shall be prime coated on all sides and edges with fire resistant paint, either clear or light color.
- B. Conduits: Refer to Section 26 05 33.13: Conduit for Electrical Systems.
- C. Cabinets: Refer to Section 26 27 16: Electrical Cabinets and Enclosures.
- D. Outlet Boxes: Refer to Section 26 27 19: Multi-Outlet Assemblies.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide NEC sized ground conductor from each telephone cabinet and backboard to cold water pipe.
- B. Pullwires shall be installed in all telephone conduits continuous and without splices, projecting 12 inches out of each end of conduit/outlet box.
- C. Attach backboards to metal studs with self-tapping screws, along entire wall of telephone closets.
- D. Equip all junction boxes with plaster rings.

3.2 AT&T SPECIFICATIONS

- A. AT&T Specifications follow.

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AT&T Specifications

Trenching

Conduit

Boxes and Manholes

Aerial Entrance Masts

Service Cabinets

Bonding and Grounding

A Guide for California Developers of Commercial Property

This guide consists of AT&T California specifications and diagrams for trenching, underground support structure, aerial installations, and other make ready work performed by developers and their agents as required by AT&T for installation of its copper communication facilities on commercial private property. Any deviation from the information provided in this document must be approved by the local AT&T Engineer.

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AT&T Planning and Design Requirements

The California Public Utility Commission Tariff Schedule A2 defines specific responsibilities for both the Developer and AT&T to establish telephone service to your project. AT&T must approve the final plan for service prior to the start of construction for the telephone facilities. In order for AT&T to begin engineering to serve your project you must provide the following:

1. Two (2) scaled copies of the site plan, floor plan and electrical/telephone site plan (E-1) drawings (*AT&T Engineer may request your plans on a Compact Disk in lieu of hard copies*)
2. Two (2) scaled copies of off-site improvement plans
3. Address and telephone number of Developer/Owner, General Contractor, Electrical Consultant, and Electrician
4. Assessor Parcel Number and address of project
5. Approved parcel map issued by the governing municipality
6. Power company trench layout

After receipt of these items, AT&T will return to you a red-lined CD or scaled copy of your plans indicating the trench route and substructure requirements and a Service Connection Agreement Letter. This letter must be signed and returned prior to any detailed engineering work by AT&T.

In order to best serve the telecommunication needs of you and your tenants, if available, please provide AT&T with the estimated number of voice, data, and facsimile lines for each commercial building. For advanced services, include estimated high speed data (T1) and fiber based services (DS3 and above).

General Construction Requirements

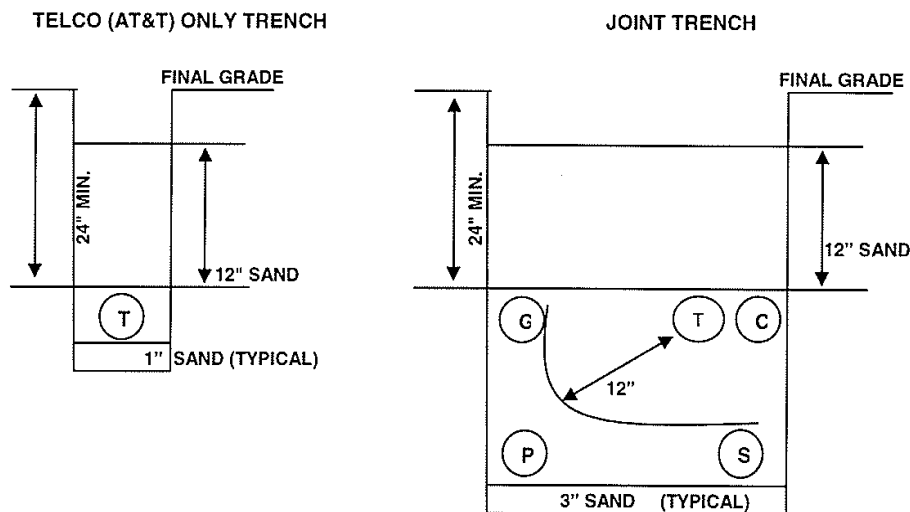
1. Contact AT&T at 661-266-3207 at least 45 days prior to construction to arrange a pre-construction meeting date.
2. Notify AT&T on 661-267-7525 at least 48 hours prior to trenching to ensure an AT&T Inspector will be on site, if required.
3. Verify the location of AT&T and all other utility substructures and buried facilities two (2) days prior to excavation.
Call Underground Service Alert:

North 1-800-227-2600
South 1-800-422-4133

4. Provide supervision and coordination between the various contractors working within the project in order to prevent damage to AT&T facilities. The developer is responsible for the cost of repairs, replacement or relocation made necessary by damage to the AT&T facilities by other work operations.
5. Construct trench and place substructures according to AT&T plans and specifications.
6. Request and get authorization for any design change from the AT&T engineer or AT&T inspector prior to implementing the change.
7. Provide "As Built" drawings with the footages to the AT&T engineer or AT&T inspector upon completion of the conduit system.
8. Call 661-267-7525 or 661-361-4751 for inspection of building requirements at least 30 days prior to needing telephone service, including temporary alarm circuits.
9. AT&T facilities will not be placed until all developer requirements are completed to AT&T specification and meet AT&T approval.

Trenching

1. Minimum radial clearance must be 12" from all trench occupants except CATV (C.P.U.C. Order 128), unless there is a prior signed agreement with AT&T.
2. Bends, sweeps or grade changes that have a radius of 80' or less or a grade change of 20% or more must be encased in 2500 psi concrete.
3. Minimum trench cover must meet the governing agency requirement and Cal P.U.C. GO 128.
4. All trench backfill material must be minimum Class B and compacted in accordance with governing agency specifications. Cover conduit with 12" of fine soil (import) before tamping.
5. Stake property corner for AT&T tie-in from the dedicated street or easement.



