



**Nevada Joint Union High School District**  
11645 Ridge Road , Grass Valley, CA 95945

**CLASSROOM MODERNIZATION**  
**Culinary Arts**  
**NEVADA UNION HIGH SCHOOL**  
DSA Application No. – 02-117832

**CONTRACT DOCUMENTS, CONDITIONS &  
TECHNICAL SPECIFICATIONS**

DERIVI CASTELLANOS ARCHITECTS  
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Technical Specifications for:

## **CLASSROOM MODERNIZATION**

# **Culinary Arts**

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**NEVADA UNION HIGH SCHOOL**

11761 Ridge Road , Grass Valley, CA 95945

Prepared for:

## **Nevada Joint Union High School District**

11645 Ridge Road , Grass Valley, CA 95945

Prepared by:

Derivi Castellanos Architects

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**DSA Appl. No. – 02-117832**

DCA Job No. 19.010

December , 2019

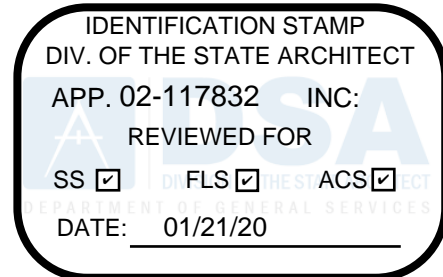
# CLASSROOM MODERNIZATION – CULINARY ARTS

## NEVADA UNION HIGH SCHOOL

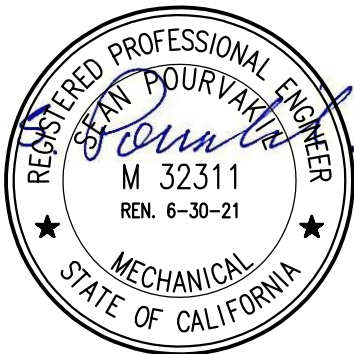
**ARCHITECT :**



Derivi Castellanos Architects



**MECHANICAL ENGINEER :**



LP Consulting Engineers

**ELECTRICAL ENGINEER**



LP Consulting Engineers

IDENTIFICATION STAMP  
 DIVISION OF STATE ARCHITECT  
 OFFICE OF REGULATION SERVICES  
**Appl. No. 01 – 117832**

AC \_\_\_\_\_ FLS \_\_\_\_\_ SS \_\_\_\_\_

DATE: \_\_\_\_\_

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Inside Cover  
Approval and Signatures  
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## **CLASSROOM MODERNIZATION - CULINARY ARTS**

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**Not Used**

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**Section 02 41 19 SELECTIVE DEMOLITION**

**PART 1 -GENERAL**

**1.01 WORK INCLUDED**

- A. Remove materials, systems, components, fixtures and equipment as designated and as required for completion of the Culinary Arts Classroom Modernization work as indicated on the project Demolition Plans
- B. Coordinate selective demolition with plumbing, mechanical and electrical work; cap and identify active utilities where not otherwise identified under Division 26 work.
- C. NOTE: Hazardous materials removal/abatement has previously been addressed by the District and is not included in the scope of contractor's work.
- D. Contractor shall recycle demolished materials rather than landfill materials wherever possible.

**1.02 RELATED WORK**

- A. Coordinate Selective Demolition with:
  - 1. *Division 1: Construction Waste Management Program – Not included at this time.*

**1.03 SUBMITTALS**

- A. Demolition procedures and operational sequence for review and acceptance by Owner/Architect.
- B. Reports: Submit typewritten reports of surveys conducted with the Owner before and after performance of demolition operations.
- C. Salvageable Items: Submit typewritten list of items to be salvaged, for Owner's approval.

**1.04 QUALITY ASSURANCE**

- A. Standards: Perform demolition in conformance with ANSI A10.6 and NFPA 241.
- B. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Pre-demolition Conference: Conduct conference at Project site.

**1.05 EXISTING CONDITIONS**

- A. Site Surveys:
  - 1. Following performance of demolition, inspect and report defects and structural weaknesses of construction and improvements partially demolished, cut, and removed; of construction and improvements remaining; and of adjacent construction and improvements.
- B. Protection: Protect the structural integrity of existing construction and improvements to remain.

**1.06 PROTECTION**

- A. Do not interfere with use of adjacent building spaces; maintain free and safe passage to and from.
  - 1. Cover and protect existing materials when demolition work is performed in

- areas where existing materials have not been removed.
- B. Cease operation and notify Architect immediately if safety of structure appears to be endangered; take precautions to properly support structure.
    - 1. Do not resume operation until safety is restored.

#### 1.07 EXISTING SERVICES

- A. Disconnect or remove utility services as required for completion of Project; disconnect, stub off, and cap utility service lines not required as part of the completed project.
  - 1. Do not remove utilities discovered during demolition but not indicated without first determining purpose for utility.
- B. Do not disrupt services to adjacent building areas not in Project.
- C. Place markers to indicate location of disconnected services; identify service lines and capping locations on Project Record Documents.

### PART 2 -PRODUCTS

#### 2.01 MATERIALS

- A. General:
  - 1. Remove and recycle or dispose of items and materials not designated to be salvaged or re-installed. Disposal shall be at the legal dump site for the material to be disposed. *Coordinate with 01 74 19 – Construction Waste Management.*
  - 2. If, in the course of removing designated items and materials, the condition of other materials or the structure so exposed appears to be damaged or of otherwise questionable condition, immediately notify the Architect, who will determine if the other materials or structure shall be removed, and if so to what extent.
  - 3. Nothing to be removed from the site shall be stored, sold, or burned on the site without the Owner's prior written consent.
  - 4. Remove and recycle or dispose of all debris found in each unit at start of work.
- B. Items to be Salvaged or Re-installed:
  - 1. Carefully remove materials indicated to be retained by Owner or re-installed; deliver and store where directed on site.
    - a. Coordinate extent of existing materials to be retained by Owner with Owner's Representative prior to beginning selective demolition.
  - 2. Carefully disconnect, remove, and protect items indicated and designated to be salvaged, as well as any additional items so directed by the Architect.
  - 3. Package salvaged items that are in satisfactory condition for reinstallation in cardboard and label as to contents. Should a question arise as to whether or not certain items are of suitable condition for reinstallation, consult the Architect for determination.
  - 4. Deliver salvaged items at time and to location directed by the Owner.
  - 5. Reinstall salvaged items in locations indicated, or as designated by the Architect.
  - 6. Salvaged items not indicated or designated for reinstallation in the Work shall be delivered to Owner.
  - 7. Obtain approved list of items to be salvaged, prior to beginning demolition operations.



8. Salvaged items rejected by the Owner shall become the Contractor's property.

### PART 3 -EXECUTION

#### 3.01 EXAMINATION

- A. Verify that conditions are satisfactory for beginning selective building demolition. If unsatisfactory conditions exist, do not begin demolition operations until such conditions have been corrected.

#### 3.02 PREPARATION

- A. Prior to start of demolition operations, prepare a proposed layout and sequence for the Work; coordinate with related Work which requires cutting and sawing.
- B. Review proposed layout and sequence with the Owner and Architect prior to starting demolition operations.
- C. Cap and protect utility lines prior to start of demolition operations.

#### 3.03 GENERAL

- A. As demolition progresses, continuously inspect for damage. Should signs of damage arise, immediately notify the Architect, and stop demolition operations in the affected location until advised as to how to proceed.
- B. Remove items designated for demolition, and as required for the performance of the Work. If in doubt as to whether an item is to be demolished, contact the Architect for a decision prior to proceeding with its demolition.
- C. Remove items carefully; provide for neat and structurally sound junctions between existing and new materials.
- D. As applicable, remove miscellaneous items and fastenings associated with items to be demolished.
- E. Clean surfaces affected by the demolition operations of all residual adhesives, bitumen, and other adhering materials, as required to afford suitable substrates for the application of new materials.
- F. Perform demolition in accordance with authorities having jurisdiction.
- G. Remove demolished materials from site, unless otherwise directed.
  1. Remove from site, contaminated, vermin infested, and dangerous materials encountered and disposed of by safe means so as not to endanger health of workers or public.
- H. Remove tools and equipment upon completion of work; leave area in condition acceptable to Architect.

#### 3.04 CUTTING

- A. Make new openings neat, as close as possible to profiles indicated, and only to the extent required to accommodate new Work.
- B. Do not cut or alter structural members without the prior written consent of the Architect.

#### 3.05 REPAIR

- A. Repair damage to adjacent construction caused as result of this work. Patch to produce surfaces suitable for new materials

END OF SECTION

**SECTION 03 21 00 - REINFORCING STEEL**

**PART 1 - GENERAL**

1.1 GENERAL REQUIREMENTS

A. Requirements of Division 1 apply to all work of this Section.

1.2 SCOPE

A. Unless noted otherwise, furnish and install reinforcing for all concrete, including dowels, chairs, spacers, bolsters, etc., necessary for supporting and fastening reinforcement in place as shown on the Drawings and specified herein.

1.3 RELATED WORK (See also Table of Contents)

A. Cast-In-Place Concrete: Section 03 30 00.

1.4 QUALITY ASSURANCE

A. General:

1. Acceptable Manufacturers: Regularly engaged in the manufacture of steel bar and welded wire fabric reinforcing.
2. Installer Qualifications: Installation shall be done only by an installation firm normally engaged in this business. All work shall be performed by qualified mechanics working under an experienced supervisor.
3. Welding Qualifications: Welding procedures, welding operators and welders shall be qualified in accordance with AWS D1.4 - "Structural Welding Code Reinforcing Steel".
  - a. Welders whose work fails to pass inspection shall be re-qualified before performing further welding.
4. Reinforcement Work shall conform to ACI 301 and CBC Section 1907, as minimum standards.
5. Allowable Tolerances:
  - a. Fabrication:
    - 1) Sheared length: 1 inch.
    - 2) Depth of truss bars: Plus 0 minus ½-inch.
    - 3) Ties: Plus or minus ½-inch.
    - 4) All other bends: Plus or minus 1 inch.
  - b. Placement:
    - 1) Concrete cover to form surfaces: Plus or minus ¼-inch.
    - 2) Minimum spacing between bars: Plus or minus ¼-inch.
    - 3) Crosswise of members: Spaced evenly within 2 inches of stated separation.
    - 4) Lengthwise of members: Plus or minus 2 inches.
  - c. Maximum bar movement to avoid interference with other reinforcing steel, conduits, or embedded items: 2 bar diameters.

B. Standards and References: (Latest Edition unless otherwise noted):

1. American Concrete Institute (ACI).
  - a. ACI 301 - "Specifications for Structural Concrete for Buildings".

- b. ACI 315 - "Details and Detailing of Concrete Reinforcing".
  - c. ACI 318 – "Building Code Requirements for Reinforced Concrete"
2. American Society for Testing and Materials (ASTM).
    - a. ASTM A82 - "Cold Drawn Wire for Concrete Reinforcement".
    - b. ASTM A185 - "Welded Steel Wire Fabric for Concrete Reinforcement".
    - c. ASTM A615 - "Deformed and Plain Billet-Steel Bars for Concrete Reinforcement".
    - d. ASTM A706 – "Low Alloy Steel Deformed Bars for Concrete Reinforcement".
  3. Concrete Reinforcing Steel Institute (CRSI) - "Manual of Standard Practice".
  4. 2007 California Building Code (CBC),.
- C. Submittals:
1. Shop Drawings: Prepare in accordance ACI 315. Indicate bending diagrams, assembly diagrams, splicing and laps of bars and shapes, dimensions and details of bar reinforcing and assemblies. Correctness of all reinforcing requirements and work is the responsibility of Contractor. Identify such shop drawings with reference thereon to sheet and detail numbers from Contract Drawings.
    - a. Do not use scaled dimensions from Contract Drawings in determining the lengths of reinforcing bars.
    - b. No reinforcing steel shall be fabricated without approved shop drawings.
    - c. Any deviations from the contract documents must be clearly indicated as a deviation on the shop drawings.
    - d. Areas of high congestion, including member joints and embed locations shall be fully detailed to verify clearances and assembly parameters and coordination with other trades.
  2. Certified mill test reports of supplied reinforcing indicating chemical and physical analysis. Tensile and bend tests shall be performed by the mill in accordance with ASTM A615.
  3. Product Data:
    - a. Manufacturer's specifications and installation instructions for splice devices.
    - b. Bar Supports.
  4. Certificates of Compliance with specified standards:
    - a. Reinforcing bars.
    - b. Welded wire fabric.
    - c. Welding electrodes.
  5. Samples: Only as requested by Architect.
- D. Tests and Inspections:
1. A testing program is required prior to start of construction. Testing program to be done in Compliance with the 2013 CBC requirements and in collaboration with Testing Laboratory, Design team, contractor, owner and submitted for review by the Division of the State Architect. Requirements below are minimum requirements; additional requirements may be required in final testing program.
  2. All reinforcing steel whose properties are not identifiable by mill test reports shall be tested in accordance with ASTM A615. One Series of tests for each missing report to be borne by the Contractor.
  3. When tests are indicated for reinforcing steel on the structural drawings, the reinforcing steel used shall be tested in accordance with ASTM A615. One

tensile and one bend test for each 2-1/2 tons of steel or fraction thereof, shall be made.

4. Inspect shop and field welding in accordance with AWS D1.4, including checking materials, equipment, procedure and welder qualification as well as the welds. Inspector will use non-destructive testing or any other aid to visual inspection that he deems necessary to assure himself of the adequacy of the weld.
6. Tests and inspection shall be performed by Owners testing agency except when needed to justify rejected work, in which case the cost of retests and reinspection shall be borne by the Contractor.

#### 1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size and length.
- B. Handle and store materials to prevent contamination.
  1. Store reinforcement in a manner that will prevent excessive rusting or coating with grease, oil, dirt, and other objectionable materials. Storage shall be in separate piles or racks so as to avoid confusion or loss of identification after bundles are broken.
- C. Deliver and store welding electrodes in accordance with AWS D12.1.

### **PART 2 - PRODUCTS**

#### 2.1 MATERIALS

- A. Reinforcement Bars: ASTM A615, Grade 40 for No. 3 and smaller bars; ASTM A615, Grade 60 for No. 4 and larger bars.
  1. Bar reinforcement to be welded shall meet chemical requirements of ASTM A706.
- B. Stirrups and Ties: ASTM A615, Grade 60 for No.4 and larger bars, ASTM A615, Grade 40 for No. 3 and smaller bars.
- C. Steel Dowels: Same grade as bars to which dowels are connected.
- D. Welded wire Fabric: ASTM A185.
- E. Tie Wires: FS-QQ-W-461, annealed steel, black, 16 gauge minimum.
- F. Welding Electrodes: AWS D1.4, low hydrogen, E70XX series.
- G. Bar Supports:
  1. Typical, unless noted otherwise; CRSI Class 2 wire supports.
    - a. Do not use wood, brick or other objectionable materials.
    - b. Do not use galvanized supports.
  2. Supports placed against ground: Pre-cast concrete blocks not less than 4 inches square with embedded wire.

H. Mechanical Couplers: Comply with ACI 318 section 12.14.3.

### **PART 3 - EXECUTION**

#### **3.1 FABRICATION**

- A. Shop fabricate reinforcement to meet requirements of Drawings.
- B. Fabricate reinforcement in accordance with the requirements of ACI 315 where specific details are not shown or where Drawings and Specifications are not more demanding.
- C. Steel reinforcement shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on the Drawings shall not be used. Heating of bars for bending will not be permitted.
- D. Reinforcing shall not be field bent or straightened without structural engineer's review.
- E. Provide offsets in rebar (1:6 maximum) where required to maintain clearances.

#### **3.2 CONDITION OF SURFACES**

- A. Examine surfaces and conditions receiving or affecting the work. Do not proceed until unsuitable conditions have been corrected.

#### **3.3 GENERAL**

- A. Concrete shown without reinforcing shall be reinforced as similar parts shown with reinforcing except where concrete is specifically noted to be unreinforced.

#### **3.4 PLACEMENT**

- A. All reinforcement shall be accurately set in place, lapped, spliced, spaced rigidly and securely held in place and tied with specified wire at all splices and crossing points. All wire tie ends shall point away from the form. Carefully locate all dowel steel to align with wall and column steel.
  - 1. Bars shall be in long lengths with laps and splices as shown. Offset laps in adjacent bars. Place steel with clearances and cover as shown. Bar laps shall be as indicated on the Drawings. Tie all laps and intersections with the specified wire.
  - 2. Maintain clear space between parallel bars not less than 1-1/2 times nominal diameter, but in no case shall clear space be less than 1-1/2 times maximum size concrete aggregate.
  - 3. Reinforcing dowels for slabs shall be placed as detailed. Sleeves may be used if reviewed by the Structural Engineer before installation. Install dowel through all construction and expansion joints for all slabs on grade.

- B. Bar Supports: Support and securely fasten bars with chairs, spacers and ties to

### **REINFORCING STEEL**

**03 21 00-4**

prevent displacement by construction loads or placement of concrete beyond the tolerances specified. Conform to CRSI as a minimum standard.

- C. Steel Adjustment:
  - 1. Move within allowable tolerances to avoid interference with other reinforcing steel, conduits, or embedded items.
  - 2. Do not move bars beyond allowable without concurrence of Structural Engineer.
  - 3. Do not heat, bend, or cut bars without concurrence of Structural Engineer.
  - 4. Reinforcement shall not be bent after being embedded in hardened concrete.
  
- D. Splices:
  - 1. Splice reinforcing as shown on drawings.
  - 2. Lap Splices: Tie securely with wire to prevent displacement of splices during placement of concrete.
  - 3. Splice Devices: Install in accordance with manufacturer's written instructions. Obtain Structural Engineer's review before using.
  - 4. Do not splice bars except at locations shown without concurrence of Structural Engineer.
    - a. Where splices in addition to those indicated are required, indicate location on shop drawings clearly and highlight "for Engineer's approval".
  