T Telephone
 G Gas
 P Primary
 S Secondary
 C Cable

AT&T California

5

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Conduit

Conduit placed for AT&T must be for its exclusive use. AT&T will NOT occupy the same conduit with other utilities or foreign cable/communication systems. AT&T may refuse to occupy conduit that deviates from our plans and specifications. AT&T will specify the number and size of conduits for your project.

The developer is responsible for repairing or resolving any problems with the conduit they have installed that prevents AT&T from pulling its cable through the conduit using normal installation methods. All conduit sections must be rodded, cleared, and roped prior to AT&T pulling in cable. Mandrelling of conduit may be required.

Material Requirements

1. Four inch (4") conduit must be type PTS 77 (C plastic) or Schedule 40.
 - Minimum sweep for 4" conduit is four (4) ft 90 degree radius.
 - Maximum of two (2) 90 degree bends
 - Three-eighth inch (3/8") minimum polypropylene pull line WITH or equivalent strength Polyester Woven Mule Tape must be installed in terminated conduit end to end. Leave a minimum of 3' of secured rope in each box. Ropes must be one continuous length for each section and to the terminal room in the building (no tying or splicing of rope).
2. ~~Two inch (2") conduit must be type PTS 66/DB 120 rigid plastic or Schedule 40.~~
 - ~~• Minimum sweep for 2" conduit is two (2) ft 90 degree radius.~~
 - ~~• Maximum of two (2) 90 degree bends~~
 - ~~• Three-sixteenth inch (3/16") or larger, polypropylene pull line or equivalent strength Polyester Woven Mule Tape must be installed in terminated conduit end to end.~~
 - ~~• Leave a minimum of 3' of secured rope in each box. Ropes must be one continuous length for each section and to the terminal room in the building (no tying or splicing of rope).~~

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3. Rigid plastic or steel conduit must be used in floor slabs.
4. Condulets, plumber's fittings, water and gas pipes are not acceptable.
5. Aerial installations require a 2" steel conduit and approved weather head fitting. See diagrams on pages 13 and 14.

Installation Requirements

1. Minimum trench coverage is detailed on page 6.
2. Service conduit (4") must be terminated above distribution conduits (4") in the box to prevent water flowing from the box and down service conduit toward the building. Boxes must be ordered with the appropriate number of knockouts or terminators to accommodate the conduits.
3. Wall to wall measurements of terminated conduit between boxes and to the terminal room in the building is required (use Logan's line, Tru Tape®, mule or steel tape). Lengths must be included in the "As-Builts" and a copy provided to AT&T prior to installation of AT&T's cable.
4. Conduit in multiple duct designs must be installed using AT&T approved spacers.
5. Concrete encase (2500 psi) all bends with less than 80' radius.
6. *A maximum of two (2) 90 degree bends per section may be installed unless otherwise approved by AT&T.* Pull boxes may be required. Straight 20' lengths may be used on 90 degree bends with a radius greater than 40'. Factory bends are required for all other bends.
7. Underground entrance conduit in a building must terminate 2" above the floor. The terminal room should be planned so that AT&T's entrance cable WILL NOT EXCEED 50' beyond the point where it enters the building.
8. Mule tape all conduits (see material requirements on page 7). Use a temporary universal plug to keep conduit free of debris. Cap all stubbed conduit.

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Boxes and Manholes

Material Specifications

All pull boxes, splice boxes and manholes placed by the developer that will be owned and maintained by the property owner must be approved for use by AT&T. The developer may purchase from any manufacturer that meets AT&T's specifications for boxes and manholes, and must include the appropriate racking, sump, bolt down cover, and pulling eyes. ~~Boxes and manholes owned by the property owner must have a generic telephone emblem on the lid. The use of AT&T's name or logo is not permitted on a property owner's boxes and manholes.~~

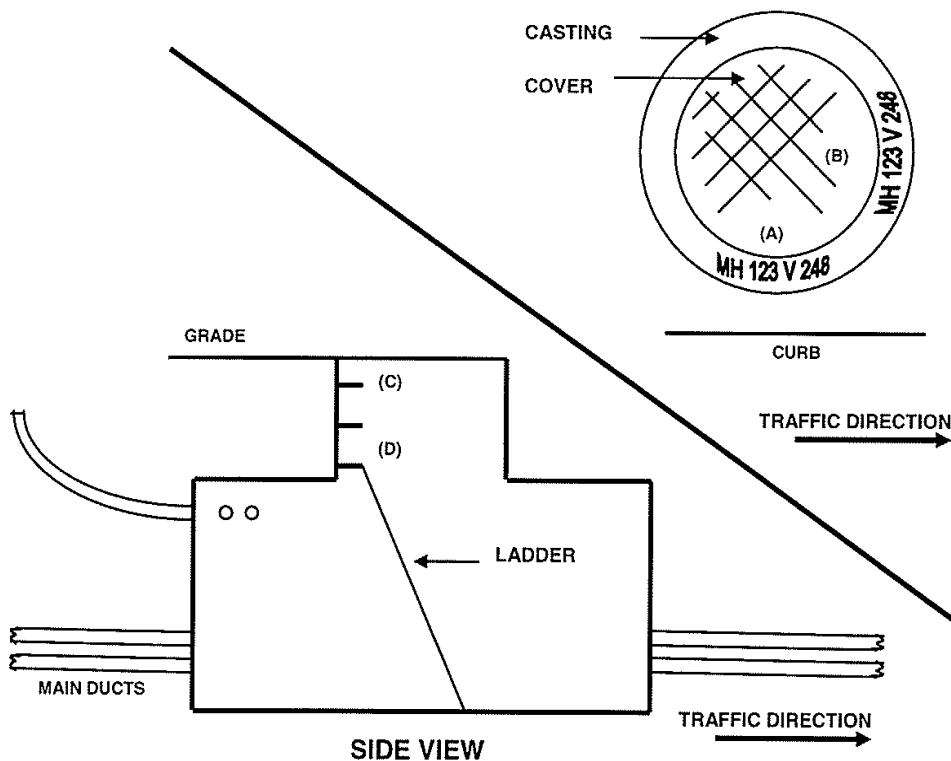
Installation Specifications for Boxes

1. All boxes must be placed in areas outside of vehicular traffic. The AT&T engineer will specify the size and location of boxes. Manholes will be specified in areas that are exposed to vehicular traffic.
2. Placement of boxes and manholes must allow for the final grade of new sidewalk and parkways.
3. A minimum of six inches (6") of compacted sand, graded level is required under all pull boxes (hand holes) and splice boxes. Six inches (6") of gravel, drain rock or base rock is required for manholes. The floor must be level and free of debris.
4. Conduit must terminate at the end wall or side wall in a terminator or knockout as specified by the AT&T Engineer. Entry through the bottom of a box or the middle of a side wall is not acceptable.
5. All conduits entering knockouts in a plastic or polymer box must be cut within one inch (1") flush with the inside of the wall and sealed. All joints must be mortared and all unused ports and openings sealed. Use cement mortar, water plug cement or other approved prepared mortars.
6. Service conduits must be terminated above the main distribution conduits.