- E. Welding:
  - 1. Welding is not permitted unless specifically detailed on Drawings or approved by Engineer.
  - 2. Employ shielding metal-arc method and meet requirements of AWS D1.4.
  - 3. Welding is not permitted on bars where the carbon equivalent is unknown or is determined to exceed 0.55.
  - 4. Welding shall not be done within two bar diameters of any bent portion of a bar which has been bent cold.
  - 5. Welding of crossing bars is not permitted.
  
- F. Reinforcement shall be free of mud, oil or other materials that may reduce bond at the time concrete is placed. Reinforcement with tightly adhered rust or mill scale will be accepted without cleaning provided that rusting has not reduced dimensions and weights below applicable standards. Remove loose rust.
  
- G. Protection against rust:
  - 1. Where there is danger of rust staining adjacent surfaces, wrap reinforcement with impervious tape or otherwise prevent rust staining.
  - 2. Remove protective materials and clean reinforcement as required before proceeding with concrete placement.
  
- H. Drawing Notes: Refer to notes on Drawings for additional reinforcement requirements.
  
- J. Mechanical and Electrical Drawings: Refer to Mechanical and Electrical Drawings for formed concrete requiring reinforcing steel. All such steel shall be included under the work of this Section.

**END OF SECTION 03 21 00**

**SECTION 03 30 00 - CAST-IN-PLACE CONCRETE**

**PART 1 – GENERAL**

1.1 GENERAL REQUIREMENTS

1.2 SCOPE

A. Furnish, place and finish cast in place concrete and related work as indicated on the Drawings and specified here.

1. Install miscellaneous metal and other items furnished by other trades to be installed in concrete work.

1.3 RELATED WORK (See Table of Contents)

1.4 QUALITY ASSURANCE

A. Standards and References: (Latest Edition unless otherwise noted)

1. 2013 California Building Code (CBC),.
2. AMERICAN CONCRETE INSTITUTE (ACI)
  - a. ACI 117 Standard Tolerances for Concrete Construction and Materials
  - b. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
  - c. ACI 211.2 Standard Practice for Selecting Proportions for Structural Lightweight Concrete
  - d. ACI 301 Structural Concrete for Buildings
  - e. ACI 305R Hot Weather Concreting
  - f. ACI 318 Building Code Requirements for Reinforced Concrete
3. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
  - a. ASTM C 31 Making and Curing Concrete Test Specimens in the Field
  - b. ASTM C 33 Concrete Aggregates
  - c. ASTM C 39 Compressive Strength of Cylindrical Concrete Specimens
  - d. ASTM C 42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
  - e. ASTM C 94 Ready-Mixed Concrete
  - f. ASTM C 109 Test of Hydraulic Cement Concrete
  - g. ASTM C 143 Slump of Hydraulic Cement Concrete
  - h. ASTM C 150 Portland Cement
  - i. ASTM C 172 Sampling Freshly Mixed Concrete by the Volumetric Method
  - j. ASTM C 192 Making and Curing Concrete Test Specimens in the Laboratory
  - k. ASTM C 260 Air-Entraining Admixtures for Concrete
  - l. ASTM C 330 Lightweight Aggregates for Structural Concrete
  - m. ASTM C 494 Chemical Admixtures for Concrete

- n. ASTM C 618 Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
- o. ASTM C685 Volumetric Batching and continuous mixing
- p. ASTM C1157 Hydraulic-Cement

**B. Submittals:**

1. Concrete mix designs. See “Mix Design” below. Include results of test data used to establish proportions.
2. Certificates of Compliance from Manufacturer
  - a. Cement certificates
  - b. Aggregates
  - c. Admixtures.
3. Data regarding hardeners and sealers.
4. Grout samples for sacked surface textures and colors upon Architects request only.
5. Layout drawings for construction, control and expansion joints.
6. Transit-mix delivery slips:
  - a. Keep record at the job site showing time and place of each pour of concrete, together with transit-mix delivery slips certifying contents of the pour.
  - b. Make the record available to the Architect for his inspection upon request.
  - c. Upon completion of this portion of the work, deliver the record and the delivery slips to the Architect.

**C. Tests and Inspections:**

1. A testing program is required prior to start of construction. Testing program to be done in Compliance with the 2016 CBC requirements and in collaboration with Testing Laboratory, Design team, contractor, owner and submitted for review by the agency in charge of building enforcement. Requirements below are minimum requirements; additional requirements may be required in final testing program.
2. The following tests shall be made by a recognized testing laboratory selected by the Owner. All tests shall be in accordance with the previously mentioned standards and ACI 318 Section 5.6. A complete record of all tests and inspections shall be kept
  - a. Compressive Strength: Make and cure in accordance with ASTM C-31. Test in accordance with ASTM C-39 and ACI 318 section 5.6
    - 1) A record shall be made of time and of locations of concrete from which samples were taken.
    - 2) Four identical cylinders shall be taken from each pour of 150 cubic yards or 5000 square feet or part thereof, being placed each day per ACI 318 5.6.2.1. One cylinder shall be tested at age 7 days, and two at age 28 days unless otherwise specified. Preserve remaining cylinder for future use.
    - 3) Test specimens in accordance with ASTM C157.
  - c. Concrete consistency (slump) shall be tested in accordance with ASTM C143.
3. Provide full time inspection during the taking of test specimens and during the placing of all concrete and embedded steel.
4. Provide concrete batch plant inspections per ASTM C685.



**PART 2 - PRODUCTS**

**2.1 MATERIAL**

- A. Portland Cement: ASTM C 150, Type I or Type II. One brand of cement shall be used throughout to maintain uniform color for all exposed concrete.
- B. Concrete Aggregate: Fine and coarse aggregates shall be regarded as separate ingredients. Each size of coarse aggregate, as well as combination of sizes when two or more are used, shall conform to grading requirements of appropriate ASTM Standards and ACI 318.
  - 1. Concrete Aggregates for Standard Weight Concrete: ASTM C 33. Aggregate shall be crushed granite or Perkins type.
- C. Water: Clean and free from injurious amounts of oil, acids, alkali, organic matter and other deleterious substances; suitable for domestic consumption.
- D. Admixtures shall be subject to prior approval by the Architect, in accordance with ACI 318, Calcium Chloride is not permitted.
  - 1. Water Reducing
    - a. ASTM C494 Type A - for use in cool weather.
    - b. ASTM C494 Type D - for use in hot weather.
  - 2. Air Entraining
    - a. Conform to ASTM C 260
  - 3. Fly Ash
    - a. Conform to ASTM C 618
  - 4. Mid-Range Water-Reducers
    - a. Master Builders "Polyheed" or approved equal.
  - 5. Fly Ash Pozzolan
    - a. Conforming to ASTM A-618 Class F
- E. Slab on Grade Vapor Retarder
  - 1. Vapor Retarder must have the following qualities:
    - a. 10 mil thickness minimum
    - b. WVTR less than 0.008 as tested by ASTM E 96
    - c. ASTM E 1745 Class A (Plastics)
  - 2. Vapor Retarder Products
    - a. Stego Wrap Vapor Retarder by STEGO INDUSTRIES LLC.
    - b. W.R. Meadows Premoulded Membrane with Plasmatic Core.
    - c. Zero-Perm by Alumiseal.
  - 3. Vapor Retarder Tape
    - a. Water Vapor Transmission Rate :ASTM E 96, 0.3 perms or lower
    - b. Minimum 8-mils thick
    - c. Minimum 4 inches wide
    - d. Manufactured from High Density Polyethylene
    - e. Pressure Sensitive Adhesive
- F. Sand: Clean, dry, well graded.

- G. Abrasive aggregate for non-slip finish: Fused aluminum oxide grits, graded 12/30. Use factory-graded rustproof and non-glazing material that is unaffected by freezing, moisture and cleaning materials.
  - 1. Products offered by manufacturers to comply with the above requirements include: A-H Alox; Anti-Hydro Waterproofing Co., Toxgrip; Toch Div. - Carboline, or approved equal.
- H. Expansion Joint Filler:
  - 1. Joint fill shall be a preformed non-extruded resilient filler, saturated with bituminous materials and conforming to ASTM D 1751. Products shall be equivalent to Burke "Fiber Expansion Joint", W.R. Meadows "Fibrated Expansion Joint Filler", or approved equal.
- I. Bonding Agent: Sonneborn "Sonobond"; the Euclid Chemical Company "Euco-Weld"; Larsen Products Corp., "Weld-Crete" or approved equivalent.
- J. Concrete Sealer: Cure and Seal, as manufactured by the Euclid Chemical Company "Aqua-Cure VOX", Sonneborn "Kure-N-Seal WB", Burke "Spartan-Cote", W.R. Meadows "Intex" or approved equal conforming to ASTM C-309, Type I, Class B requirements, and conforming to State of California Air Resources Board VOC Regulations.
- K. Concrete Hardener/Sealer: Clear, water soluble, sprayable in-organic silicate based hardener/sealer or acrylic co-polymer resin. Products shall be equal to Euclid Chemical Company "Eucosil", Burke "Spartan-Cote", Sonneborn "Sonosil", W.R. Meadows "Pena-Lith", or approved equal and must conform to State of California Air Resources Board VOC Regulations.
- L. Concrete Cure: Water based curing compound conforming to ASTM C-309, Type 1, Class A and B, and AASHTO Specification M-148; Type 1, Class A and B requirements, and State of California Air Resources Board VOC Regulations. Product shall be equivalent to Euclid Chemical Company "Kurez VOX", Burke "No. 1127" or "Aqua-Resin Cure", W.R. Meadows "1100 Clear", or approved equal.

## 2.2 CONCRETE

- A. Concrete Mixes:
  - 1. Type A Concrete:
    - Strength: 3000 lbs. per square inch at 28 days.
    - Maximum Aggregate Size: 1-1/2 inch.
    - Cement Content: As determined by mix design (ACI 318 Section 5.2).
    - 5.0 sacks per yard minimum.
    - Maximum Water to Cement Ratio: 0.58
    - Admixture: Water Reducing.
    - Use for concrete sidewalks, mechanical and electrical pads, miscellaneous non-structural slabs on grade.
    - Maximum Fly Ash content as a percentage of total cementitious material: 15%
- B. Consistency of Concrete: Concrete slump, measured in accordance with ASTM C 143, shall fall within following limits.

1. For General concrete placement: 3 inch plus or minus 1 inch.
2. Mixes employing the specified mid-range water reducer shall provide a measured slump not to exceed 7 inch  $\pm$ 1 inch after dosing, 2 inch  $\pm$ 1 inch before dosing.
3. Concrete slump shall be taken at point of placement. Use water reducing admixtures as required to provide a workable consistency for pump mixers. Water shall not be added at the jobsite without written review by the structural engineer.

**C. Mix Design:**

1. Initial mix design shall be prepared for all concrete in accordance with ACI 318 section 5.2. Mix proportions shall be determined in accordance with ACI 318 Section 5.3 or ACI 318 section 5.4. In the event that additional mix designs are required due to depletion of aggregate sources, aggregate not conforming to Specifications, or at request of Contractor, these mixes shall be prepared as above.

**D. Mixing:**

1. Equipment: All concrete shall be machine mixed. Provide adequate equipment and facilities for accurate measurement and control of materials.
2. Method of Mixing:
  - a. Transit Mixing: Comply with ASTM C 94. Ready mixed concrete shall be used throughout, except as specified below.
  - b. On-Site Mixing: Use only if method of storing material, mixing of material and type of mixing equipment is approved by Architect. Approval of site mixing does not relieve Contractor of any other requirements of Specifications.
  - c. Mixing shall be in accordance with ACI 318 5.8.
3. Mixing Time: After mix water has been added, concrete shall be mixed not less than 1-1/2 minutes nor more than 1-1/2 hours. Concrete shall be rejected if not deposited within the time specified.
4. Admixtures:
  - a. Air entraining and chemical admixtures shall be charged into mixer as a solution and shall be dispensed by an automatic dispenser or similar metering device. Powdered admixtures shall be weighed or measured by volume as recommended by manufacturer. Accuracy of measurement of any admixture shall be within plus or minus 3%.
  - b. Two or more admixtures may be used in same concrete, provided such admixtures are added separately during batching sequence, and provided further that admixtures used in that combination retain full efficiency and have no deleterious effect on concrete or on properties of each other.
  - c. All admixtures are to be approved by Structural Engineer prior to commencing this work.
5. Retempering:
  - a. Concrete shall be mixed only in quantities for immediate use. Concrete which has set shall be discarded, not retempered.
  - b. Indiscriminate addition of water to increase slump is prohibited.
  - c. When concrete arrives at project with slump below that suitable for placing, water may be added only if neither maximum permissible water-cement ratio nor maximum slump is exceeded. Water shall be incorporated by additional mixing equal to at least half of total mixing time required. Any addition of

water above that permitted by limitation of water-cement ratio shall be accompanied by a quantity of cement sufficient to maintain proper water-cement ratio. Such additions shall only be used if approved by Architect. In any event, with or without addition of cement, not more than 2 gallons of water per cubic yard of concrete, over that specified in design mix, shall be added.

6. Cold Weather Batching: When temperature is below 40 degrees F or is likely to fall below 40 degrees F during 24 hour period after placing, provide adequate equipment for heating concrete materials. No frozen materials or materials containing ice shall be used. Temperatures of separate materials, including mixing water, when placed in mixer shall not exceed 100 degrees

F. When placed in forms concrete shall have a temperature between 50 degrees F and 85 degrees F.

7. Hot Weather Batching: Concrete deposited in hot weather shall have a placing temperature below 85 degrees F. If necessary, ingredients shall be cooled to accomplish this.

## 2.3 FLOOR LEVELING AND FILL MATERIALS

- A. Epoxy Concrete Mortar: Floor leveling, non-shrink trowel applied epoxy concrete mortar; TPM 115 General Polymers Corp., A-H Emery Epoxy Topping #170 Anti-Hydro Corp., or approved equal, where areas to fill are less than 1/4 inch thick.
- B. Concrete Mortar: Floor leveling, patching and repair, non-shrink trowel applied concrete mortar; Master Builders EMBECO 411-A, Euclid EUCO, or approved equal, where areas of fill are greater than 1/4 inch thick.
- C. Cementitious Floor Leveling Material: Shall be self-leveling or trowelable with a minimum 28 day compressive strength of 3000 psi in accordance with ASTM C-109. Material shall be equal to Quickrete No. 1249, Ardex V-800/K-55, Mapei "Ultra/Flex" or approved equal.

## PART 3 - EXECUTION

### 3.1 PLACEMENT

- A. Before any concrete is placed, the following items of work shall have been completed in the area of placing.
  1. Embedded work of all trades shall be in place in the forms and adequately tied and braced.
  2. The entire place of deposit shall have been cleaned of wood chips, sawdust, dirt, debris, hardened concrete and other foreign matter. No wooden ties or blocking shall be left in the concrete except where indicated for attachment of other work.
  3. Reinforcing steel, at the time the concrete is placed around it, shall be cleaned of scale, mill scale or other contaminants that will destroy or reduce bond.
  4. Concrete surfaces to which fresh concrete is to be bonded shall be brush cleaned to remove all dust and foreign matter and to expose the aggregate, and then coated with the bonding adhesive herein specified.

8. Prior to placing concrete for any slabs on grade, the moisture content of the subgrade below the slabs shall be adjusted to at least optimum moisture.
  9. No concrete shall be placed until formwork and reinforcement has been approved by Inspector of Record. Clean forms of all debris and remove standing water. Thoroughly clean reinforcement and all handling equipment for mixing and transporting concrete. Concrete shall not be placed against reinforcing steel that is hot to the touch. Notify Architect 48 hours in advance of concrete pour.
- B. Conveying: Handle concrete from mixer to place of final deposit by methods which will prevent separation or loss of ingredients. Deposit concrete in forms as nearly as practicable at its final position in a manner which will insure that required quality is obtained. Chutes shall slope not less than 4 inches and not more than 6 inches per foot of horizontal run.
- C. Depositing: Deposit concrete into forms in horizontal layers not exceeding 24 inches in thickness around building, proceeding along forms at a uniform rate and consolidating into previous pour. In no case shall concrete be poured into an accumulation of water ahead of pour, nor shall concrete be flowed along forms to its final place of deposit. Fresh concrete shall not be permitted to fall from a height greater than 6 feet without use of adjustable length pipes or, in narrow walls, of adjustable flexible hose sleeves. Concrete shall be scheduled so that placing is a continuous operation for the completion of each section between predetermined construction joints. If any concreting operation, once planned, cannot be carried on in a continuous operation, concreting shall stop at temporary bulkheads, located where resulting construction joints will least impair the strength of the structure. Location of construction joints shall be as shown on the drawings or as approved by Structural Engineer. The rate of rise in walls shall not be less than 2 feet per hour.
1. Consolidation: Concrete shall be thoroughly compacted and worked to all points with solid continuous contact to forms and reinforcement to eliminate air pockets and honeycombing. Power vibrators of approved type shall be used immediately following pour. Spading by hand, hammering of forms or other combination of methods will be allowed only where permitted by Structural Engineer. In no case shall vibrators be placed against reinforcing steel or used for extensive shifting of deposited fresh concrete. Provide and maintain standby vibrators, ready for immediate use.
  2. Hot Weather Concreting: Unless otherwise directed by the Architect, perform all work in accordance with ACI 305 when air temperature rises above 75 degrees F and the following:
    - a. Mixing Water: Keep water temperature as low as necessary to provide for the required concrete temperature at time of placing. Ice may be required to provide for the design temperature.  
Aggregate: Keep aggregate piles continuously moist by sprinkling with water.  
Temperature of Concrete: The temperature of the concrete mix at the time it is being placed in the forms shall not exceed 85 degrees F. The method employed to provide this temperature shall in no way alter or endanger the design mix or the design strength required.  
Dampen subgrade and formwork before placing concrete. Remove all excess water before placing concrete. Keep concrete continuously wet when air temperature exceeds 85 degrees F for a minimum of 48 hours after placing concrete.

Protection: Minimize evaporation from concrete in place by providing shade and windbreaks. Maintain such protection in place for 14 days minimum.

3. Cold Weather Concreting: Follow recommended ACI 306 procedures when air temperature falls below 40 degrees F., as approved by Architect. Concrete placed in freezing temperatures shall have a temperature of not less than 50 degrees F. Maintain this temperature for at least 7 days. No chemicals or salts shall be used to prevent freezing and no accelerating agents shall be used without prior approval from Architect.

### 3.2 CURING AND PROTECTION

- A. Curing: Exposed surfaces of all concrete used in structure shall be maintained in a moist condition for at least 7 days after placing. The following final curing processes shall normally be considered to accomplish this. Concrete shall be maintained at not less than 50 degrees F nor more than 100 degrees F for a period of 72 hours after being deposited.
  1. Flatwork to be exposed, stained, or painted shall have curing process submitted and approved by the architect prior to construction.
  2. Initial Curing Process - Flat Work:
    - a. Mist Spraying: As soon as troweling of concrete surfaces is completed, exposed concrete shall be sprayed continuously with a special atomizer spray nozzle, capable of producing a fine mist. Spraying shall be done without any dripping of water from nozzle. Amount of spraying shall be such as to maintain surface of concrete moist without any water accumulating on surface. Maintain spraying for a minimum of 12 hours, or until such time as hereinafter described curing process is applied. Mist spraying will not normally be required when the ambient air temperature is below 90 degrees F.
  3. Final Curing Process - Flatwork: Except as noted, use any of following:
    - a. Water Curing: Concrete shall be kept wet by mechanical sprinklers or by any other approved method which will keep surfaces continuously wet.
    - b. Saturated Burlap Curing: Finished surfaces shall be covered with a minimum of two layers of heavy burlap which shall be kept saturated during the curing period.
    - c. Curing Compounds: Membrane curing compounds of chlorinated rubber or resin type conforming to ASTM C309 may be used only if specifically approved by Architect. Use of membrane curing compound will not be permitted on surfaces to be painted, or to receive ceramic tile, membrane water-proofing or hardeners and sealers. Membrane curing compound may be used in areas to receive resilient floor tile, provided it is wax-free, compatible with adhesive used and approved by adhesive manufacturer. Agitate curing compounds thoroughly by mechanical means continuously during use and spray or brush uniformly in accordance with manufacturer's recommendations. Apply immediately following final finishing operation. All curing compounds shall conform to State of California Air Resources Board VOC Regulations.
    - d. Waterproof paper conforming to ASTM C 171, or opaque polyethylene film, may be used. Concrete shall be covered immediately following final finishing operation. Anchor paper or film securely and seal all edges in such a manner as to prevent moisture escaping from concrete.
  4. Curing Process - Formed Surfaces: Forms heated by sun shall be kept moist during curing period. If forms are to be removed during curing period, curing as described for flatwork shall be commenced immediately.

- B. Refer to Drawings for areas of concrete slab not to receive curing compounds or hardening compounds. Where concrete floors are to receive heavy duty coatings, waterproof coatings and the like, verify with coating installer the type of finish required for specified coating.
- C. Protection: Contractor shall be responsible for protection of finished concrete against injury by rain, cold, vibration, animal tracks, marking by visitors, vandalism, etc.
- D. Provide additional curing agents or compounds, not necessarily listed herein, but as recommended and or required for use with shake type hardeners or other special coatings and coverings by their manufacturers for a complete and proper installation.

### 3.3 FINISHES

- A. Broom Finish: Steel trowel surface to a smooth dense surface free of lines, tool marks, cat faces and other imperfections. After troweling, and before final set, give surface a broom finish, brushing in direction noted on Drawings, or as directed. Broom finish shall be used typically on exterior flatwork except as otherwise indicated or specified and shall be "medium" texture as approved by Architect.
  - b. Smooth Steel Trowel Finish: Apply 2 steel trowelings to obtain hard, smooth surface. All lips, irregularities, uneven levels, etc. shall be worked out before last troweling. All interior flatwork shall have a smooth steel trowel finish unless specified otherwise.
- 3. Tolerances:
  - a. For tolerances not indicated, refer to ACI 117.
  - b. Finished surfaces of all interior integral finished flatwork shall be sufficiently even to contact a 10' long straightedge with a tolerance of 1/8 inch.
  - c. Finished surfaces of exterior integral finished flatwork shall not vary more than 1/4 inch from a 10' long straightedge, except at grade changes.
- C. Sacked Surfaces: Exposed surfaces that are unacceptable in appearance to the Architect shall be sacked.
  - 1. Prepare concrete surfaces in accordance with the referenced standards. Remove any form release materials by stoning by hand, power grinding or other method approved by the Architect.
  - 2. Prepare concrete surfaces to receive sack finishing with a light sand blasting.
  - 3. For best results, grout application and rubbing should be performed when areas to be treated are shaded and during cool, damp weather. When work is to be performed in hot and dry weather, a fog spray should be available for continuous use.
  - 4. Prepare grout samples for matching of concrete surfaces for approval by the Architect. These shall be made in the following proportions of gray cement to white cement to sand: 1:1:2, 1:2:3, and 2:1:3, etc. until the correct matching color is obtained on the test areas. Sand should be fine enough to pass the Number 30 sieve. Mixes should be made to a good workable consistency in a clean container and the mix with the best color chosen, or modified if needed.
  - 5. Provide sufficient quantities of sand and cement from the same source for the complete work at the job site.
  - 6. Mixing and Application:
    - a. Mixing of grout on the job should be timed for it to be used up within 1 to 1-1/2 hours.
    - b. Let the grout stand 20 to 30 minutes after mixing, and then remixed before applying.

- c. Soak the concrete surface thoroughly with water at least 15 minutes before applying grout and again just before application so that the surface is adequately wet during the operation.
  - d. Apply grout with plasterer's trowel or sponge rubber float in sweeping strokes from the bottom up. Brush or spray gun applications may be used when approved by the Architect.
  - e. Work in freshly applied grout vigorously with a sponge rubber float, then let sit until some of its plasticity is gone but not until it loses its damp appearance. At this point it shall be rubbed with clean, dry burlap to remove the excess grout, leaving no visible film on the surface but filling all air holes.
  - f. Keep the surface wet for a day after grouting and sack rubbing are completed.
7. Alternate methods of application and materials shall be subject to the approval of the Architect.

### 3.4 PATCHING

#### A. Formed Surfaces:

1. Promptly upon removal of contact forms and after concrete surfaces have been inspected, form ties shall be removed and all necessary patching and pointing shall be expertly done.
2. Honeycombed areas shall be removed down to sound concrete, coated with a bonding grout or approved compound and patched using a low shrinkage high bond mortar. Patched areas shall be cured by being kept damp for at least 5 days.
3. Tie holes shall be cleaned, dampened and filled solid with patching mortar or cement plugs of an approved variety.

#### B. Slabs on Grade: After entire slab is finished, shrinkage cracks that may appear shall be patched as follows:

1. Where slab is not exposed or where appearance is not important, cracks larger than 1/32 inch wide shall be filled with cement grout and struck off level with surface.
2. Where slab is exposed and appearance is important, unsightly cracks shall be repaired in a manner satisfactory in appearance to Architect. If this cannot be accomplished, concrete shall be considered defective.

### 3.5 DEFECTIVE CONCRETE

#### A. Defective concrete shall mean any of the following:

1. Concrete not meeting 100 percent of the specified 28 day compressive strength.
2. Concrete exhibiting rock pockets, voids, spalls, streaks, cracks, exposed reinforcing to extent that strength, durability, or appearance is adversely affected.
3. Concrete significantly out of place, line, or level.
4. Concrete not containing the required embedded items.

#### B. Upon determination that concrete strength is defective:

1. Should cylinder tests fall below minimum strength specified, concrete mix for remainder of work shall be adjusted to produce required strength. Core samples



shall be taken and tested from cast-in-place concrete where cylinders and samples indicate inferior concrete with less than minimum specified strength.

- a. Cores of hardened concrete shall be taken and tested in accordance with ASTM C 42 and C 39. Number and location of such cores shall be subject to the approval of Architect.
  - b. Cost of core sampling and testing will be paid for by the Contractor.
  - c. "500 psi" and "85 percent" reduction in ACI 318 5.6.5.4 will not justify low cylinder tests.
- C. Upon determining that concrete surface is defective, Contractor may restore concrete to acceptable condition by cutting, chipping, pointing, patching, grinding, if this can be done without significantly altering strength of structure. Permission to patch defective areas will not be considered a waiver of the right to require removal if patching does not, in the opinion of the Architect, satisfactorily restore quality and appearance.
- D. If core tests indicate that concrete is below the strength specified, or if patching does not restore concrete to specified quality and appearance, the concrete shall be deemed defective, and shall be removed and replaced without additional cost to the Owner.
- E. No repair work shall begin until procedure has been reviewed by the Architect and Structural Engineer.

### 3.6 SURFACE HARDENER AND SEALER

- A. Seal all interior exposed flatwork with clear sealer, except surfaces receiving ceramic tile, quarry tile, poured flooring or other special finishes specified, or as scheduled on the Drawings.
1. Apply sealer in 2 or 3 coats, in accordance with manufacturer's directions, using the maximum quantity recommended.
    - a. Concrete floors must be thoroughly cured for a minimum of 30 days and completely dry before treatment.
    - b. Surfaces to be treated must be clean, free of membrane curing compounds, dust, oil, grease and other foreign matter.
    - c. Upon completion, concrete surfaces shall be clean and without discoloration or traces of excess hardener left on the surface.
- B. Apply sprayable hardener/sealer at locations as scheduled or as indicated on the Drawings. Apply in accordance with the manufacturer's favorably reviewed application instructions and recommendations.

### 3.7 GROUTING

- A. Prepare and place grout materials at locations as indicated on the Drawings in accordance with the manufacturer's recommendations and installation instructions.
- B. Pack grout materials solidly between bearing surfaces and bases or plates as indicated and to ensure no voids.

3.8 ADJUSTING AND CLEANING

- A. Remove all debris, excess materials, tools and equipment resulting from or used in this operation at completion of this work.

**END OF SECTION 03 30 00**

**SECTION 05 50 00 – METAL FABRICATIONS**

**PART 1 - GENERAL**

**GENERAL REQUIREMENTS**

**1.1 SCOPE**

- A. Shop fabricated metal items and miscellaneous metal work.

**1.2 QUALITY ASSURANCE**

- A. Standards and References: (Latest Edition unless otherwise noted)
  - 1. 2016 California Building Code (CBC), with State of California Amendments
  - 2. American Society for Testing and Materials (ASTM) Specifications as listed in the Section.
- B. Submittals:
  - 1. Shop Drawings: Submit shop drawings indicating profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevation, and details where applicable. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.
  - 2. Manufacturer's descriptive data: Submit for manufacturer's items.

**1.5 DELIVERY, STORAGE AND HANDLING**

- A. Deliver all parts ready for erection; store in close proximity to final locations.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Steel Sections: ASTM A36.
- B. Steel Tubing: ASTM A500, Grade B.
- C. Steel Pipe: ASTM A53, Type E or S, Grade. B.
- D. Steel Bolts, Nuts, and Washers: ASTM A307.
- E. Welding Materials: AWS D1.1; type required for materials being welded.
- F. Galvanizing: Hot-dip process ASTM A123 typical and ASTM A153 for threaded fasteners performed after fabrication into largest practical section. Weight of coating not less than 2 oz. per sq. ft. of surface. Where damaged, repair surface with one coat of hot process galvanizing repair compound, "Galvalloy", Galvweldalloy", or approved equal.
- G. Primer: Tnemec Company "Series V10 Red Primer", Sherwin-Williams "Kern Primer"; or approved equal.
- H. Dissimilar Materials: Separate dissimilar surfaces in contact with or in close proximity to non-compatible metals, concrete masonry, or plaster with neoprene gasket; or other approved means.
- I. Expansion Bolts: Hilti "Kwik Bolt TZ" Expansion Anchor Bolts, galvanized unless otherwise indicated.

- J. Non-shrink Grout: Master builders 928 or equal.
- k. Metal Stud Construction – See Drawing A5.40

**2.2 FABRICATION**

- A. Verify dimensions on site prior to shop fabrication.
- B. Fabricate items with joints tightly fitted and secured.
- C. Fit and shop assemble in largest practical sections, for delivery to jobsite.
- D. Grind exposed welds flush and smooth adjacent finished surfaces. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of structure, except where specifically noted otherwise.
- F. Make exposed joints butt tight, flush and hairline.
- G. Supply components required for anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, except where specifically noted otherwise.

**2.3 FINISH**

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact bond with concrete or where field welding is required.
- C. Prime paint interior items with one coat unless scheduled to be galvanized.
- D. Galvanize exterior items and scheduled interior items to minimum 2.00 oz/sq ft zinc coating.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Obtain Architect's approval prior to site cutting or making adjustments not scheduled.
- B. Clean and strip primed steel items to bare metal where site welding is scheduled.
- C. Make provision for erection loads with temporary bracing. Keep work in alignment.
- D. Supply items required to be cast into concrete with setting templates, for installation under appropriate Sections.

**3.2 INSTALLATION**

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Perform field welding in accordance with AWS D1.1.
- C. After installation, touch-up field welds, scratched or damaged surfaces with primer, except repair exposed galvanized work (not to be painted) with hot process field galvanizing, in accord with manufacturer's published directions.

**END OF SECTION 05 50 00**

**SECTION 06 10 00 - ROUGH CARPENTRY**

**PART 1 - GENERAL**

1.1 GENERAL REQUIREMENTS

1.2 SCOPE

- A. Provide all labor, materials, tools, facilities and equipment required for the fabrication and installation of rough carpentry and associated items (except that which is specified elsewhere) indicated on Drawings and necessary to complete the Work. Items include, but are not necessarily limited to, the following:
1. Blocking, backing, stripping, furring, and nailers.
  2. Rough hardware.
  3. Wood framing..

1.3 RELATED WORK (See Table of Contents)

1.4 QUALITY ASSURANCE

- A. General:
1. Coordinate the work of all trades to ensure proper placement of all materials, anchors, etc., as well as providing for openings and anchors for the installation of surface mounted materials and equipment.
  2. Qualifications for Workmen: Provide sufficient skilled workmen and supervisors who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of construction involved and the materials and techniques specified.
  3. Rejection: In the acceptance or rejection of rough carpentry, no allowance will be made for lack of skill on the part of the workmen.
- B. Standards and References: (Latest Edition unless otherwise noted)
1. 2016 California Building Code (CBC).
  2. Lumber: West Coast Lumber Inspection Bureau (WCLIB); Standard Grading Rules for West Coast Lumber No. 17.
  3. Lumber: Western Wood Products Association (WWPA); Western Lumber Grading Rules 05.
  4. Redwood: Redwood Inspection Service (RIS); Standard Specifications for Grades of California Redwood Lumber.
  5. Wood Sheathing: The Engineered Wood Association; Specifications and Grades.
    - a. Structural Plywood: United States Product Standard PS1, Group 1 Douglas Fir.
    - b. APA rated sheathing: United States Product Standard PS2.
  6. Wood Preservative: American Wood-Preservers' Association (AWPA):
    - a. U1, Use Category System: User Specification for Treated Wood.
    - b. M4, Standard for the Care of Preservative-Treated Wood Products.
  7. 2012 National Design Specification for Wood Construction (NDS).

- C. Submittals:
  - 1. Certification:
    - a. Preservative Treated Wood: Certification for waterborne preservative and that moisture content was reduced to 19 percent maximum, after treatment.
  
- D. Tests and Inspections:
  - 1. A testing program is required prior to start of construction. Testing program to be done in Compliance with the 2013 CBC requirements and in collaboration with Testing Laboratory, Design team, contractor, owner and submitted for review by the agency in charge of building enforcement. Requirements below are minimum requirements; additional requirements may be required in final testing program.
  - 2. If indicated on the Structural Drawings, load test expansion and epoxy anchors as indicated on the drawings.