Installation Specifications for Manholes

1. Conduits must be terminated in the manufactured terminators only. Main conduits must be placed in lower terminators first. From each terminator, a minimum of 5' of straight conduit is required (no bends). Manholes are not to be cored without prior AT&T approval.
2. Steps and ladder must face oncoming traffic. Steps: First step 6"-17" from grade to step (C). All other steps 12" separation from each other (D). All steps must be concreted in place and extended 6" from MH wall.
3. Cover from grade to MH roof must be a minimum of 24" and a maximum of 60", unless otherwise indicated by the AT&T engineer.
4. Floor of MH must be level.

MANHOLE DIAGRAM



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Service Cabinets, Bonding and Grounding

All service cabinet, bonding, and grounding requirements must meet the National Electrical Code. The list of requirements below provides the minimum specifications accepted by AT&T.

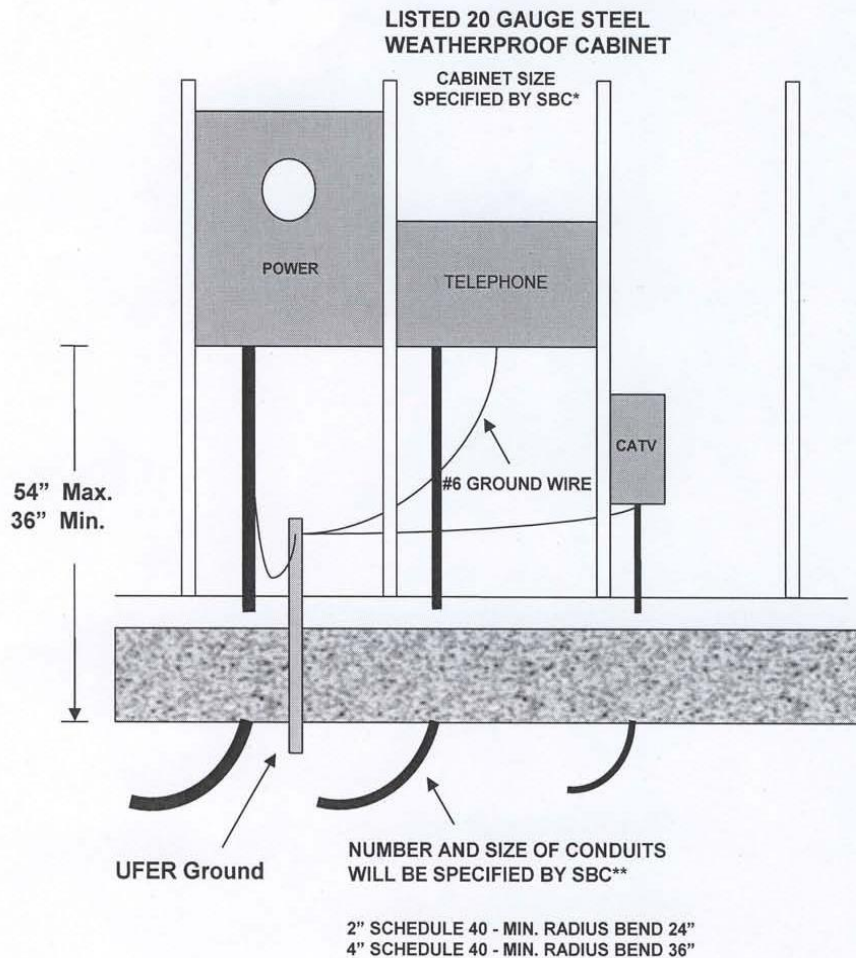
- 20 Gauge Steel Weatherproof Listed Cabinet. The cabinet must be listed by a Nationally Recognized Testing Laboratory, such as UL, and must meet the following UL 50 Standard for Safety Criteria:
 - Number 3 R for Exterior Use
 - Protection Against Corrosion
 - Overlap Requirements
- Cabinet size specified by AT&T Engineer
- Equipped With $\frac{3}{4}$ " Plywood Backboard
- Allow 3' Minimum Clearance In Front Of Cabinet

Grounding Options For AT&T Facilities Are Listed In Order of AT&T Preference:

1. #6 copper ground wire to Electrical Power Service Grounding Electrode, Service Grounding Electrode Conductor or Service Panel
2. #6 copper ground wire to a Concrete-Encased Electrode meeting the requirements of the NEC (UFER Ground)
3. #6 copper ground wire to a Ground Ring meeting the requirements of the NEC or to the metal frame of the building which is effectively grounded.
4. If the building does not have a grounding electrode means, connect a #6 copper ground wire to a driven ground rod that is a minimum of 12.7 mm (0.50 in) in diameter and 1.5m (5 ft) long. The rod must be installed at least 1' to 2' from the outside wall and a minimum of 6' from power or lightening ground rods.