**1.5 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Protection:
  - 1. After delivery, store all materials off the ground, covered, and in such a manner as to ensure proper ventilation and drainage and to protect against damage and the weather. Maintain wood at the maximum moisture levels indicated in Materials Section.
  - 2. Keep all material clearly identified with all grade marks legible; keep all damaged material clearly identified as damaged, and separately store to prevent its inadvertent use. Do not allow installation of damaged or otherwise non-complying material.
  - 3. Use all means necessary to protect the installed work and materials of all other trades.
  - 4. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Sawn Lumber:
  - 1. Lumber (Wood Framing): Meet requirements of following minimum grades. All grades to WCLIB Grading Rules No. 17. Species shall be Douglas Fir - Larch

<u>Item</u>	<u>Maximum Moisture</u>		
	<u>Sizes</u>	<u>Grade</u>	<u>Content at Initial Use</u>
All Material	2x	No. 2	19%
		Unless Noted Otherwise	
All Material	3x,4x	No. 2	30%
		Unless Noted Otherwise	
All Material	6x	No. 1	30%
		Unless Noted Otherwise	

2. "At initial use" shall be that point at which nails, screws, bolts, split rings, shear plates or other fasteners or the holes for said fasteners are placed in the wood.
  3. All sawn lumber is assumed to be enclosed in the dry building envelope in the final service condition, unless noted otherwise, and free to dry to moisture content less than 19%.
  4. The Contractor shall use whatever means necessary, including site drying to ensure that the moisture contents above are not exceeded.
  5. All studs, plates, joists, rafters and beams 3x and thicker shall be free of heart center in accordance with the specified grading standards.
- B. Wood Sheathing:  
N/A
- C. N/A
- D. Rough Hardware Fastenings and Connections: All types including bolts, lag screws, nails, spikes, screws, washers and other rough hardware, of kinds that may be purchased and that require no further fabrication, shall be furnished and installed for all finish and rough carpentry and shall conform to 2005 NDS Standards and dimensions. All hardware exposed to weather shall be hot-dipped galvanized per ASTM A123 Standards. All nails used into pressure treated lumber shall be hot-dipped galvanized per ASTM A123 or stainless steel.
1. Common wire nails or spikes unless noted otherwise on the Drawings. Box nails and sinker nails are not permitted. Vinyl coating is permitted on nails when not exposed to weather.
  2. Bolts: Bolt material shall conform to ASTM A307, Grade A. Bolt dimensions shall conform to ANSI/ASME B18.2.1 with hex head of sizes indicated.
  3. Lag Screws: Lag screws shall conform to ASTM 307, Grade A. All lag screws shall have hex heads where exposed.
  4. Washers: Standard flat washers shall conform to ANSI B18.22.1, Type A, Wide Pattern. Steel plate washers shall be Simpson BP or BPS or equivalent. Malleable iron washers shall be standard malleable iron washers.
  5. Fabricated Metal Timber Framing Connectors: Connectors shall be punched for nailing and bolting. Nails and nailing shall conform to the manufacturer's instructions with a nail provided for each punched hole. All connectors must have specific ICC approval. Types as noted on Drawings are Simpson Strong-Tie. Hardware suppliers other than Simpson shall submit a comparative material list itemizing product designation, load rating and supported member size for review by the enforcement agency and the Structural Engineer.

## 2.2 FABRICATION

- A. Lumber:
1. All lumber shall be air or kiln-dried to the maximum moisture content indicated in Materials Section.
  2. Furnish S4S unless otherwise noted.
  3. Size to conform to rules of governing standard. Sizes shown are nominal unless otherwise noted.

- B. Wood Treatment:  
N/A
- C. Fire Treatment: All fire-retardant-treated wood shall be identified with a label meeting the requirements of CBC Section 2303.2.1. The treating process and results thereof shall meet the requirements of CBC Section 2303.2 . Moisture content of fire-retardant-treated wood shall meet CBC Section 2303.1.8.2 Treater shall submit design and fastener valves for treated wood to Structural Engineer for review. See Drawings for location of fire-retardant-treated wood.

### 2.3 SOURCE QUALITY CONTROL

- A. Grade Mark each piece of lumber. Marking must be done by recognized agency.
  - 1. Douglas Fir shall bear WCLIB or WWPA grade stamp.
  - 2. Pressure treated Douglas Fir shall bear AWPA Quality mark.
- B. Wood Sheathing: Each panel shall be legibly identified as to type, grade and specie by APA grade. If plies are spliced, the slope of the scarf shall not be steeper than 1:8. White pockets will not be permitted in face plies.

## **PART 3 - EXECUTION**

### 3.1 SURFACE CONDITIONS

- A. Inspection:
  - 1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly proceed.
  - 2. Verify that rough carpentry may be performed in strict accordance with the original design and all pertinent codes and regulations.
- B. Discrepancies: In the event of discrepancy, immediately notify Architect. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

### 3.2 WORKMANSHIP

- A. General: All rough carpentry shall produce joints true, tight, and well nailed with all members assembled in accordance with the Drawings and with all pertinent codes and regulations.
- B. Selection of Lumber Pieces: Carefully select all members. Select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing or making proper connections. Cut out and discard all defects which will render a piece unable to serve its intended function.
- C. Lumber may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.



- D. Shimming: do not shim any framing component.
- E. Care shall be taken that notching and boring of members is in strict conformance with the Drawings and that there are no over-cuts.

**3.3 FASTENING**

- A. Nailing: Except as otherwise indicated on Drawings or specified, all nailing shall be as required by CBC Table 2304.9.1 - Fastening Schedule.
  - 1. Nails or Spikes shall be common wire unless noted otherwise. Penetration of nails or spikes shall be one-half the length of the nail or spike into the piece receiving the point. However, to connect pieces 2" in thickness, 16d nails shall be used unless noted otherwise.
    - a. Bore holes for nails wherever necessary to prevent splitting.
    - b. Use finish or casing for finish work.
    - c. Use of machine nailing is subject to a satisfactory installation of nails. Minimum edge distances shall be maintained. Nails installed through sheathing with nail guns shall not penetrate into the outer plies deeper than hand nailing. Submittal of guns and nails is required.
    - d. All nailing into Pressure-Treated lumber shall utilize hot-dipped zinc coated galvanized nails or stainless steel nails per CBC Section 2304.9.5.
- B. Bolts and Lag Screws: Bolts shall be sizes indicated on Drawings. Holes for bolts shall be 1/16-inch larger than the bolt diameter. Malleable, Steel plate or standard flat washers shall be used where heads or nuts would otherwise bear directly on wood surfaces. Malleable or plate washers shall be used on all anchor bolts. Cut washers are not permitted. Lag screws shall be screwed (not driven) into place. For the shank, holes shall be bored the same depth and diameter as shank. For threaded portion, holes shall be pre-drilled as follows:

Lag Screw Size	Thread Portion Pre-Drill
1/2" diameter	1/4" diameter
5/8" diameter	5/16" diameter
3/4 diameter	3/8" diameter
7/8" diameter	1/2" diameter
1" diameter	5/8" diameter

Soap Lag screws prior to installation. Tighten all bolts and screws before closing in.

- C. Framing Devices: Install according to the manufacturer's instructions unless otherwise noted.

**3.4 FRAMING AND ROUGH CARPENTRY**

- A. Blocking: Blocking shall be as indicated on Roof Framing Plan, A4.20

**3.5 MISCELLANEOUS CARPENTRY WORK**

- A. Install all items under other sections specified to be furnished and installed in other sections which relate to the rough carpentry work.

- B. Miscellaneous Carpentry Work not included under other sections but, indicated or required yet not specified elsewhere shall be furnished and installed hereunder, including appropriate fastening devices. Contractor shall provide miscellaneous carpentry work for all sections and divisions of work identified.
- C. Wood Curbs for Equipment: Construct all wood curbs for roof mounted equipment as detailed. Provide all miscellaneous blocking, bracing, supports, and other wood items as shown or required to complete the work.
- D. Plywood Backing for Electrical, telephone, and similar types of wall mounted equipment shall be provided hereunder where required. Plywood shall be 3/4-inch thick exterior A-C plywood with 'A' face exposed.
- E. Shoring and Bracing: Shore or brace for temporary support of all work as required during the construction period except any shoring and bracing specified and included under other sections of these specifications.
- F. Temporary Enclosures: Provide and maintain all barricades and enclosures required to protect the work in progress.
- G. Protect all work in progress and all work installed, as well as the work of all other trades. Any work damaged as a result of the work under this section shall be corrected to its original condition or replaced if directed by the Architect at no increase in cost to the Owner.

**END OF SECTION 06 10 00**

**SECTION 07 21 00 – INSULATION**

1. GENERAL:

1.1 DESCRIPTION OF WORK:

- A. Extent of insulation work is shown on drawings and indicated by provisions of this section.
- B. Applications of insulation specified in this section include the following:
  - 1. Batt-type building insulation with wire supports and vinyl sheet covering.

1.2 QUALITY ASSURANCE:

- A. Thermal Conductivity: Thicknesses indicated are for thermal conductivity (k-value at 75 degrees F or 24 degrees C) specified for each material. Provide adjusted thicknesses as directed for equivalent use of material having a different thermal conductivity. Where insulation is identified by “R” value, provide thickness required to achieve indicated value.
- B. Fire and Insurance Ratings: Comply with fire-resistance, flammability and insurance ratings indicated, and comply with regulations as interpreted by governing authorities. All insulation and vapor barriers shall be flame spread rated at 25 or less, ASTM E84. Comply with CBC, Chapter 7, and Underwriters Laboratories listings for referenced Design No, when components are part of fire rated assemblies. The maximum density of smoke developed shall be less than 25.

1.3 SUBMITTALS:

- A. Product Data: Submittals are not required unless a substitution is being requested. Submit manufacturer’s product specifications and installation instructions for each type of insulation and vapor barrier material required.

1.4 PRODUCT HANDLING:

General Protection: Protect insulation’s from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer’s recommendations for handling, storage and protection during installation.

2. PRODUCTS

2.1 INSULATING MATERIALS:

A. Mineral/Glass Fiber Blanket/Batt Insulation (M/GFB Ins):

Inorganic (non-asbestos) fibers formed with binders in resilient flexible blankets or semi rigid bats; FS HH-I-521, type as indicated, densities of not less than 0.5 lb. per cu. ft. for glass fiber units and not less than 2.5 lb. per cu. ft. for mineral

wool units, k-value of 0.27; manufacturer's standard lengths and widths as required to coordinate with spaces to be insulated; types as follows (provide greater R-values, if shown on plans):

1. Provide Type I R 13/19/30 (as shown) unfaced blanket units at new wall in-fills and roof. Refer to drawings for location.

Flame-Spread Rating: Provide units with rating of 25, ASTM E 84.

Kraft faced units (type II) may only be used where the facing is installed in contact with the unexposed surface of the ceiling or wall finish, per CBC 2016

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

Certain-Teed Products Corp; Valley Forge, PA  
Clecon Inc; Cleveland OH  
Manville Bldg. Materials Corp; Denver, CO  
Mizell Bros. Co; Atlanta GA  
Owens-Corning Fiberglass Corp Inc; Toledo, OH  
Forty-Eight Insulations, Inc; Aurora, IL  
Rockwool Industries Inc; Englewood, CO  
United States Gypsum Co; Chicago, Illinois

- B. R-30 roof thermal insulation between roof joist at 4' 0" to be supported with wire netting and covered with vinyl sheeting.

- B. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer, and complying with fire-resistance requirements.

- C. Mechanical Anchors: Type and size shown or, if not shown, as recommended by insulation manufacturer for type of application and condition of substrate. Provide anchorage of top of blanket at head rails at all vertical installations.

3. EXECUTION:

3.1 INSPECTION AND PREPARATION:

- A. Installer must examine substrates and conditions under which insulation work is to be performed, and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with insulation work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- B. Clean substrates of substances harmful to insulation or vapor barriers, including removal of projection which might puncture vapor barriers
- C. Close off openings in cavities to receive poured-in-place and foamed-in-place insulation, sufficiently to prevent escape of insulation. Provide bronze or stainless steel screen (inside) where openings must be maintained for drainage or ventilation.

3.2 INSULATION INSTALLATION:

A. General:

1. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult Manufacturer's technical representative for specified recommendations before proceeding with work.
2. Extended insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections, which interfere with placement.
3. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness. Anchor at head.
4. Covering unfaced units with wire batt supports and/or mesh insulation netting in lieu of providing the integral faced units specified.

3.3 CLEANING, PATCHING, PROTECTION:

- A. Cleaning: Immediately upon completion of spraying operations in each containable area of project, remove over-spray and fall-out of materials from surfaces of the work, and clean surfaces to remove evidence of soiling. Repair or replace damaged work to restore surfaces to acceptable condition.
- B. Coordinate installation of fireproofing with other work so as to minimize the need for other trades to cut into or remove installed fireproofing. As other trades successively complete installations of other work, patch fireproofing installations, so as to maintain complete coverages of full thickness on substrates to be protected with fireproofing. Trowel-applied fireproofing materials are acceptable for patching of work. Do not allow work-requiring patchings to be covered over or otherwise concealed before patching is completed.
- C. Protection: Repair or replace work that has not been successfully protected.

**END OF SECTION 07 21 00**

**SECTION 07 60 00 – FLASHING AND SHEET METAL**

**1. GENERAL**

**1.1 DESCRIPTION OF WORK**

- A. Extent of each type of flashing and sheet metal work is indicated on drawings and by provisions of this section.
- B. Types of work specified in this section the following:
  - 1. Metal counter flashing; and base flashing (if any).
  - 2. Metal wall flashing [and expansion joints].
  - 3. Gutters and downspouts (rain drainage).
  - 4. Gravel stops, exposed metal trim/fascia units.
  - 5. Miscellaneous sheet metal accessories.

**1.2 SUBMITTALS**

- A. Shop drawings are not required unless substitutions or alternate details are proposed.
- B. Shop Drawings, Flashing, Sheet Metal, Accessories:  
  
Submit shop drawings showing layout, joining, profiles, and anchorages of fabricated work, including major counter-flashings, trim/fascia units, gutters, downspouts, scuppers, and expansion joint systems; layouts at 1/4" scale, details at 3" scale.

**1.3 JOB CONDITIONS**

- A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

**2. PRODUCTS**

**2.1 FLASHING AND SHEET METAL MATERIALS:**

- A. Sheet metal Flashing/Trim
  - 1. Zinc-Coated Steel: Commercial quality with 0.20% copper, ASTM A 525 except ASTM A 527 for lock-forming, G90 hot-dip galvanized, mill phosphatized where indicated for painting; .0239" thick (24 gage) except as otherwise indicated.

B. Miscellaneous Materials and Accessories:

1. Solder: For use with steel or copper, provide 500-50 tin/lead solder (ASTM B 32), with rosin flux.
2. Fasteners: Same metal as flashing/sheet metal or, other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
3. Bituminous Coating: FS TT-C-494 or SSPC – Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
4. Mastic Sealant: Polyisobutylene non-hardening, non-skinning, non-drying, non-migrating sealant.
5. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed; comply with FS TT-S-0027, TT-S-00230, or TT-S-001543.
6. Epoxy Seam Sealer: 2-part non-corrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior non-moving joints including riveted joints.
7. Adhesives: type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet.
8. Paper Slip Sheet: 5 lb. rosin-sized building paper.
9. Polyethylene Underlayment: 6 mil carbonated polyethylene film; FS L-P 512.
10. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size and gage required for performance.
11. Cast-Iron Drainage Boots: Grey iron casting of size and pattern indicated, ASTM A 48 bituminous shop-coated.
12. Elastic Flashing Filler: Closed-cell polyethylene or other soft closed-cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.
13. Roofing Cement: ASTM D 2822, asphaltic

2.2 FABRICATED UNITS

- A. General Metal Fabrication: Shop fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA “Architectural Sheet Metal Manual” and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
- B. Seams: Fabricate non-moving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof form expansion joints of intermeshing hooked flanges, not less than 1” deep, filled with mastic sealant (concealed within joints).
- D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- E. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
- F. Aluminum Extrusion Units: Fabricate extruded aluminum running units with formed or extruded aluminum joint covers, for installation behind main members where possible. Fabricate mitered and welded corner units.

3. EXECUTION

3.1 INSTALLATION REQUIREMENTS

- A. General: Except as otherwise indicated, comply with manufacturer’s installation instructions and recommendations, and with SMACNA “Architectural Sheet Metal Manual.” Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.



- B. Underlayment: Where stainless steel or aluminum is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.
- C. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.
- D. Install reglets to receive counter-flashing in manner and by methods indicated. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division 3 sections. Where shown in masonry, furnish reglets to trades of masonry work for installation as work of Division-4 Sections.
  - 1. Install counter-flashing in reglets, either by snap-in seal arrangement, or by welding in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending upon degree of sealant exposure.
- E. Install elastic flashing in accordance with manufacturer's recommendations. Where required, provide for movement at joints by forming loops or bellows in width of flashing. Locate cover or filler strips at joints to facilitate complete drainage of water from flashing. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.
- F. Nail Flanges of expansion joints units to curb nailers, at maximum spacing of 6". Fabricate seams at joints between units with minimum 3" overlap, to form a continuous waterproof system.
- G. Install beehive-type strainer-guard at conductor heads, removable for cleaning downspouts.

### 3.2 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.
- B. Protection: Installer shall advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction, to ensure that work will be without damage or deterioration, other than natural weathering, at time of substantial completion.

**END OF SECTION 07 60 00**

**SECTION 07 92 00 – JOINT SEALERS**

1. **GENERAL**

1.2 **DESCRIPTION OF WORK**

A. The extent of each form and type of joint sealer is indicated on drawings and by provisions of this section.

B. The applications for joint sealers as work of this section include the following:

1. Pavement and sidewalk joints
2. Concrete construction joints
3. Floors joints (interior)
4. Wall joints (exterior)
5. Flashing and coping joints
6. Interior wall/ceiling joints
7. Gasketing of assemblies

C. General performance; Except as otherwise indicated, joint sealers are required to establish and maintain airtight and waterproof continuous seals on permanent basis, within recognized limitations of wear and aging as indicated for each application. Failures of installed sealers to comply with this requirement will be recognized as failures of materials and workmanship. All sealants shall be guaranteed two years.

1.3 **SUBMITTALS:**

A. Shop drawing submittals are not required unless a substitution is being requested.

1.4 **JOB CONDITIONS:** Do not proceed with installation of liquid sealants under unfavorable weather conditions. Install elastomeric sealants when temperature is in lower third of temperature range recommended by manufacturer for installation.