See Service Cabinet Diagram on Page 11

SERVICE CABINET DIAGRAM



*CABINET SIZE H= W= D=
 **CONDUIT SIZE = Number =

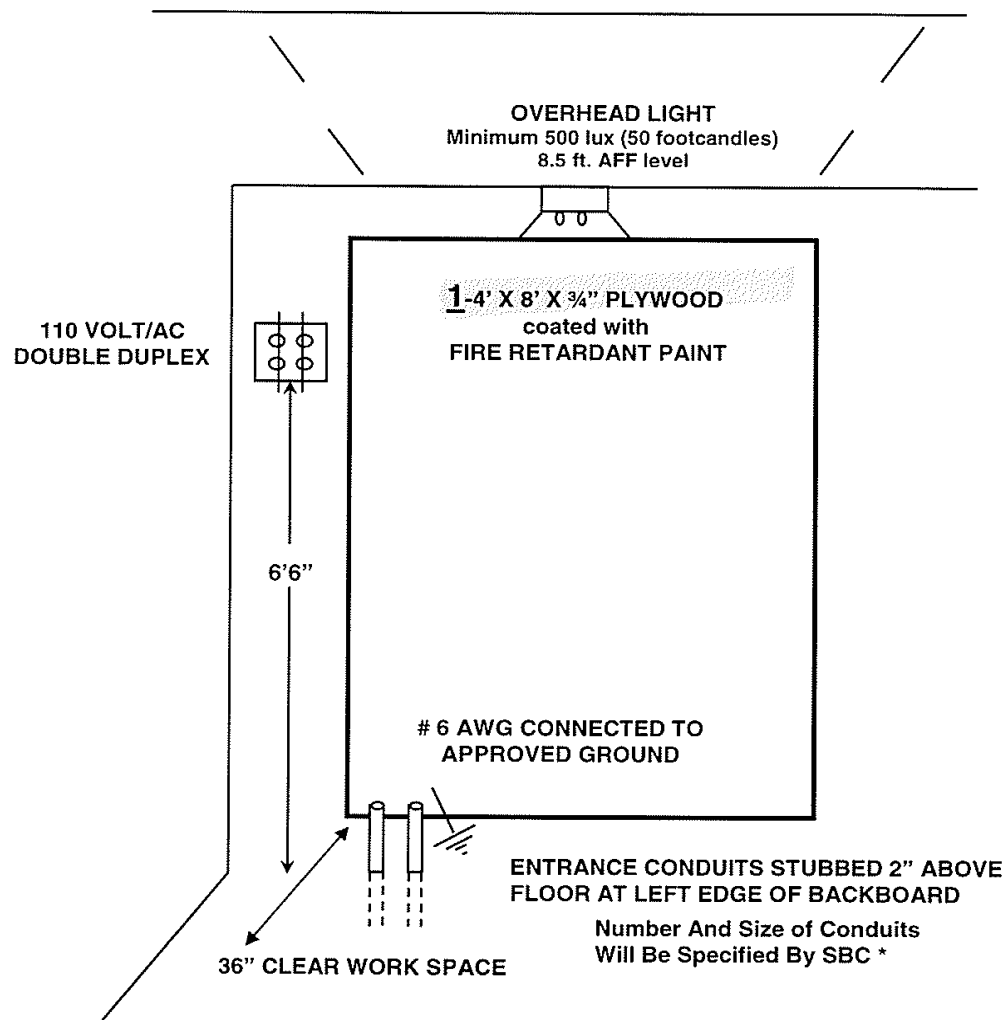
NOTE: Grounding source options are Electrical Power Service Grounding Electrode, Service Grounding Electrode Conductor or Service Panel, UFER, ground ring, or driven ground rod. See Details on page 10.

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BACKBOARD DIAGRAM



***CONDUIT SIZE = 4" NUMBER = 1**

NOTE: Grounding source options are Electrical Power Service Grounding Electrode, Service Grounding Electrode Conductor or Service Panel, UFER, ground ring, or driven ground rod. See page 11 for Details.

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END OF SECTION

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SECTION 27 41 23.13**TELEVISION MOUNTING BRACKETS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide television mounting brackets where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 27 00 00: Communications.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Submit a material list with names of manufacturers, model numbers, and technical information on all brackets to be installed.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Provide wall or ceiling mounted television brackets to accommodate 25"-27" monitors. Los Angeles County Fire Department to provide T.V. Model # and Specifications.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
- B. Install in accordance with manufacturer's directions for type of mounting required at height and locations indicated and in compliance with applicable regulations of governing authorities.

END OF SECTION

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SECTION 28 13 00**SECURITY ACCESS CONTROL SYSTEM****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide all labor, material, equipment, and testing for entry door access controls and main entry door release as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 08 71 00: Door Hardware.
 - 2. Division 26: Electrical wiring and connections.

1.2 REFERENCES

- A. ADA - Americans with Disabilities Act.
- B. ANSI/NEMA 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- C. UL 294 - Standard for Access Control System Units.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data:
 - 1. Submit materials list, manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 - 2. Submit details of installation and anchorage sufficient to enable proper interface of the work of this Section with the work of other trades.
- C. Shop Drawings: Submit shop drawings of security access control system installation and components. Show conduit diagrams and connection to electrical services.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of the Owner's administrative requirements.

- B. Protect from damage during delivery, handling, storage and installation.

1.6 COORDINATION

- A. Coordinate with other trades as required for a timely and smooth execution of work.
- B. Verify all dimensions for proper fit and attachment of all parts.

1.7 WARRANTY

- A. Manufacturer's warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Submit manufacturer's standard written warranty, executed by manufacturer, agreeing to repair or replace components that fail in materials or workmanship. Failures include, but are not limited to faulty operation of network router, network controllers, or security control units.

PART 2 - PRODUCTS

2.1 FIELD HARDWARE

- A. Provide security network routers, network controllers and security control units as selected by the Fire Department. Also Include the following.
 - 1. (1) 120V, 20-amp duplex outlet.
 - 2. (4) Sielox #CN-SLX-LGENCL Large Enclosure (20" x 20").
 - 3. (1) Sielox #PW-ALT-BAT12 Backup Battery.
 - 4. (6) Sielox #PW-ALT-BAT7 12VDC/7AH Sealed Lead Acid Batteries.
 - 5. (7) Sielox #CN-SLX-2700 Terminal Controllers.
 - 6. (13) Sielox #RD-HID-40NKS-00-00000 Model 40 Single Gang Card Readers.
 - 7. Access control composite cables.
- B. Network Router:
 - 1. Provide security network routers (NR) to interface the network to network controllers (NC).
 - 2. Model and related accessories, including rack mounting device, as selected by the Fire Department.

C. Network Controllers:

1. Provide network controllers to interface the network routers to the sub LAN interface (SLI) on which the security control units (SCU) reside. Model and related accessories as selected by the Fire Department.
2. Provide 5 custom pages on the ViewCon to include the following:
 - a. All doors status.
 - b. All points in each Controller LAN controller.
 - c. All points in alarm in each Controller LAN controller.
 - d. When not in use the ViewCon shall display the date and time.

D. Security Control Units (SCU):

1. Provide security control units to interface individual door controls with the network controllers. Model and related accessories as selected by the Fire Department.
2. SCUs shall function as either a stand-alone device or as part of a larger local area network (LAN) host system. By processing input data with programmed information, the SCU shall control access into and exit from an area. Door processing units shall be capable of handling four (4) reader inputs and controlling four (4) individual doors. The SCUs and the system shall support multiple reader technologies.
3. Provide SCUs in NEMA-1 enclosures. Provide controllers sufficient to allow for connection of all monitored points, and future door connections, to be labeled "spare". Unused I/O points on the SCUs may be used for auxiliary points not directly associated with the doors being controlled.
4. Each SCU shall support end-of-line resistor supervision on input circuits for door status monitoring and annunciate whether the circuit is in "Alarm" or "Normal," and whether the alarm is a "Short" or an "Open". Each data processing unit shall monitor its enclosure for tamper alarm and monitor the battery for low charge conditions.
5. SCUs shall be connected to the network routers through the network controllers.

2.2 OPERATIONAL SEQUENCE

A. Exterior Zone:

1. All exterior doors that are not emergency or "exit only" doors shall be fitted with all components that make up a "fully prepped" access controlled door, and shall function as specified herein. A fully prepped door includes a reader, electrified exit device or electric strike, request to exit (REX), and a door

position indicator switch (DPIS). Both doors in a double door entry shall have electrified exit devices.

2. When activated by passing a properly authorized card by the exterior reader, the associated door(s) shall unlock and remain unlocked for a preset (adjustable up to 60 seconds) time period to allow entrance into the building.
3. Based on the building schedule, the following shall occur:
 - a. If the access to the building occurs outside the preset building occupied hours, the doors shall relock and the exterior zone shall re-arm.
 - b. If the access to the building occurs after the preset building open time and prior to the preset building closure time, (occupied hours), the doors shall remain unlocked and the exterior zone disabled.
 - c. The building shall remain locked and the exterior zone remained armed until a properly authorized card activates the system. Subsequent activations of the exterior zone shall not change the status (i.e. unlocked and unarmed) until the occupied hours have elapsed.
 - d. The exterior zone shall automatically lock and arm at the preset building closure time.
4. There shall be a card reader supplied that is programmed to override the building time schedule for a preset (adjustable) time period. This reader shall be identified and mounted in such a way as to distinguish it from the other card reader(s) in the building.

2.3 SECURITY DEVICES

- A. All devices shall have their own home run to the head-end electronics.
- B. Motion Detectors: Provide Passive Infrared (PIR) motion detectors to detect intruder movement when building ACSS system is alarmed. PIRs shall employ balanced dual-opposed sensing technology with multiple sensor zones and be resistant to false alarms due to environmental disturbance and RFI. Motion detectors shall not be wired in series. Each shall have its own home run.
- C. Proximity Readers: Proximity readers shall be used for controlled entry and shall employ programmable technology for greater security and for use with cards with varying protocols. Readers shall be rated for outdoor use, and be UL-listed to meet the requirements of UL 294. A multi-color LED indicator shall be provided offering red, green and amber indications to show user the status of the read operation. Color shall be black and be designed to mount on a standard electrical handy box. Proximity card readers shall be as selected by the Fire Department. Proximity readers shall be wired with 8 conductor cables.

- D. Door Position Switches: Provide magnetic door switches to detect door openings. Switch shall be designed for wide gap operation on metal doors. Sensor shall be as selected by the Fire Department.
- E. Request-To-Exit (REX) Devices: Provide PIR-based motion detectors designed for access control to unlock doors when exiting areas. Detectors shall have narrow beam and be designed for access control applications only, (i.e., unit shall have narrow beam able to be focused across door only to eliminate false tripping due to personnel walking by area). The REX devices shall be as selected by the Fire Department.
- F. Electric Strikes and/or Locks and Exit Devices: The electrified hardware devices are provided in Section 08 71 00.
- G. Automatic Door Openers: The ADA openers shall be interfaced with the access control system. All devices associated with the opener shall have their own home run to the head-end electronics, i.e. push pads and the door opener trigger. This will allow the access control system to have complete control over the opener operation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The access control system will need to be integrated into LACOFD's existing network. Coordinate with John McWilliams at MCM Integrated Systems. Telephone (818) 232-1818.
- B. Install security access control system in the Telecom Room as required for entry door access control.
- C. It shall be the responsibility of the security system installer to verify the proper type, model, hanging, and operation of all hardware that must interface with the security system.
 - 1. Coordinate the installation of security access control devices and electrified hardware devices to tie them into the system to provide the functionality and meet the sequencing specified.
 - 2. Coordinate installation of magnetic door switches with the door and hardware suppliers to ensure that the door frame is properly fabricated to receive the position switch.

3.2 TESTING

- A. Upon completion of the work and after all connections have been made and the system is in full operation, test the security access control system and correct any defective work.

3.3 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Provide the services of an authorized representative of the security access control system to instruct the Owner's personnel in the proper operation and routine maintenance of the system. Include an allowance for four (4) hours of the authorized representative of at the Project site, at a time requested by the Owner, for training of the Owner's operating personnel.

END OF SECTION

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SECTION 28 31 00**FIRE DETECTION AND ALARM****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work Included: Provide all labor, material, equipment, and testing necessary and complete for a fire detection and alarm system where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to the following.