2. **PRODUCTS**

2.1 **ACCEPTABLE MANUFACTURERS**

A. General: Manufacturers listed in this article include those known to produce the indicated category of prime joint sealer material, either as a nominally pure generic product or as an equivalent-performance modification thereof or proprietary product

B. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Manufacturers of Elastomeric Sealants (Liquid):

Applied Polymers of America, Inc; Wayne, NJ  
Dow Corning Corp; Midland, MI  
Euclid Chemical Co; Cleveland, OH  
General Electric Co; Waterford, NY  
Gibson-Homans Co; Twinsburg, OH

Goal Chemical Sealants Corp; Los Angeles, CA  
Mameco International; Cleveland, OH  
W.R. Meadows, Inc; Elgin, IL  
Parr, Inc; Cleveland, OH  
Pecora Corp; Harleysville, PA  
Sika Chemical Corp; Lyndhurst, NJ  
Sonneborn Building Products, Inc. Shakapee, MN  
Standard Dry Wall Products Co; Miami, FL  
Tremco, Inc, Cleveland, OH  
Williams Products, Inc; Troy, MI

C. Mfrs of Non-Elastomeric sealants/Caulks (Liquid/Tape)

Gibson-Homans Co; Twinsburg, OH  
Goal Chemical Sealants Corp; Los Angeles, CA  
Macco Adhesives; Cleveland, OH  
W.R. Meadows, Inc; Elgin, IL  
Parr Inc; Cleveland, OH  
Pecora Corp, Harleyville, PA  
Protective Treatments, Inc; Dayton, OH  
Sashco, Inc; Brighton, Co  
Sika Chemical Corp; Lyndhurst, NJ  
Sonneborn Building Products, Inc. Shakapee, MN  
Standard Dry Wall Products CO; Miami, FL  
Tremco, Inc; Cleveland,OH

D. Mfrs. Of Rubber and Polymeric Gaskets (Solid/Cellular)

D.S. Brown Co; North Baltimore,OH  
Kirkhill Rubber Co; Brea, CA  
Rubatex International, LLC; Bedford, VA  
Watson Bowman Acme Corp.; Amherst, NY  
Williams Product, Inc; Troy, MI

E. Mfrs. Of Joint Fillers/Sealant Backers:

Baker Rod Manufacturing Co; Denver, CO  
Dow Chemical Co; Midland, MI  
Fel-Pro, Inc; Skokie, IL  
W.R. Meadows, Inc; Elgin, IL  
Rubatex International, LLC; Bedford, VA  
Sonneborn Building Products, Inc. Shakapee, MN  
Williams Products, Inc. Troy, MI

2.2 MATERIALS:

- A. General Sealer Requirements: Provide colors indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors. Select materials for compatibility with joint surfaces and other indicated exposures, and except as otherwise indicated, select modules of elasticity and hardness or grade recommended by manufacturer for each application indicated. Where exposed

to foot traffic, select nontracking materials of sufficient strength and hardness to withstand stiletto heel traffic without damage or deterioration of sealer system.

**B. Elastomeric Sealants:**

1. Multi-Component Polysulfide Sealant (2Ps-S): Except as otherwise indicated, provide manufacturer's standard, nonmodified, 2-or-more-part, polysulfide-based, elastomeric sealant; complying with either ASTM C 920 Type M Class 25, or FS TT-S-00227E Class A; self-leveling grade/type where used in joints of surfaces subject to traffic, otherwise non-sag grade type.
  - a. Bituminous Modification (-Bit): Where joint surfaces contain or are contaminated with bituminous materials, provide manufacturer's modified type sealant which is compatible with joint surfaces (modified with coal tar or asphalt as required.)
2. Multi-Component Polyurethane Sealant (2Pu-S): Except as otherwise indicated, provide manufacturer's standard, nonmodified, 2-or-more-part, polyurethane-based, elastomeric sealant; complying with either ASTM C 920 Type M Class 12.5, or FS TT-S-00227E Class B; self-leveling grade/type where used in joints of surfaces subject to traffic, otherwise nonsag grade/type.
  - a. Bituminous Modification (-bit): Where joint surfaces contain or are contaminated with bituminous materials, provide manufacturer's modified type sealant which is compatible with joint surfaces (modified with coal tar or asphalt as required).
3. Single-Component Polysulfide Sealant (1Ps-S): Except as otherwise indicated provide manufacturer's standard, nonmodified, one-part, polysulfide-based, air-curing, elastomeric sealant; complying with either ASTM C 920 Type S Class 12.5, or FS TT-S-00230 C Class B' self-leveling grade/type where used in joints of surfaces subject to traffic, otherwise non-sag grade/type.
4. Single-Component Polyurethane Sealant (1Pu-S): Except as otherwise indicated, provide manufacturer's standard, nonmodified, one-part, polysulfide-based, air-curing, elastomeric sealant; complying with either ASTM C 920 Type S Class 25, or FS TT-S-00230C Class A; self-leveling grade/type where used in joints of surfaces subject to traffic, otherwise non-sag grade/type.
  - a. Bituminous Modification (-Bit): Where joint surfaces contain or are contaminated with bituminous materials, provide manufacturer modified-type sealant which is compatible with joint surfaces (modified with coal tar or asphalt as required).
5. Single-Component Silicon Rubber Sealant (1SR-S): Except as otherwise indicated, provide manufacturer's standard, nonmodified, one-part, silicon-rubber-based, air-curing, nonsag, elastomeric sealant; complying

with either ASTM C 920 type S Class 25 Grade NS, or FS TT-S-001543A Class A Type Non-sag.

C. Foam-type Filler-Sealants

1. Fire Resistant Foamed-in-Place filler (FR-FM-F): Provide manufacturer's standard, 2-part, silicone based, room-temperature-vulcanizing, foamed elastomer, recommended by manufacturer for filling joints and other openings in construction work; with cured density of 15 to 20 pcf, partially (50%) close-cell structured cohesive/tensile strength of 25 psi, 40% compression deflection of 10 psi, and flamespread rating of 25 (ASTM E 84); tested and rated by UL for 3-hr. fire resistance for penetration seals (ASTME 119).
2. Preformed Compressible-Foam Sealant (CmpF-S): Provide manufacturer's standard open-cell, flexible foam strip of polyurethane or other weather-resistant foam, saturated with butylene or other nondrying liquid sealant/adhesive, to a formulation which will form a paintable watertight joint at 50% compression, without staining, migrating, hardening or other performance failure.

D. Joint-Fillers, Pavement Types:

1. Self-expanding Cork Joint Filler (SECrk-JF): Provide resilient and non-extruding type premolded cork units complying with ASTM D 1752, Type III; FS HH-F-341, Type II, Class C; or AASHTO M 153, Type III.
2. Cork Joint Filler (Crk-JF): Provide resilient and non-extruding type premolded cork units complying with ASTM D 1752, Type II; FS HH-F-341, Type II, Class B; or AASHTO M 153, Type II.
3. Sponge Rubber Joint Filler (SpR-JF): Provide resilient, non-extruding, open-cell type premolded rubber, gray to match concrete, complying with ASTM D 1752, Type I; FS HH-F-341, Type II, Class A; or AASHTO M153, Type I.
4. Bituminous and Fiber Joint Filler (BtmF-JF): Provide resilient and non-extruding type premolded bituminous composition of organic fiber or granulated cork, between two bituminous felt liners, complying with ASTM D 944 or D 1751, AASHTO M 33 or M 213, or (if fiber type) FS HH-F-341, Type III.

E. Cellular/Foam Joint Fillers and Sealant Backers:

1. Closed-Cell Synthetic Rubber Joint Filler (CcSynR-JF): Provide expanded synthetic rubber complying with ASTM D 1056, Class SC-E (oil-resistant and medium swell), of 2 to 5 psi compression deflection (Grade SCE 41); except provide 13 to 17 psi compression deflection (Grade SCE 44) where filler is applied under sealant exposed traffic.

2. Closed-Cell PVC Joint Filler (CcPVC-JF): Provide flexible expanded polyvinyl chloride complying with ASTM D 1667, Grade VE 41 BL (3.0 psi compression deflection); except provide higher compression deflection grades as may be necessary to withstand installation forces and provide proper support for sealants, if any.
3. Closed-Cell Semi-Rigid Plastic Joint Filler (CcPls-JF): Provide flexible, compressible, non-staining closed-cell plastic joint filler, recommended by manufacturer where low modules of elasticity are required, but suitable for retaining poured concrete.
4. Expanded Polyethylene Joint Filler (ExPe-JF): Provide flexible, compressible, closed cell, polyethylene of not less than 10 psi compression deflection (25%); except provide higher compression deflection strength as may be necessary to withstand installation forces and provide proper support for sealants; surface water absorption of not more than 0.1 lbs.per sq. ft.
5. Open-Cell Polyurethane Joint filler (OcPu-JF): Provide flexible, highly compressible, open-cell polyurethane foam of not less than 1.3 lbs. per cu. ft. density and not less than 2 psi compression deflection (25%), with not more than 10% compression set for 25 hours at 50% compression (ASTM D 3574 test methods).

F. Gaskets:

1. Hollow Neoprene Pavement Gasket (HINpP-Gkt): Provide hollow or compartmentalized neoprene extrusion, designed to withstand compression to 40% of normal width without extrusion from joint, and with full recovery; with heavy, durable top member, suitable for long-term exposure to severe traffic abrasion and contamination; hardness of approximately 55 Shore A; comply with ASTM D 2628.
2. Molded Neoprene Gasket (MidNp-Gkt): Provide extruded neoprene or EPDM gaskets complying with ASTM D 2000, Designation 2BC 415 to 3BC 620, black (40 to 60 Shore A durometer hardness); of profile shown or, if not shown, as required by joint shape size and movement characteristics to maintain a watertight and airtight seal.
3. Molded PVC Gasket (MIdPVC-Gkt): Provide flexible extruded poly-vinyl chloride gaskets of hardness and profile shown or, if not shown, as required by joint shape size movement characteristics to maintain a watertight and airtight seal; comply with ASTM D 2287.
4. Closed-Cell Neoprene Gasket, Exposed (CcNp-Gkt-Xpz): Provide extruded or molded expanded neoprene or EPDM complying with ASTM C 509, Type II, black; formed with durable self-skin to profile shown or, if not shown, as required to maintain a watertight and airtight seal.
5. Closed-Cell Neoprene Gaskets, Concealed (CcNp-Gkt-Cnc): Provide extruded or molded expanded neoprene or EDPM gaskets complying with ASTM D 1056, Class SCE or RE, of the compression deflection required

to perform properly; self-skinned and in profile shown or, if not shown, as required to maintain a watertight and airtight seal.

6. Closed-Cell PVC Gasket (CcPVC-Gkt): Provide closed cell flexible, self-adhesive, non-extruding, polyvinyl chloride foam gaskets complying with ASTM D 1667, Grade VE 41 BI (2 to 5 psi for 25% compression), except provide a higher compression deflection grade if necessary to maintain a watertight and airtight seal.

G. Miscellaneous Materials:

1. Joint Primer/Sealer: Provide type of joint primer/sealer recommended by sealant manufacturer for joint surfaces to be primed or sealed.
2. Bond Breaker Tape (BB-Tp): Provide polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant – contact surfaces where bond to substrate or joint filler must be avoided for proper performance or sealant. Provide self-adhesive tape where applicable.
3. Sealant Backer Rod (S-BR): Provide compressible rod stock of polyethylene foam, polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable non-absorptive material as recommended by sealant manufacturer for backup of and compatibility with sealant. Where used with hot-applied sealant, provide heat-resistant type which will not be deteriorated by sealant application temperature as indicated.

3. EXECUTION

3.1 INSPECTION:

- A. Installer must examine substrates, (joint surfaces) and conditions under which joint sealer work is to be performed, and must notify Contractor in writing of unsatisfactory condition. Do not proceed with joint sealer work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 JOINT PREPARATION:

- A. Clean joint surfaces immediately before installation of gaskets, sealants or caulking compounds. Remove dirt, insecure coatings, moisture and other substrates which could interfere with seal of gasket or bond of sealant or caulking compound. Etch concrete and masonry joint surfaces as recommended by sealant manufacturer. Roughen vitreous and glazed joint surfaces as recommended by sealant manufacturer.
- B. Prime or seal joint surfaces where indicated, and where recommended by sealant manufacturer. Confine primer/sealer to areas of sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION:

- A. Comply with manufacturer's printed instructions except where more stringent requirements are shown, or specified, and except where manufacturer's technical representative directs otherwise.
- B. Set joint filler units at depth or position in joint as indicated to coordinate with other work, including installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between ends of joint filler units.
- C. Install sealant backer rod for liquid-applied sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for application indicated.
- D. Install bond breaker tape where indicated and where required by manufacturer's recommendations to ensure that liquid-applied sealants will perform as intended.
- E. Employ only proven installation techniques, which will ensure that sealants are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and vertical surface fill joint to form a slight cove, so that joint will not trap moisture and dirt.
- F. Install liquid-applied sealant to depths as shown or, if not shown, as recommended by sealant manufacturer but within the following general limitations, measured as center (thin) sections of beads; (not applicable to sealants in lapped joints).
  - 1. For sidewalks, pavements and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75% of joint width, but neither more than 5/8" deep nor less than 3/8" deep.
  - 2. For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2" deep nor less than 1/4" deep.
  - 3. For joints sealed with non-elastomeric sealants and caulking compounds, fill joints to a depth in range of 75% to 125% of joint width.
- G. Spillage: Do not allow sealants or compounds to overflow from confines of joints, or to spill onto adjoining work, or to migrate into voids of exposed finishes. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage.
- H. Do not overheat or reheat hot-applies sealants; discard (do not use).
- I. Recess exposed edges of gaskets and exposed joint fillers slightly behind adjoining surfaces, unless otherwise shown, so that compressed units will not protrude from joints.



- J. Bond ends of gaskets together with adhesive or “weld” by other means as recommended by manufacturer to ensure continuous watertight and airtight performance. Miter-cut and bond ends at corners unless molded corner units are provided.
- K. Install fire-resistant foamed-in-place filler in openings where indicated, and at thickness' indicated. Dam bottom of vertical openings and one side of horizontal openings with temporary containment forms or, where required to achieve fire-resistant ratings, provide permanent mineral composition board forms. On horizontal penetrations, provide partial face containment forms where required for foam placement. Allow installed fillers to cure 24 hours; remove temporary forms; trim ragged edges with sharp knife; inspect and fill voids with additional filler to form uniform thickness of filler.

3.4 CURE AND PROTECTION:

- A. Cure Sealants and caulking compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability. Advise contractor of procedures required for cure and protection of joint sealers during construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at time of substantial completion. Cure and protect sealants in a manner, which will minimize increases in modules of elasticity and other accelerated aging effects. Replace or restore sealants, which are damaged or deteriorated during construction.

**END OF SECTION 07 92 00**

**Section 08 11 10 METAL DOORS AND FRAMES**

**PART I - GENERAL/MATERIALS**

**1.01 SYSTEM DESCRIPTION**

- A. Specifying steel doors and frames, lite frames and door louvers.
  - 1. Cover each type of door, frame, and frame condition.
    - a. Elevation of all doors and frames.
    - b. Jamb and head details.
    - c. Hardware reinforcing details of doors and frames.
    - d. Door and frame location schedule.
    - e. Complete door and frame descriptive nomenclature.
    - f. Material description and gauges.
    - g. Methods of anchorage.
    - h. Hardware preparation locations.
    - i. Glass molding details.
    - j. Louver details.

**1.02 QUALITY ASSURANCE**

- A. Steel doors and frames shall comply with the Steel Door Institute (SDI) “recommended Specifications for Standards Steel Doors and Frames” ANSI A250.8-03 (SDI-100) and requirements for other types of doors and frames selected.
  - 1. Finish hardware preparation in accordance with ANSI A115.1, “Specifications for Door and Frame Preparation”, where applicable, and SDI-107.
  - 2. Provide minimum gauge hardware reinforcing in accordance with Table IV of ANSI A250.803 (SDI-100).
- B. Fire-rated Assemblies: Whenever a fire-resistance classification is indicated, provide fire-rated steel doors and frames investigated and tested as part of a fire door assembly, complete with type of fire door hardware to be used.
  - 1. Identify each fire-rated door and frame with permanent, metal labels from approved testing agency indication applicable fire rating.
    - a. Doors with continuous hinges shall have this label affixed to the top of the door.
  - 2. Construct and install assemblies to comply with National Fire Protection Association (NFPA) Standards No. 80.
- C. Exterior glazed frame members shall withstand a wind load of 24 psf, minimum.
- D. Specify and/or detail location of finish hardware on drawings or in accordance with “Recommended

- E. Location for Builder’s Hardware” published by the National Builders’ Hardware Association and Title 24 Handicapped requirements.
- E. Finish shall comply with ANSI A250.10 (SDI A224.1), “Test Procedure and Acceptance Criteria for Primed Painted Steel Surfaces”.

**1.03 MATERIALS**

- A. Hot-Rolled Steel Sheets and Strips: Commercial carbon steel, pickled and oiled, complying with ASTM A568 and ASTM A569.
- B. Cold-Rolled Steel Sheets: Commercial-quality carbon steel complying with ASTM A366 and ASTM A568.
- C. Galvanized Steel Sheets: Commercial-quality zinc-coated carbon steel complying with ASTM A526, with G60 zinc coating, mill phosphatized, complying with ASTM A525.
- D. Shop-Applied Paint: Rust-inhibitive primer, either air dried or baked on, suitable as a base for specified finish paints. Provide zinc-rich primer complying with Steel Structures Painting Council (SSPC) Paint Specification No. 20 for touching up galvanized steel.
- E. Louvers: Stationary inverted - “V” blade type, 1" thick, 18 - gauge steel blades and frame. Specify fire rated assemblies where required.
- F. Glass: Specified in Section 08 80 00.