1. Fire alarm control panel communicator (located in the telephone room) to monitor the sprinkler and water flow switches.
2. LCD remote annunciator (located near the front entrance or in a normally attended location).
3. Horn/strobe and pull station (located near the remote annunciator).
4. Valve tamper switches to monitor the position of each sprinkler valve.
5. Local 120 vac smoke alarms.
6. Water flow switch and outside waterflow bell.

- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.

1. Section 27 00 00: Communications.
2. Section 27 30 00: Voice Communications.

1.2 REFERENCES

- A. ASA/ANSI S3.41 - Audible Emergency Evacuation (E2) and Evacuation Signals with Relocation Instructions (ESRI).
- B. C.B.C. - (California Building Code) 2022 Edition.
- C. CSFM - California State Fire Marshal.
- D. NFPA 72 - National Fire Alarm and Signaling Code.

1.3 QUALITY ASSURANCE

- A. Qualifications of Installers: As specified in NFPA 72, 10.5.2. In addition, the installer shall hold a valid C-10 license in the State of California and have at least five (5) years installation experience in fire alarm systems.

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- B. All equipment, devices and materials associated with the fire alarm system shall be currently CSFM listed and installed as required by the currently adopted edition of the building, mechanical, fire Title 24, California Code of Regulations and NFPA codes.
- C. Equipment manufacturers, catalog numbers, model designations and functions are indicated to establish standards of quality.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
 - 1. Submit a material list with names of manufacturers, model numbers, and technical information on all equipment to be installed.
 - 2. Submit complete system circuit diagrams, block diagrams, and shop drawings which clearly illustrate how all components relate and how they are interconnected.
 - 3. Submit a statement listing every technical and operations parameter wherein the submitted equipment varies from that originally specified. If the submitter fails to list a particular variance and his submittal is accepted, but subsequently deemed by the Owner to be unsatisfactory because of the unlisted variance, the submitter must replace or modify such equipment at once and without cost to the Owner.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide manual pull station, horn, listed and approved strobe light, annunciator, communicator/fire alarm monitor, all wiring, connections to devices, outlet boxes, junction boxes and all other necessary material for a complete operating system.
- B. Local Smoke Detectors: Hard wired with battery back-up. Units shall indicate low battery with audible alarm. Provide with batteries.
- C. Local Combination Smoke Detector and Carbon Monoxide Sensor: Hard wired with battery back-up. Units shall indicate low battery with audible alarm. Provide with batteries.

2.2 SYSTEM FUNCTIONS

- A. General: The activation of the manual pull station, or sprinkler waterflow, shall cause the following functions to automatically occur.
 - 1. The device in alarm will be indicated at the annunciator with an audible sounder and text description.
 - 2. Signal will be transmitted to the central station with point identification.
 - 3. Horn/strobe will be activated.

- B. Smoke Detectors: The activation of any sleeping area smoke detector shall cause the following functions to automatically occur.
 - 1. The detector in alarm will be indicated at the annunciator with an audible sounder and text description.
 - 2. An audible alarm signal will sound from all of the smoke detectors.
- C. Supervisory Operation: Upon supervisory activation of any sprinkler valve supervisory switch, the following functions shall automatically occur.
 - 1. The valve tamper switch generating the signal will be indicated at the annunciator with an audible sounder and text description.
 - 2. Signal will be transmitted to the central station with point identification.
- D. Trouble Operation: Upon activation of a trouble condition or signal from any device on the system, the following functions shall automatically occur.
 - 1. The internal audible device shall sound at the control panel and remote annunciator.
 - 2. The LCD display shall indicate all applicable information associated with the trouble condition including zone, device type, device location and time/date.
 - 3. Signal will be transmitted to the central station with point identification.

2.3 SYSTEM CONFIGURATION

- A. General: The fire control / communicator will be addressable and programmable. All valves, including both interior and exterior, controlling the water supply for automatic sprinkler systems and water-flow switches on all sprinkler systems shall be electrically monitored.
- B. A remote annunciator shall be located in a normally attended location or at the main entrance of the station.
- C. One horn strobe shall be mounted in a location near the annunciator.
- D. One manual pull station shall be provided near the annunciator and horn / strobe.
- E. The fire alarm control panel shall be mounted in the telephone/communications room.
- F. A smoke detector alarm will cause the sounders of all of the smoke detectors to operate. The specific detector causing the alarm will be indicated at the annunciator. The smoke detectors shall not sound the building alarm or send a signal to the remote monitoring service.
- G. A waterflow condition will cause all of the smoke detector sounders and the single horn strobe to activate. The specific device will be described with text on the annunciator. A signal will be sent to the remote station.

- H. Addressable system type smoke detector shall be provided in each sleeping room and at a point centrally located in the corridor giving access to each separate sleeping area. The smoke detectors shall employ a local programmable sounder. When actuated, the smoke detector shall sound an audible alarm within the sleeping areas of the station and annunciate the text description of the specific detector in alarm.
- I. A supervisory condition will not cause the alarm signal to activate. The status will be displayed on the annunciator. A supervisory signal will be sent to the remote monitoring station.

2.4 MATERIALS

- A. Panel Components & Functions: The control panel shall be an addressable microprocessor-based system with an integral built in communicator. The control panel shall include the following capacities:
 - 1. Supervision of system components, wiring, initiating devices and software shall be provided by the control panel.
 - 2. Failure or fault of system component or wiring shall be indicated by type and location on the LCD display.
- B. Smoke Detectors: Photoelectric analog addressable smoke detectors shall be CSFM listed and employ a programmable local sounder.
- C. Manual Station: Provide analog/addressable double action, single stage fire alarm station.
- D. Signals: Provide a horn strobe with the proper candela rating for the room in which it is mounted.
- E. Annunciator: Provide an annunciator capable of displaying the status of the fire alarm system with alphanumeric text descriptions specific to the device in alarm.
- F. Alarm: On activation of manual pull station or water flow device, the system shall sound horns, and strobe lights shall flash at a minimum of 60 flashes per minute. The front panel shall turn on the respective display identifying the alarm device and floor of alarm.
- G. Alarm Sequence: System alarm operation subsequent to the alarm activation of any manual station, automatic detection device, or sprinkler flow switch is to be as follows.
 - 1. All audible alarm indicating appliance shall sound a temporal 3 in compliance with ANSI S3.41 until silenced by the alarm silence switch at the control panel.
 - 2. The activation of any standpipe or sprinkler valve tamper switch shall activate the system supervisory service audible signal and illuminate the display at the control panel and the remote annunciator. Differentiation between valve tamper activation and opens and/or grounds on fire alarm initiation circuit wiring shall be provided.