**1.04 FABRICATION - STEEL FRAMES**

- A. Gauges:
  - 1. All frames to be a minimum of 14 gauge. Labeled Frames: 14 gauge, or as included in UL test procedure if greater than 14 gauge.
  - 2. Exterior Frames: galvanized.
  - 3. Interior Frames: cold rolled.
- B. Prepare rabbet stops for rubber door silencers.
  - 1. Located three on strike jamb for single doors and four on head for pairs of doors.
  - 2. Exterior frames shall have continuous weather stripping.
- C. Glass Stops for Borrowed Lites and Vision Lites in Door: prefabricated unit, with mitered joints, welded and ground smooth.

- D. Anchors:
1. Provide not less than six anchors and two floor clips per side for door up to 7 feet high.
  2. Anchors shall be furnished to suit wall conditions and floor angles or clips welded to frame for fastening to floor.

**1.05 FABRICATION - STEEL DOORS**

- A. Classification:
1. Interior: Level 4, Model 2, Heavy Duty seamless, Hollow Steel Construction, minimum 14 gauge.
  2. Exterior: Level 4, Model 2, Extra Heavy Duty seamless, minimum 14 gauge galvanized.
- B. Use only cold-rolled steel for faces of doors and panels. Top edge of door to be welded flush channel, with no lip. Bottom of door shall have inverted channel. Weatherproof top edge of exterior doors. Turn face sheets over vertical edges of doors and mechanically interlock. All visible edge seams shall be filled and ground smooth.
- C. Louvers shall be full welded and factory installed.
- D. Reinforcements and Prep for doors; MINIMUM gauge and o.c. reinforcements shall be as follows:
1. 7 gauge flat steel reinforcement for hinges.
  2. 10 gauge steel reinforcement for locksets and surface applied hardware.
  3. Internal reinforcing of the door shall prevent collapse of face sheets by stress of lockset installation.
  4. All doors will be reinforced for closers where called for; 14 gauge minimum.
  5. Vertical steel stiffeners to be 6" o.c. with fully foamed insulated cores.
  6. Drilling and tapping for mortise hardware will be done at factory to templates provided by hardware supplier.
- E. Provide the following door clearances, unless otherwise indicated on the drawings.
1. Provide 1/8" at head, jambs and meeting stiles at pair of doors.
  2. Provide 3/8" to finish floor at bottom where there is no threshold or carpet.
  3. Provide 1/4" at bottom to top of carpet or threshold.

**PART II - EXECUTION/MAINTENANCE**

**2.01 INSTALLATION OF FRAMES**

- A. Install frames in accordance with SDI-105, "Recommended Erection Instructions for Steel Frames", unless otherwise specified.
- B. Set frames to maintain scheduled dimensions, hold head level, and maintain jambs plumb and square.
- C. Install fire-rated frames in accordance with NFPA Standards No. 80.

**2.02 INSTALLATION OF DOORS**

- A. Installation of steel doors in accordance with manufacturer's instructions and SDI standards.
- B. Adjust operable parts for correct function.
  - 1. Specify T-24 requirements for accessible requirements.

END OF SECTION

**Section 08 14 10 WOOD DOORS**

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**PART I - GENERAL/MATERIALS**

**1.01 SYSTEM DESCRIPTION**

- A. Solid core, solid stave wood doors for interior use.
- B. Flush doors shall be manufactured in accordance with:
  - 1. Woodwork Institute of California (WIC) Manual, Section 20 "Doors".
  - 2. National Wood Window and Door Association (NWWDA) Industry Standard I.S. 1-Series, "Wood Flush Doors".
- C. Sound Rated Doors: STC 36.

**1.02 QUALITY ASSURANCE**

- A. Qualifications of Manufacturers: Qualified to affix each door with NWWDA Seal of Acceptance or quality certification stamp.
- B. Allowable Tolerance for Fabrication of Doors:
  - 1. Pre-machining for Hardware: NWWDA "Standard Procedures and Recommendations for Factory Machining Architectural Wood and Plastic Faced Flush Doors for Hardware".
- C. Fire-Rated Assemblies: Wherever a fire-resistance classification is required, provide fire-rated doors investigated and tested as part of a fire door assembly, complete with type of fire door hardware to be used.

**1.03 WARRANTY**

- A. Warranty materials and workmanship for the lifetime of the original installation.
  - 1. Warranty shall also include refinishing and reinstallation, which may be required to repair or replacement of defective doors.  
  
Hardware: Upon completion of installation, doors and finish hardware shall operate smoothly. Owner shall not be required to do any remedial work for a minimum of 5 years.

**1.04 MANUFACTURERS**

- A. Weyerhaeuser, Algoma, or equal.

**1.05 MATERIALS**

- A. Face veneer at transparent finish doors: (Coordinate with owner) NWWDA grade I (premium), standard thickness, kiln dried and smoothly sanded.
- B. Face veneer at paint grade doors: (coordinate with owner) Birch, NWWDA grade II (good), standard thickness, kiln dried and smoothly sanded.
- C. Cores:
  - 1. Non-rated and 45-minute rated doors: Solid core solid stave in accordance with ANSI A208.1.
  - 2. Fire Rated: Incombustible mineral core. Density range from 16 pcf to 28 pcf maximum. Moisture absorption maximum 10 percent or core weight when relative humidity is 90 percent and temperature is 70 degree F.
- D. Reinforcement: Provide solid wood blocking or other acceptable material for door hardware, including for door closer, such that no through-bolts shall be required to permanently mount hardware on door. If blocking is not practical, provide stave-core wood door.

**PART II EXECUTION/MAINTENANCE**

**2.01 INSTALLATION**

- A. Doors to be installed in accordance with manufacturer's instructions and requirements of NWWDA standards. Comply with requirements of T-24.
- B. Specify installation of fire-rated doors in fire-rated frames in accordance with requirements of NFPA standard No. 80.
- C. Specify to seal job site cut surfaces and top and bottom of doors with two coats of door manufacturer's standard sealer before final hanging of doors.
- D. Hardware: Upon completion of installation, doors and finish hardware shall operate smoothly. Owner shall not be required to do any remedial work for a minimum of 5 years.
- E. Field finish of doors to be in accordance with WIC technical bulletin 417-R Recommended Procedure for Transparent Finishes for Architectural Millwork" system 1.

END OF SECTION

**Section 08 31 13 ACCESS DOORS**

**PART 1 - GENERAL/MATERIALS**

**1.01 SYSTEM DESCRIPTION**

- A. Access Doors; rated and non-rated to all concealed, spaces, parts and equipment.

**1.02 GUARANTEE**

- A. Guarantee-Warranty: One (1) year from the date of final acceptance by the Owner.

**1.03 MANUFACTURERS**

Milcor, J L Industries, or Williams Milcor product numbers are listed for reference only. Contractor's submittal to specify type, style, size and rating.

**1.04 MATERIALS**

- A. Types:
  - 1. At Walls and Ceilings; 14 gauge steel panel in 16 gauge steel frame; prime coated; standard cam lock. 12"x12" minimum, 24"x 24" minimum at points requiring physical access.
  - 2. Fire Rated Openings
    - a. General: "Fire Rated" type manufactured by Milcor, Inc., or equal; minimum; steel frame; continuous hinge; flush face, key operated 93K series lock and interior latch release mechanism; UL rating as required.
    - b. Wall: Model No. 3208, or equal.
    - c. Ceiling: Model No. 3210, or equal.

**PART 11 - EXECUTION/MAINTENANCE**

**2.01 INSTALLATION**

A.General: Installation shall be in strict conformance with industry-standards and the manufacturer's written directions.

B.Paint finishes shall not cover UL or ratings.

End of Section 08 31 13



**Section 08 41 13 - ALUMINUM STOREFRONT and ENTRANCE DOORS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, apply to this Section.

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Storefront framing.
  - 2. Manual-swing entrance doors.

**1.3 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.

**1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
  - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior. showing the following:
    - a. Joinery, including concealed welds.
    - b. Anchorage.
    - c. Expansion provisions.
    - d. Glazing.
    - e. Flashing and drainage.
  - 2. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers..
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12 inches lengths of full-size components and showing details of the following:
  - 1. Joinery, including concealed welds.

2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

- F. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- B. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C1401. Include periodic quality-control reports.
- C. Source quality-control reports.
- D. Field quality-control reports.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.
- B. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront to include in maintenance manuals. Include ASTM C1401 recommendations for post-installation-phase quality-control program.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

- C. Structural-Sealant Glazing: Comply with ASTM C1401 for design and installation of storefront systems.

1.8 MOCKUPS

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1.9 PRECONSTRUCTION LABORATORY MOCKUPS

- A. Preconstruction Testing Service: [Owner will engage] a qualified testing agency to perform testing on preconstruction laboratory mockups.
- B. Build preconstruction laboratory mockups at testing agency facility; use personnel, products, and methods of construction that will be used at Project site.

- 1. Size and Configuration: As indicated on Drawings.
- 2. Notify Architect 7 [seven] days in advance of the dates and times when preconstruction laboratory mockups will be constructed and tested.

- C. Preconstruction Laboratory Mockup Testing Program: Test preconstruction laboratory mockups according to requirements in "Performance Requirements" Article. Perform the following tests in the following order:

- 1. Structural: ASTM E330/E330M at 50 percent of positive test load.
- 2. Air Infiltration: ASTM E283.
- 3. Water Penetration under Static Pressure: ASTM E331.
- 4. Water Penetration under Dynamic Pressure: AAMA 501.1.
- 5. Structural: ASTM E330/E330M at 100 percent of positive and negative test loads. Repeat the following:
- 6. Testing will not be required if data based on previous testing of current sealant products match those submitted.

1.10 WARRANTY

- A. Special Warranty: **Manufacturer/Installer** agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

- 1. Failures include, but are not limited to, the following:
  - a. Structural failures, including, but not limited to, excessive deflection.
  - b. Noise or vibration created by wind and thermal and structural movements.
  - c. Deterioration of metals and other materials beyond normal weathering.
  - d. Water penetration through fixed glazing and framing areas.
  - e. Failure of operating components.
- 2. Warranty Period: Two [2] years from date of Substantial Completion.

- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Warranty Period: Five [5 ] years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

Delegated Design: Engage a qualified professional engineer, to design aluminum-framed entrances and storefronts.

- A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
  - 1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  - 2. Failure also includes the following:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage.
    - c. Noise or vibration created by wind and thermal and structural movements.
    - d. Loosening or weakening of fasteners, attachments, and other components.
    - e. Failure of operating units.
- B. Structural Loads:
  - 1. Wind Loads: As indicated on Drawings/Structural calculations..
- C. Deflection of Framing Members: Per industry standards.
- D. Structural: Test according to ASTM E330/E330M:
- E. Air Infiltration: Test according to ASTM E283 for infiltration:

- F. Water Penetration under Static Pressure: Test according to ASTM E331:
- G. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1:
- H. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 requirements.
- I. Energy Performance: Certify and label energy performance according to NFRC as:
- J. Noise Reduction: Test according to ASTM E90, with ratings determined by ASTM E1332.
- K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
- L. Structural-Sealant Joints:
  - 1. Designed to carry gravity loads of glazing.
- M. Structural Sealant: ASTM C1184. Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed, aluminum-framed entrances and storefronts without failing adhesively or cohesively

### 2.3 STOREFRONT SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 1. Kawneer North America, an Arconic company or equal
- B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
  - 1. Exterior Framing Construction: Thermally broken
  - 2. Glazing System: Retained mechanically with gaskets on four sides
  - 3. Glazing Plane: Front
  - 4. Finish: Clear anodic finish
  - 5. Fabrication Method: Field-fabricated stick system.
  - 6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  - 7. Steel Reinforcement: As required by manufacturer.
  - 8. Mullion: 12 ga, T=0.1024", 6063 T6 aluminum – see structural calculations.
- C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.

**2.4 ENTRANCE DOOR SYSTEMS**

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
  - 1. Door Construction: 1-3/4-inch overall thickness,
  - 2. Door Design: Medium stile; 3-1/2-inch nominal width.
  - 3. Glazing Stops and Gaskets: For 1 inch insulated glazing, *tempered for both outer and inner boards.*
    - a. Provide nonremovable glazing stops on outside of door.

**2.5 ENTRANCE DOOR HARDWARE**

- A. Entrance Door Hardware: manufacturer's standard accessible items.
- B. General: Provide entrance door hardware.
- C. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.
- D. Door Stops: BHMA A156.16, Grade 1, floor mounted, as appropriate for door location indicated, with integral rubber bumper.
- E. Weather Stripping: Manufacturer's standard replaceable components.
- F. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- G. Thresholds: BHMA A156.21 raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

**2.6 GLAZING**

- A. Glazing: 1" insulated glazing unit [s], *tempered glazing for both outer and inner boards*
- B. Glazing Gaskets: Manufacturer's standard items.
- C. Glazing Sealants: As recommended by manufacturer.
- D. Weather Sealants:: ASTM C920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.

**2.7 MATERIALS**

- A. Sheet and Plate: ASTM B209 .

- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221
- C. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
- D. Structural Profiles: ASTM B308/B308M.
- E. Steel Reinforcement:
  - 1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
  - 2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
  - 3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.
  - 4. Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
- F. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
- G. Anchors: Three-way adjustable anchors with minimum adjustment.
- H. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing.

## 2.8 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
  - 1. Profiles that are sharp, straight, and free of defects or deformations.
  - 2. Accurately fitted joints with ends coped or mitered.
  - 3. Physical and thermal isolation of glazing from framing members.
  - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  - 5. Provisions for field replacement of glazing.
- D. Storefront Framing: Fabricate components for assembly using recommendation by manufacturer.
- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
  - 1. At exterior doors, provide weather sweeps applied to door bottoms.

- G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.9 ALUMINUM FINISHES

- A. Clear Anodic Finish:

## 2.10 SOURCE QUALITY CONTROL

- A. Structural Sealant: Perform quality-control procedures complying with ASTM C1401 recommendations, including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

### 3.3 INSTALLATION

- A. General:
  - 1. Comply with manufacturer's written instructions.
  - 2. Do not install damaged components.
  - 3. Fit joints to produce hairline joints free of burrs and distortion.
  - 4. Rigidly secure nonmovement joints.
  - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
  - 6. Seal perimeter and other joints watertight unless otherwise indicated.
- B. Metal Protection:
  - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
- C. Set continuous sill members and flashing in full sealant bed to produce weathertight installation.



- D. Install components plumb and true in alignment with established lines and grades.
- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- F. Install glazing as specified in Section 088000 "Glazing."
- G. Install weatherseal sealant according to Section 079200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.
- H. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
  - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
  - 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

### 3.4 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
  - 1. Plumb: 1/8 inch in 10 feet
  - 2. Level: 1/8 inch in 20 feet
  - 3. Alignment:
    - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on:
  - 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
  - 2. Air Infiltration: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article.
  - 3. Water Penetration: ASTM E1105 at a minimum.
- C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

- D. Prepare test and inspection reports.

**3.6 MAINTENANCE SERVICE**

**A. Entrance Door Hardware:**

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six <6> months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

**END OF SECTION 08 41 13**

**SECTION 08 71 00 – FINISH HARDWARE**

1. GENERAL:

1.1 DESCRIPTION OF WORK:

- A. Definition: “Finish Hardware” includes items known commercially as builders hardware which are required for swing, sliding and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame. Types of items in this section include (but are not necessarily limited to):

Hinges  
Lock Cylinders and Keys  
Lock and latch sets  
Bolts  
Exit devices (panic hardware)  
Push/pull units  
Closers  
Overhead holders  
Door trim units  
Protection plates  
Thresholds  
Weather-stripping  
Smoke Seals

- B. “Hardware Groups” .  
See A6.10 for Hardware Type for listing of the kinds of hardware and see Doors Schedule for the hardware selections.

1.2 QUALITY ASSURANCE:

- A. Manufacturer: Obtain each kind of hardware (latch and locksets, hinges, closers, etc) from only one manufacturer.
- B. Supplier: A recognized builders hardware supplier who has been furnishing hardware in the project’s vicinity for a period of not less than 2 years, and who is, or employs an experienced hardware consultant who is available, at reasonable times during the course of the work, for consultation about project’s hardware requirements, to owner, Architect and Contractor.
- C. Hardware Coordination Meeting: If considered necessary, during the course of the work but prior to ordering; contractor shall hold a meeting to review specific door hardware. This meeting shall review the hardware and key schedule along with specific information concerning location and function of each lockset. The meeting shall include the Architect, District Representative, District Locksmiths, General Contractor, Hardware Sub-contractor, and the manufacturer’s representative.

1.3 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical information for each item of hardware. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finish.
- B. Hardware Schedule: Submit final hardware schedule confirming compliance as indicated herein. Hardware schedules are intended for coordination of work. Include the following:
  - 1. Name and manufacturer of each item.
  - 2. Fastenings and other pertinent information
  - 3. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
  - 4. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
  - 5. Mounting locations for hardware.
  - 6. Door and frame sizes and materials.
  - 7. Keying information.

1.4 PRODUCT HANDLING:

- A. Packaging:
  - 1. Furnish all finish hardware with each unit clearly marked or numbered in accordance with the Hardware Schedule.
  - 2. Pack each item complete with all necessary pieces and fastener.
  - 3. Properly wrap and cushion each item to prevent scratches during delivery and storage.
- B. Delivery:
  - 1. Deliver all finish hardware to the installers in a timely manner to ensure orderly progress of the total work.

2. PRODUCTS

2.1 FASTENINGS:

- A. General:
  - 1. Furnish all finish hardware with all necessary screws, bolts, and other fasteners of suitable size and type to anchor the hardware in position for long life under hard use.
  - 2. Furnish fastenings where necessary with expansion shields, toggle bolts, sex bolts, and other anchors approved by the Architect, according to the material to which the hardware is to be applied and the recommendations of the hardware manufacturer.
  - 3. Provide the products of the manufacturers listed, without substitutions, unless approved in advance, in writing, by Architect.