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3. Restoring the valve to the normal position shall cause the supervisory service display to extinguish thus indicating restoration to normal position.
4. The system batteries shall be supervised so that a low battery condition or disconnection of the battery(s) shall be audibly and visually indicated at the control panel and the remote annunciator.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Furnish and install all conduit systems, pull wires, distribution terminal cabinets, power wiring and devices, etc. indicated on the Drawings and as required for the alarm system.
- B. Manufacturer's Representative: Equipment, devices and wiring for the alarm system shall be furnished and installed by the manufacturer's authorized representative or distributor. The representative shall be responsible for the system's operation, its function and its testing. The representative shall also be responsible for providing complete maintenance for one year after final acceptance by the Owner.
- C. Boxes: All junction boxes shall be painted red and labeled "Fire Alarm".
- D. Conduit: Wiring for the alarm system shall be installed in conduit as indicated on the Drawings.
- E. Conductors: Conductors attached to the equipment or to distribution terminal boards for alarm system shall be clearly and permanently tagged to indicate their function and destination. All conductors shall be pulled and fastened securely so as to avoid sharp corners and be fastened to suitable hardware in a manner to prevent injury or physical distortion of the conductor. Splices, fittings and connectors shall be made only at known points or be otherwise indicated on each system layout to facilitate servicing the systems. Wiring in distribution terminal cabinets shall be neatly laced, marked at both ends and terminated on terminal locks. Color coding of conductors shall be maintained throughout the installation.
- F. Installation of equipment and devices that pertain to other Sections shall be closely coordinated with the appropriate equipment suppliers and installers of these other Sections.
- G. System installation shall not be started until detailed drawings and specifications for each component of the system have been approved by the California State Fire Marshall.

3.2 TESTING

- A. Upon completion of the work and after all electrical connections have been made and the system is in full operation, the alarm system shall be tested and defective work shall be corrected.

- B. Before the work will be accepted, demonstrate to the Owner, the Architect and the State Fire Marshall that the entire installation is complete and in proper operating condition and that the subcontract has been properly and fully executed. The acceptance testing shall be arranged for and witnessed by the Owner, the Architect and the State Fire Marshall.
- C. Guarantee that the signal systems are complete and in perfect operation and that all apparatus will perform in accordance with the Drawings and Specifications.
- D. Provide record of completion with as-built drawings.

3.3 TRAINING

- A. The fire alarm and detection systems subcontractor shall include an allowance for four (4) hours of a competent representative at the Project site, at a time requested by the Owner, for training of the Owner's operating personnel.

END OF SECTION

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SECTION 31 31 16.13
CHEMICAL TERMITE CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide soil treatment for control of subterranean termites.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
 - 1. Section 03 30 00: Cast-In-Place Concrete.
 - 2. Civil Drawings: Grading.
 - 3. Civil Drawings: Excavation and Fill.

1.2 REFERENCES

- A. EPA - U.S. Environmental Protection Agency.
- B. FIFRA - Federal Insecticide, Fungicide and Rodenticide Act.

1.3 QUALITY ASSURANCE

- A. Applicator Qualifications: A pest control operator registered and licensed in the State of California and who is experienced and has completed termite control treatment similar to that indicated for this Project and whose work has a record of minimum ten (10) year's successful in-service performance.
- B. Regulatory Requirements: Provide materials in compliance with all current regulations of the State of California and which bear a Federal registration number of the EPA. Materials shall conform to State and Local regulations to meet minimum treatment standards for preventive preconstruction treatments.
- C. Verify chemicals are approved for use by applicable authorities in termite control at Project location and under specific Project conditions including proximity to water sources.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of the Owner's administrative requirements.
- B. Product Data: Provide manufacturer's literature on chemicals to be used for Project, including EPA Registration number and percentages of each type of chemical in water emulsion and manufacturer's recommended application rates.
- C. Submit manufacturer's recommendations which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

- D. Certification: Provide certification that chemicals comply with Federal Insecticide, Fungicide and Rodenticide Act, and applicable State and local requirements.
- E. Qualification Data: For firms and persons specified in Article 1.3 to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following as applicable.
 - 1. Date and time of application.
 - 2. Moisture content of soil before application.
 - 3. Brand name and manufacturer of termiticide.
 - 4. Quantity of undiluted termiticide used.
 - 5. Dilutions, methods, volumes, and rates of application used.
 - 6. Areas of application.
 - 7. Water source for application.
- G. Warranties: Special warranties specified in this Section.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with EPA-Registered Label requirements and requirements of authorities having jurisdiction.

1.6 COORDINATION

- A. Coordinate soil treatment application with excavating, filling, and grading and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs, before construction.

1.7 WARRANTY

- A. Warranty: Furnish written warranty, executed by applicator and Contractor, certifying that applied soil termiticide treatment will prevent infestation of subterranean termites. If subterranean termite activity is discovered during warranty period, applicator will re-treat soil and repair or replace damage caused by termite infestation.
- B. Warranty Period: Five (5) years from date of Substantial Completion.
- C. Provide performance bond for soil treatment, termite/pest control.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT SOLUTION

- A. General: Use an emulsible, concentrated termiticide that dilutes with water, specially formulated to prevent termite infestation. Fuel oil will not be permitted as a diluent. Provide a solution consisting of one of following chemical elements.
- B. Subject to compliance with requirements, products that may be incorporated in the work include Dragnet FT (Permethrin) by FMC Corp. solutions as recommended by applicator if approved for intended application by the Owner. Use only soil treatment solutions that are not harmful to plants.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine substrates, areas, and conditions, with applicator present, for compliance with requirements for moisture content of the soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control.
- B. During initial stages of construction, determine fill material to be used and set tentative date for initial service and schedule subsequent service as deemed necessary for completion of soil treatment.
- C. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparing substrate. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil and around foundations.
- B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended by termiticide manufacturer.
- C. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

- A. Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.
- B. Dilute product with water to concentration level recommended by manufacturer.