- B. Design:
  - 1. All fastenings shall harmonize with the hardware as to material and finish.

2.2 KEYING:

- A. Construction Keying: Provide a method independent of the final keying system for securing the building during construction.
- B. Final Keying System:  
Per the District's standard existing at the site.

2.3 FINISH:

- A. All finishes to be satin chromium plated, US 26 D, ANSI 626 unless otherwise indicated.

2.4 SCHEDULED HARDWARE:

The Hardware Schedule on the drawings is coded according to the number prefix for each item listed under the following headings:

- A. **Locks/Latchsets:**
- B. **Hinges**
- C. **Closers**
- D. **Stops**
- E. **Thresholds**
- F. **Miscellaneous**

3. EXECUTION:

3.1 DELIVERIES:

Stockpile all items sufficiently in advance to ensure their availability and make all necessary deliveries in a timely manner to ensure orderly progress of the total work.

3.2 INSTALLATION:

- A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with

governing regulations, and except as may be otherwise directed by Architect. Hand-activated hardware such as lever latchsets, panic bars, push-pull handles, and lever handle thumb-turn dead bolts shall be mounted between **34” to 44”** above finish floor.

- B. Install each hardware item in compliance with the manufacturer’s instructions and recommendations. Wherever cutting and fittings 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 9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.
- C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- D. Drill and countersink units, which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

**3.3 ADJUST AND CLEAN:**

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation of function of every unit. Replace units, which cannot be adjusted to operate freely and smoothly as intended for the application made. Adjust interior and exterior door closers to 5 lbs (maximum). Delay shall be as per CBC 11B-404.2.8.1 - : from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds min. For Fire Doors “the maximum effort to operate the door may be increased to the minimum allowable by the appropriate administrative authority, not to exceed 15 lbs.”
- B. Instruct Owner’s Personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.
- C. Continued Maintenance Service: Approximately six months after the acceptance of hardware in each area, the Installer, accompanied by the representative of the latch and lock manufacturer, shall return the project and re-adjust every item of hardware to restore proper function of doors and hardware. Consult with and instruct Owner’s personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware, and deliver report to owner with a copy of the Architect.

**3.4 HARDWARE SCHEDULE:**

Refer to the Door Schedule shown on the drawings to identify the appropriate hardware for each door.

**END OF SECTION 08 71 00**

**Section 08 80 00 – GLASS and GLAZING**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Glass and glazing for windows and doors.

**1.2 REFERENCES**

- A. ASTM C-1036 - Standard Specification for Flat Glass.
- B. ASTM C- 1048 - Standard Specification for Heat-Treated Flat Glass - Kind FT Coated and Uncoated Glass.
- C. Glass Association of North America (GANA) (formerly FGMA) - Glazing Manual.
- D. Title 24, Part 2, Chapter 24, current edition.

**1.3 QUALITY ASSURANCE**

- A. Conform to GANA Glazing Manual for glazing installation methods.
- B. Manufacturer: Manufacturer shall have produced the specified system or products for a period of one (1) year prior to beginning work of this section, and shall have the capability to produce the specified products to the delivery and quantity criteria of the project.
- C. Staff:
  - 1. Use only personnel who are thoroughly trained and experienced in the skills required and have installed similar applications of the specified products within one year prior to beginning work of this section.
  - 2. Use only staff who are completely familiar with the manufacturers' recommended methods of installation as well as the requirements of this work.

**1.4 SUBMITTALS**

- A. Materials List: Provide complete list of all proposed materials and accessories, including product data on performance criteria.
- B. Samples: Accompanying materials list, submit three 12 inch square samples of each glass type. Grind and seal all edges.
- C. Shop Drawings: Provide complete shop drawings indicating glass type, installation method, and materials used.

**1.5 DELIVERY, STORAGE, AND PROTECTION**

- A. Deliver , store and protect products.

1.6 WARRANTY

A. Warranty:

1. Provide, in Architect approved form, the Owner with a guarantee against the following specific defects or failures for a period of three (3) years after Notice of Substantial Completion:
  - a. Broken, cracked or otherwise damaged glass not resulting from vandalism.
  - b. Water intrusion through sealant/glass joint.
  - c. Sealant failure.
  - d. Fogging or delamination at laminated glass.

B. Insulating Glass Warranty:

1. Provide, in Architect approved form, the Owner with manufacturers warranty against the following specific defects or failures for a period of ten (10) years after Notice of Substantial Completion:
  - a. No material obstruction of vision through glass caused by accumulation of dust, moisture or film on the internal surface of glass caused by insulating seal failure.
  - b. Water intrusion through sealant/glass

joint. PART 2 - PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Characteristics of specific products, where named in this Section, are indicated to establish required level of quality, appearance, and performance. Architect will consider requests for substitutions.

2.2 TEMPERED VISION GLASS GL-01

- A. Manufacturer: PPG, [www.ppgglass.com](http://www.ppgglass.com), or equal.
- B. Type: Clear, single vision, fully tempered, float glass.
- C. Characteristics:
1. Total Thickness: 1/4 inch minimum, and as required by code.
  2. Characteristics: Type 3 Clear
  3. Strength: Fully Tempered (Kind FT) per ASTM C 1048 and ASTM C 1036. Permanently label all tempered glass.
  4. Type: Condition A - uncoated, Type 1 - transparent, Class 1 - clear, q3 quality - glazing select, float glass.
  5. Light Transmission: 89% visible light.
  6. Shading Coefficient: 0.94.
  7. Safety Standards: Comply with Chapter 24, Part 2, Title 24, CCR safety glazing requirements.



2.3 INSULATING GLASS UNIT, fully tempered – GL-XX

- A. Fabricator: Oldcastle Glass, [www.OldcastleGlass.com](http://www.OldcastleGlass.com), or equal.
- B. Series/Type: Dual glazed glass units, fully tempered.
  - 1. Exterior Lite: 1/4-inch PPG Caribia with Solarban 70XL on Surface 2.
  - 2. Interior Lite: 1 / 4 inch PPG clear.
- C. Total Thickness: One inch, and as required by code, with 1/2 inch air space.
- D. Characteristics:
  - 1. Strength: Each lite fully Tempered (Kind FT) per ASTM C 1048 and ASTM C 1036. Permanently label all tempered glass.
  - 2. SHGC: 0.23.
  - 3. Visible Light Transmission: 47 percent.
  - 4. Shading Coefficient: 0.26.
  - 5. U-value – Summer Daytime: 0.26.
  - 6. U-value – Winter Night: 0.28.
  - 7. Safety Standards: Comply with CBC Chapter 24, safety glazing requirements.
  - 8. Seal Classification: Class CBA per ASTM E 773/774, with third party validation required.
- E. Accessories:
  - 1. Capillary Tubes: Provide capillary tubes at units as recommended by manufacturer for installed altitude conditions.
    - a. 1044, 100 cycles, CS10F.
- F. Color: Clear.

2.4 GLASS DESIGN CRITERIA

- A. Provide glass thickness, edge support, "bite," and other engineering criteria per referenced standards and Chapter 24, Title 24, Part 2, CCR.
- B. Provide glass that has been produced, fabricated, and installed to withstand normal thermal movement and wind loading, without failure, including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass and glazing materials and other defects in the work.
  - 1. Normal thermal movement is defined as that resulting from a consequent temperature range of +10 degrees F to +180 degrees F within glass and glass framing members.
- C. Provide glass thickness in minimum thickness specified and as required by Chapter 16A, Title 24, Part 2, CCR and the following criteria:
  - 1. Wind Speed: 85 MPH wind speed, (3 second gust)
  - 2. Exposure: Exposure C.

- D. Provide safety glazing complying with at all locations as required by Chapter 24, Part 2, Title 24.
  - 1. Provide permanent etched or ceramic fired label on all safety glazing, visible after installation.

## 2.5 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene or EPDM with a Shore A Durometer value of 85 +\_ 5.
- B. Spacer Shims: Neoprene with a Shore A Durometer value of 50.
- C. Foam Glazing Tapes / Beads: Provide manufacturers recommended system, UV Stabilized, black color.
- D. Glazing putty/sealant: Provide DOW or equal, Series 795 structural silicone sealant for repair of existing window system glazing. Color as selected by Architect from standard color line.

## PART 3 - PART 3 - EXECUTION

### 3.1 SURFACE CONDITIONS

- A. Inspection
  - 1. Prior to work of this section, carefully inspect previously installed work. Verify all such work is complete to the point where this installation may properly commence.
  - 2. Verify that work of this section may be installed in strict accordance with the original design, all pertinent codes and regulations, and all pertinent portions of the referenced standards.
    - a. Verify surfaces of glazing channels or recesses are clean and free of obstructions.
    - b. Verify insulating glass unit sealant is compatible with window system glazing methods specified in Section 08520.
  - 3. In the event of discrepancy, immediately notify the Architect.
  - 4. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

### 3.2 Glass installation

- A. General
  - 1. Install all glass at proper ambient temperatures.
  - 2. Do not glaze assemblies when damp or wet due to rain, dew, condensation, or other moisture sources.
  - 3. Protect glass from edge damage during handling and installation; use a rolling block in rotating glass units to prevent damage to glass corners.
  - 4. Do not impact glass with metal framing.
  - 5. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar.

6. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening.
  7. Remove from project and dispose of glass units with edge damage or other imperfections of the type that, when installed, weaken glass and impair performance and appearance.
  8. Install all glass within ambient temperature limits established by glass manufacturer.
  9. Set units of glass in each series with uniformity of pattern, draw, bow, and similar characteristics.
- B. Install all glass products in accordance with referenced codes, standards, and approved submittals. Install per recommendations of manufacturer, and as specified in related sections.
- C. Install in accordance with Listing and labeling requirements.
- D. Rest glass on setting blocks per referenced standard.
1. Install neoprene or EPDM setting blocks. No lead setting blocks permitted.
  2. Provide minimum 4 inch long setting block, and as required by glass manufacturer. Install at quarter points unless otherwise approved.
  3. Provide setting block width 1/16 to 1/8 inch less than the width of the glazing pocket, and a minimum of 1/8 inch wider than glass thickness.
  4. Provide edge blocking at all jamb conditions of captured pocket glazing.

### 3.3 PROTECTION AND CLEANING

- A. Protect glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply tape or marking of any kind to glass surface. Remove non-code required and non-permanent labels.
- B. Remove tape after work is completed.
- C. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.
- D. Examine glass surfaces adjacent to or below exterior plaster, concrete and other masonry surfaces at frequent intervals during construction, but not less often than once a month, for buildup of dirt, scum, alkali deposits or staining. When examination reveals presence of these forms of residue, remove by method recommended by glass manufacturer. Remove tape after work is completed.
- E. Do not store materials or any kind against interior or exterior surfaces of glass or glass frame. Remove tape after work is completed.
- F. Immediately prior to completion of the Work, clean all glass using manufacturers approved methods.

### 3.4 REPLACEMENT

- A. Immediately remove all glass delivered to site with manufacturing or fabrication defects.

- B. Remove and replace all glass broken, cracked, abraded or damaged in any other way during construction period due to construction, vandalism, natural occurrences or other causes.
- C. Remove and replace all glass broken, cracked, abraded or damaged in any other way during construction period due to construction, vandalism, natural occurrences or other causes.
  - 1. Comply with scratch tolerances specified below for all glass.
- D. Immediately remove all glass delivered to site with manufacturing or fabrication defects defined as follows:
  - 1. Based on inspection from a distance of 6 feet, pinholes exceeding 1/16 inch in diameter are not acceptable.
  - 2. Based on inspection from a distance of 6 feet, clusters of pinholes less than 1/16 inch in diameter shall not occur in the central 80 percent of the glass.
  - 3. Based on inspection from a distance of 10 feet, scratches exceeding 2 inches are not acceptable, except scratches up to 3 inches in length will be acceptable if located a maximum of 3 inches of glass edge.
  - 4. Concentrated scratched or abraded areas are not acceptable at any part of  
  
glass panel.

**END OF SECTION 08 80 00**

**SECTION 09 21 16 - GYPSUM SHAFT WALL ASSEMBLY**

**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes gypsum board shaft wall assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each component of gypsum board shaft wall assembly.

1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with gypsum-shaftliner-board manufacturer's written instructions.
- B. Do not install finish panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, or mold damaged.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

Design is based on ClarkDietrich No. CD/WA 120-01 Assembly.

- A. Fire-Resistance Rating: **2 hours**
- B. Gypsum Shaftliner Board:

1. Type X: ASTM C1396/C1396M; manufacturer's proprietary fire-resistive liner panels with paper faces, 1 inch thick, with double beveled long edges.

C. Gypsum Boards: 5/8" thick Gypsum Boards.

Gypsum Shaftliner and Gypsum Board must be by the same manufacturer.

D. Non-Load-Bearing Steel Framing, General: Complying with ASTM C645 requirements for metal unless otherwise indicated and complying with requirements for fire-resistance-rated assembly indicated.

E. Studs: Manufacturer's standard profile for repetitive, corner, and end members as follows:

1. Depth: 2 1/2" inches.

F. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least **2 inches** long and matching studs in depth.

G. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

Finish Panels: **As indicated.**

### 2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with shaft wall manufacturer's written instructions.

B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

C. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

1. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E1190 conducted by a qualified testing agency.

D. Acoustical Sealant: Section 079219 "Acoustical Joint Sealants."

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

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

**3.2 INSTALLATION**

- A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated and manufacturer's written installation instructions.
- B. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.
- C. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes and similar items.
- D. Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

**3.3 PROTECTION**

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

**END OF SECTION 09 21 16.23**

**Section 09 24 00 - LATH AND PLASTER**

**PART 1 - GENERAL**

- A. Work Included: Provide labor, material, equipment and services to furnish and install portland cement plaster and accessories as shown on the drawings, as specified herein, and as needed for a complete and proper installation.
1. Work to include 3 coat plaster on lath over vapor barrier on plywood, texture and finish to match existing on site – See Partition Schedule A5.10 – Wall Type W4.for requirement.
- B. Submittals: Submit product data, installation instructions and a 4-foot square plaster panel for color and texture.
- C. Quality Assurance
1. Comply with requirements of ASTM C 926.
  2. Comply with Metal Lath/Steel Framing Association "Specifications for Metal Lathing and Furring" (ML/SFA).
  3. Regulatory Requirements: Comply with CBC Section 2507.

**PART 2 - PRODUCTS**

- A. GENERAL
1. The intent is for the new plaster ,finish texture and color , to match the existing wall plaster finish to the degree possible.
- B. LATH MATERIALS AND ACCESSORIES
1. Metal Lath: Comply with ML/SFA standards.
    - a. Type F, Flat Base: Flat expanded copper-bearing steel weighing 3.4 pounds per square yard, galvanized.
    - b. Type SF, Self-Furring Base: Type F Flat Base lath with indentations 1/4 inch deep spaced 6 inches each direction.
  2. Building Paper (Felt): Comply with requirements of FS UU-B-790, Type I, Grade B, vapor-retardant, Style 2.
  3. Attachments and Fastenings:
    - a. Tie Wire: 18 gage, FS QQ-W-461h, Finish 5, Class 1 soft temper.
    - b. Screws: Galvanized, self-drilling, and self tapping.
    - c. Nails and Staples: Type, use and application required by code.
    - d. Clips: Formed from galvanized steel sheets or wire.
  4. Typical Galvanized steel Accessories:
    - c. Casing Beads: ANSI A42.3; 24 gage flange.
    - d. Strip Reinforcement: No.19 gage wire fabric.
  5. Aluminum Accessories, where indicated :
    - a. Corners : Fry Reglet 'PCM-75-75' Corner Key.
    - b. Weep Screed : Fry Reglet 'FWS-875' 3-1/2" screed length.



- c. Control Joints : Fry Reglet 'PCS-75-25/25' 1/4" Channel Screed. Clear anodized finish.
- B. PLASTER MATERIALS: Three-Coat System on Lath per ASTM C 926. No lime or other plasticizer may be added to plastic or waterproofed cement plaster at the time of mixing.
1. Portland Cement: ASTM C 150, Type II.
  2. Sand: ASTM C 144.
  3. Lime: ASTM C 206, hydrated, Type S.
  4. Water: Clean and potable.
  5. Waterproofing Agents: In Portland Cement Scratch and Brown Coats: A.C. Horn "Hydrotite"; Sonneborn Co. "Hydrocide Powder".
  6. Other Admixtures: As approved by Architect.
  8. Bonding Agent: Acryl 60 by Thoro Products; or approved equivalent.

### **PART 3 - EXECUTION**

- A. Preparation: Protect surfaces near the area of work from damage and disfiguration.
1. Apply in accordance with manufacturer's instructions.
- B. Installation:
1. Comply with requirements of ASTM C 926 including Annexes.
  2. Protect surfaces near or adjacent to plastering work.
  3. Install lath and related accessories straight, plumb, or level to provide required thickness of plaster.
  4. Exposed finish surfaces shall be true, even, without waves, cracks, or imperfections. Surface tolerance shall be limited to 1/8 inch in 8 feet as measured in any direction from a 10 foot straight edge.
  5. Penetrations: Flash all penetrations.
- C. Metal Lath Application: Install in accordance with ML/SFA and CBC as follows, unless otherwise indicated on Drawings.
1. Comply with 2016 CBC DSA Amendment 2503.2 - Additional Requirements for Inspection and Testing.
  2. Comply with 2016 CBC DSA Amendment 2504.2 - Additional Requirements for Horizontal and Vertical Assemblies.
  3. Comply with 2016 CBC DSA Amendment 2507.3 - Additional Requirements for Lath Attachment to Horizontal Wood Supports.
  4. Provide a weep screed at the foundation plate line or below, on all stud walls.
  5. Grout all hollow metal door and/or window frames prior to application of the lathing.
- D. Accessories
1. Apply corner beads at all external plaster corners using single lengths without joints.
  2. Install casing beads at terminations of all plaster surfaces unless otherwise shown.
  3. Install control and expansion joints in exterior plaster work as noted or at maximum 10 foot centers.
  4. Install accessory trim with pieces straight, aligned, plumb and level; corners mitered and smooth.
- E. Plaster Application: Comply with requirements of ASTM C-926 and the CBC.