- C. Do not apply soil poison when surface water is present.

3.4 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute the treatment evenly.
1. Slabs-on-Grade: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 2. Foundations: Adjacent soil including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers, and along entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
 3. Masonry: Treat voids.
 4. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
- B. Treat minimum 18" wide strip around perimeter of building, including where building is abutted by concrete slabs, paving, and other permanent surfacing.
- C. Avoid disturbance of treated soil after application.
- D. Post warning signs in areas of application.
- E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.5 CLEANING AND PROTECTION

- A. Remove and handle all termiticide containers in accordance with label instructions after application.
- B. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Cover treated soil with waterproof barrier if slab will not be poured the same day as treatment, according to EPA-Registered Label instructions.
- C. Keep all personnel off of the treated area until completely dry.
- D. Waste Management: Refer to Owner's administrative requirements for recycling requirements.

END OF SECTION

SECTION 33 56 13**ABOVEGROUND FUEL-STORAGE TANKS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Documents affecting work of this Section include, but are not necessarily limited to the Owner's administrative requirements.
- B. All fuel dispensing and handling equipment shall be installed in accordance with NFPA 30 "Flammable and Combustible Liquids Code," Air Quality Management District requirements and all local and State Fire Marshal Codes. Conform to the latest OSHA Requirements.
- C. Each tank for storage of diesel shall be Fire Underwriters approved complying with NFPA Standards and shall be labeled and UL listed.
- D. The following are specific quality control requirements which must be performed by the installer as a part of the installer's quality control system and are additional to the routine daily inspection requirements.
 - 1. Submit the following catalog data prior to delivery of the materials to the Job site.
 - a. Description of tank, size, capacity and type. Provide certification of Fire Underwriters approval.
 - b. Valves, transmission fittings, flange gaskets, pipe and pipe fittings as part of tank.
 - c. Fuel dispensing equipment.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Containment Solutions, Inc.
- B. PCL Industrial Services, Inc.
- C. CB & I.

2.2 MATERIALS

- A. Fireguard Vault Tank 4,000 Gallons, Split Tank (2,000 Gal. Main Diesel Tank, 500 Gal. Generator Diesel, and 500 Gal. Unleaded Gas).
- B. Storage vessel shall be a concrete, vaulted, double-walled, steel tank. Outer wall, top and bottom, shall be 10-gauge steel or thicker with a cross-broke top for water runoff.

- C. The primary tank shall be UL listed and shall be fabricated from 3/16-inch steel minimum. Tank shall be rectangular in shape.
- D. Height shall not exceed 7'-1", width shall not exceed 7'-11", and length shall not exceed 13'-0" for a 4,000-gallon diesel fuel tank.
- E. Tank shall have a 30-year warranty, which includes the concrete vaulting materials as well as the primary and secondary tanks.
- F. The tank shall include earthquake restraint tie downs.
- G. All tanks shall be labeled as follows:
 - 1. Product, 6" x 21".
 - 2. No Smoking Within 12 feet, 6" x 21".
 - 3. Hazardous materials color coding, 12" x 12".
 - 4. Capacity, 5-1/4" x 10-3/4".
 - 5. Manufacturer, lettering no larger than 6" high.
- H. The annular space between the inner and outer wall shall maintain minimum 2-hour firewall integrity under all thermal conditions per the International Building Code, as well as impact fire ballistic protection.
- I. The tank shall have an internal structural reinforcement in the concrete to enhance its integrity.
- J. The inner tank shall be totally enclosed within a bladder to provide corrosion protection as well as an immediate leak path for an external monitor; visual, liquid, or vapor.
- K. Provide evidence that secondary containment can be air pressurized up to 5 psi.
- L. Outer tank shall be painted with a rust-protective primer and exterior coating polyurethane epoxy.
- M. The 4000 gallons of diesel fuel shall be delivered with the following accessory packages:
 - 1. Non-Vapor Recovery Package D (Diesel):
 - a. 734-40 Universal Valve 4" Fill Cap.
 - b. 724-4040 Universal Valve 4" Fill Adapter.
 - c. 723-4012 Universal Valve 4" Drop Tube.
 - d. SH615 Tokheim Transfer Pump Package; 1/2 HP, 120 volt, single phase, 60 hertz.

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- e. 1595-04 Husky 10 S Non-vapor Recovery Nozzle.
 - f. 7280 Dayco 3/4" x 10' M/SW Hose.
 - g. 4120 Universal Valve 2" Vent Cap.
 - h. Grounding and Bonding.
 - i. 5-gallon Overfill Containment Bucket.
 - j. Front mounted fill box for tanks 5'-0" or taller.
- N. Audible Alarm System: Provide 85% fill notification and 90% fill shutoff (provide one each for each diesel tank).
- 1. Level Switch: Pneumercator LS 600 Series liquid level float switch with stainless steel float.
 - 2. Audible Alarm Controls: Pneumercator LC 1000 Series alarm consoles with 1/2-second response time, indicator lights, test and reset buttons, and NEMA 4 weatherproof enclosure, wall mounted. Provide sensor cable.
- O. Provide all required tank venting through canopy roof.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fuel tank, associated fuel dispensing equipment and leak detection system in accordance with all applicable Los Angeles County Guidelines for new fuel storage tanks, and per manufacturer's recommendations.
- B. Comply with all Los Angeles County Fire Department requirements, Fire Prevention Division, Petroleum Chemical Unit, for above ground fuel tank installations.

END OF SECTION

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