1. Apply mill-mixed prepared cement plaster finish in strict accordance with approved manufacturer's directions.
  2. V-groove finish plaster at junction with metal frames.
  3. Where plaster is to run behind built-in items, apply full thickness of all plaster work the same as at exposed areas.
  4. Clean expansion joints and other reveals free of plaster before it sets.
- F. Plaster Curing: Keep plaster damp for at least 48 hours after application.
1. Moist-cure plaster base and finish coats to comply with ASTM C 926, including "Annex A2 Design Considerations".
  2. Protect work from uneven and excessive evaporation during hot, dry weather and from wind.
- G. Finish Color and Texture: Provide finish color and texture to match existing plaster elements on existing adjacent surfaces.

**END OF SECTION 09 24 00 – LATH AND PLASTER**

**SECTION 09 29 00 – GYPSUM BOARD**

1. GENERAL:

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including Supplementary conditions and Division-1 Specification Sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Types of work include:

1. Gypsum board applied to steel framing and furring.
2. Gypsum backing boards for application of other finishes.
3. Gypsum board finishing (joint tape-and-compound treatment).

B. Related Work Specified Elsewhere:

1. Section 05 40 00 - Cold Formed Metal Framing
2. Section 08 11 10 – Doors and Frames
3. Section 09 90 00 – Painting

1.2 QUALITY ASSURANCE:

- A. Fire Resistance Ratings: Where gypsum board systems with fire-resistance ratings are indicated, provide materials and installations which are identical with those of applicable assemblies tested per ASTM E 119 by fire testing laboratories acceptable to authorities having jurisdiction.
- B. Gypsum Board Terminology Standard: GA-505 by Gypsum Association.
- C. Single-Source Responsibility: Obtain gypsum board products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.

1.4 SUBMITTALS:

- A. Product Data: submit manufacturer's product specifications and installation instructions for each gypsum drywall component, including other data as may be required to show compliance with these specifications.

1.5 DELIVERY

- A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.
- C. Handle gypsum boards to prevent damaged edges and ends of surfaces. Protect metal corner beads and trim from being bent or damaged.

1.6 PROJECT CONDITIONS:

- A. Environmental Requirements, General: Comply with requirements of referenced gypsum board application standards and recommendations of gypsum board manufacturer, for environmental conditions before, during and after application of gypsum board.
- B. Cold Weather Protection: For installation of gypsum board and finishes, room temperature should be maintained at not less than 40°F for mechanical application of gypsum board and not less than 50°F for adhesive application of gypsum board and for joint treatment, texturing and decoration. Where materials are being mixed and used for joint treatment or the laminating of one layer of board to another, the temperature of the building should be maintained at not less than 50°F for 48 hours before and continuously until applied materials are thoroughly dry. When a temporary heat source is used, the temperature should not exceed 95°F in any given room or area.
- C. Ventilation: Ventilate building spaces as required to remove water in excess of that required for drying joint treatment material immediately after its application. Avoid drafts during dry, hot weather to prevent too rapid drying.

2. PRODUCTS

2.1 MANUFACTURER: Subject to compliance with requirements, provide products of one of the following:

A. Gypsum Board and Related Products:

American Gypsum Co.  
Georgia-Pacific Corp.  
Gold Bond Building Products Div., National Gypsum Co.  
United States Gypsum Co.

B. Wall/Partition Support Materials:

- 1. Studs: See Section 05 40 00.

2.3 GYPSUM BOARD:

- A. Gypsum Board: ASTM C 36, (ASTM C 1395 – Ceilings, ASTM C 931-Exterior) of types, edge configuration and thickness indicated below; in maximum lengths available to minimize end-to-end butt joints.

- 1. Type: Regular assemblies  
Type "X" where indicated
- 2. Edges: Tapered.
- 3. Thickness: 5/8", unless otherwise indicated.

2.2 TRIM ACCESSORIES:

- A. General: Provide manufacturer's standard trim accessories of types indicated for drywall work, formed of galvanized steel unless otherwise indicated, with either

knurled and perforated or expanded flanges for nailing or stapling, and beaded for concealment of flanges in joint compound. Provide corner beads, L-type edge trim beads, U-type edge trim beads, special L-kerf-type edge trim beads, and one piece control.

1. Semi-finishing type: Manufacturer's standard trim units which are not to be finished with joint compound (non-beaded).
2. Plastic Edge Trim: Manufacturer's standard rigid or semi-rigid PVC moldings of the semi-finished type, shaped to provide resilient contact of gypsum board edges with other work; friction-fit, or pressure-sensitive adhesive mounting.

2.3 JOINT TREATMENT MATERIALS:

- A. General: ASTM C 475; type recommended by the manufacturer for the application indicated, except as otherwise indicated.
- B. Joint Tape: Paper reinforcing tape.
- C. Joint Compound: On interior work provide chemical-hardening-type for bedding and filling, ready-mixed vinyl-type or vinyl-type powder type for topping.

2.4 MISCELLANEOUS MATERIALS:

- A. General: Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the manufacturer of the gypsum board..
  1. Gypsum Board Screws: comply with ASTM C 954 or ASTM C 1002, and manufacturer's listings for fire assemblies.
  2. Concealed Acoustical Sealant: Non-drying, non-hardening, non-skinning, non-staining, non-bleeding, gunnable sealant for concealed applications per ASTM C 919.
  3. Exposed Acoustical Sealant: Non-oxidizing skinnable, paintable, gunnable sealant for exposed applications per ASTM C 919.
  4. Sound Attenuation Blankets: FS HH-I-521, Type I; semi-rigid mineral fiber blanket without membrane, Class 25 flame-spread, thickness as indicated.
  5. Polyethylene Vapor Retarder: A single polyethylene film, 4.0 mils, thick, with a vapor rating of 0.20 perms per ASTM E 96.

3. EXECUTION

3.1 GENERAL GYPSUM BOARD INSTALLATION REQUIREMENTS:

- A. Gypsum Board Application and Finishing Standards: ASTM C 840, GA 216, and manufacturer's listings for fire-resistant Assemblies.
- B. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 1'-0" in alternate courses of board.
- C. Install ceiling boards in the direction and manner, which will minimize the number of end-butt joints, and which, will avoid end joints in the central area of each ceiling. Stagger end joints at least 1'-0".
- D. Install wall/partition boards vertically to avoid end-butt joints wherever possible.
- E. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.
- F. Locate either edge or end joints over supports, except in horizontal applications or where intermediate supports or gypsum board back blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill cut or field cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
- G. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.
- H. Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories.

3.2 METHODS OF GYPSUM DRYWALL APPLICATION:

- A. Single-layer Application: Install gypsum wallboard.
  - 1. On ceilings apply gypsum board prior to wall partition board application to the greatest extent possible.
  - 2. On partitions/walls apply gypsum board vertically (parallel), unless otherwise indicated, and provide sheet lengths which will minimize end joints.
- B. Single-Layer Fastening Methods: Apply gypsum boards to supports as follows:
  - 1. Fasten with screws, per manufacturer's recommendation, and per their listings for fire-resistant assemblies.
- C. Double-Layer Fastening Methods: Apply base layer of gypsum board and face layer to base layer as follows:

1. Fasten both base layers and face layers separately to supports with screws.
- D. Direct-Bonding to Substrate: Where gypsum board is indicated to be directly adhered to a substrate (other than studs, joists, furring members of base layer of gypsum board,) comply with gypsum board manufacturer's recommendations, and temporarily brace or fasten gypsum board until fastening adhesive has set.

3.3 INSTALLATION OF DRYWALL TRIM ACCESSORIES:

- A. General; Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges by nailing or stapling in accordance with manufacturer's instructions and recommendations.
- B. Install metal corner beads at external corners of drywall work.
- C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where semi-finishing type is indicated. Install L-type trim where work is tightly abutted to other work, and install special kerf-type where other work is kerfed to receive long leg of L-type trim. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).
- D. Install plastic edge trim where indicated on wall panels at juncture with ceilings.
- E. Install metal control joint (beaded-type) where indicated.

3.4 FINISH DRYWALL

- A. General: For paint finish - Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fastener heads, surface defects and elsewhere as required to prepare work to decoration. Prefill open joints and rounded or beveled edges, if any, using type of compound recommended by manufacturer.
  1. Apply joint tape embedded in joint compound at joints and interior angles between gypsum boards, except where trim accessories are indicated.
  2. Apply one additional coat of joint compound applied over all joints and interior angles.
  3. Fastener heads and accessories shall be covered with two separate coats of joint compound.
  4. Joint compound shall be smooth and free of tool marks and ridges.

- B. Partial Finishing: Omit second coat (if specified) and sanding on concealed drywall work which is indicated for drywall finishing or which requires finishing to achieve fire-resistance rating, sound rating or to act as air or smoke barrier.

Refer to sections of painting, coatings and wall-coverings in Division 9 for decorative finishes to be applied to drywall work.

- C. Finish: typically light orange peel, machine applied. Omit finish where gypsum wallboard is concealed in structure or by other finish materials. See Finish Schedules for other exceptions.

3.5 PROTECTION OF WORK:

- A. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall work being without damage or deterioration.

**END OF SECTION 09 29 00**



**SECTION 09 51 20 – ACOUSTICAL CEILING**

**1. GENERAL**

**1.1 DESCRIPTION OF WORK:**

- A. Extent of each type of acoustical ceiling is shown and scheduled on drawings.
- B. Types of acoustical ceilings specified in this section include the following:
  - 1. Acoustical panel ceilings, exposed suspension system...

**1.2 QUALITY ASSURANCE:**

- A. Installer Qualifications: Firm with not less than 3 years of successful experience in installation of acoustical ceilings similar to requirements for this project and which is acceptable to manufacturer of acoustical units, as shown by current written statement from manufacturer. Installer shall be familiar with DSA I.R. 25-2.
- B. Fire Performance Characteristics: Provide acoustical ceiling components that are identical to those tested for the following fire performance characteristics, according to ASTM test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate marking of applicable testing and inspecting agency.
  - 1. Surface Burning Characteristics: As follows, tested per ASTM E 84.  
Flame Spread: 25 or less  
Smoke Developed: 50 or less
  - 2. Fire Resistance Ratings: As indicated by reference to design designation in UL "Fire Resistance Directory" of "FM Approval Guide," for floor, roof or beam assemblies in which acoustical ceilings function as a fire protective membrane; tested per ASTM E 119. Provide protection materials for lighting fixtures and air ducts to comply with requirements indicated for rated assembly.
- C. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, fire-suppression system components (if any) and partition system (if any).

**1.3 SUBMITTALS:**

- A. Product Data: Manufacturer's product specifications and installation instructions for each acoustical ceiling material required and for each suspension system, including certified laboratory test reports and other data as required to show compliance with these specifications.
  - 1. Include manufacturer's recommendations for cleaning acoustical unit, including precautions against materials and methods which may be detrimental to finishes and acoustical performances.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver acoustical ceiling units to project site in original unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS:

- A. Space enclosure: Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

2. PRODUCTS

2.1 ACOUSTICAL CEILING UNITS, GENERAL:

- A. Colors, Textures, and Patterns: Provide products as selected by Architect from manufacturer's standard colors, surface textures, and patterns available for acoustical ceiling units and exposed metal suspension system members of quality designated.

2.2 ACOUSTICAL PANELS:

- A. All Areas: CertainTeed Symphony m Rx High NRC or equal:
  - 1. 1220B -80 – RXS – 1, square edge, white 24"x48"x 7/8".

2.3 EXPOSED METAL DIRECT-HUNG SUSPENSION SYSTEMS:

System to comply with ICC Report ESR – 1308 , Seismic Category D-F.

- A. Single Web Steel Suspension System:

- 1. Structural Classification: Armstrong Corp., Heavy-Duty System
  - a. Armstrong Prelude Plus XL Fire Guard, 15/16" Environmental Tee System or as recommended by CertaiTeed
  - b. Finish: Factory Finish White Aluminum.

2.5 MISCELLANEOUS MATERIALS

- A. Acoustical Sealant: Resilient, non-staining, non-shrinking, non-hardening, non-skinning, non-drying, non-sag sealant intended for interior sealing of concealed construction joints.
  - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
    - Tremco Acoustical Sealant; Tremco
    - USG Acoustical Sealant; United States Gypsum Co.

Chem-Calk 600; Woodmont Products, Inc.

- B. Compression Posts: As detailed on drawings

3. EXECUTION

3.1 PREPARATION:

- A. Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.
1. Furnish concrete inserts, steel deck hanger clips and similar devices to other trades for installation well in advance of time needed for coordination of other work.
- B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans wherever possible.

3.2 INSTALLATION:

- A. General: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire-resistance rating requirements as indicated, and industry standards applicable to work.
- B. Arrange acoustical units and orient directionally patterned units (if any) in manner shown by reflected ceiling plans.
- C. Install acoustical tile by cementing to substrate, using amount of adhesive and procedure recommended by tile manufacturer. Maintain tight butt joints, aligned in both directions, and coordinated with ceiling fixtures. Scribe and cut tile to fit accurately at ceiling edges and penetrations.
- D. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperatures. Wires shall be prevented from sliding along framing.
- E. Install hangers plumb and free from contact with insulation or other objects with ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, countersplaying or other equally effective means.
- F. Install edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.
1. Sealant Bed: Apply continuous ribbon of acoustical sealant, concealed on back of vertical leg before installing molding.
  2. Screw-attach moldings to substrate at intervals not over 16" o.c. and not more than 3" from ends leveling with ceiling suspension system to tolerance of 1/8" in 12'-0". Miter corners accurately and connect securely. Butt splice only.

3.3 ADJUST AND CLEAN:

- A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.4 EXTRA STOCK: Deliver stock of maintenance material to Owner, furnish maintenance material matching products installed, packaged with protective covering for storage and identified with appropriate labels.

- A. Acoustical Ceiling Units: (lay-in panels and tiles) Furnish quantity of full size units equal to 2% of amount installed.
- B. Exposed Suspension Components: Furnish quantity of each exposed component required for actual installation equal to 1% of amount installed.

**END OF SECTION 09 51 00**

**Section 09 67 23 RESINOUS FLOORING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Work Included: Provide and install multi-part urethane resin floor system, complete, as shown on Drawings and as specified, including:
  - 1. Locations: Areas as indicated by the Plan finish schedule.
  - 2. Provide preparation of substrate as recommended by the resinous flooring manufacturer.
  - 3. Provide and install cove base with trims and accessories as specified in this Section.
  - 4. Provide and install multi-part resinous floor system as specified in this Section.
  - 5. Provide and install sealant joint material for the Work of this Section as specified in this Section.
  
- B. Related Work Specified Elsewhere:
  - 1. Division 03 30 00 – Cast-in-Place Concrete
  - 2. Division 07 90 00 – Joint Protection

**1.2 SUBMITTALS**

- A. Comply with provisions of Section 01 33 00 – Submittal Procedures.
  
- B. Product Data: Submit manufacturer's technical data, installation instructions, and general recommendations for each resinous flooring material required.
  - 1. Include certification that indicates compliance of materials with requirements.
  
- C. Samples: Submit, for verification purposes, 5-inch square samples of each type of resinous flooring required, applied to a rigid backing, in color and finish indicated.
  - 1. For initial selection of colors and finishes, submit manufacturer's color charts showing full range of colors and finishes available.
  
- D. Certificates: By manufacturer of resinous flooring; upon completion of Work, written statement that technical support to applicator and field supervision was sufficient to assure proper application of materials and that installation is acceptable.
  
- E. Maintenance Instructions: Submit manufacturer's written instructions for recommended maintenance practices.

**1.3 QUALITY ASSURANCE**

- A. Qualifications of the Applicator: Licensed or approved by the manufacturer of the coating system and has successfully completed 5 projects of similar size and

complexity.

- B. Single Source Responsibility: Obtain primary resinous flooring materials including primers, resins, hardening agents, finish or sealing coats from a single manufacturer with not less than ten years of successful experience in manufacturing and installing principal materials described in this Section.
- C. Special Requirements: Regulatory Agencies: Use materials for Work of this Section which comply with volatile organic compound limitations and other regulations of local Air Quality Management District and other local, state, and federal agencies having jurisdiction.
- D. ISO 9001: All materials, including primers, resins, curing agents, finish coats, aggregates and sealants are manufactured and tested under an ISO 9001 registered quality system.

#### 1.4 PRE-INSTALLATION CONFERENCE

- A. Comply with requirements Project Meetings.
- B. Arrange a conference at the job site to coordinate resinous flooring and critical finish systems, to be attended by the General Contractor, Architect/Owner's Representative and personnel involved in the actual manufacture as well as the installation of the Work in this Section and of the following Sections:
  - 1. Section 03 30 00 – Cast-In-Place Concrete
  - 2. Section 07 42 00 – Wall Panels

#### 1.5 PROJECT CONDITIONS

- A. Type 1 concrete shall be properly cured for a minimum of 7 days.
- B. Utilities, including electric, water, heat (air temperature between 60 and 85°F/16 and 30°C) and finished lighting to be supplied by General Contractor.
- C. Job area to be free of other trades during, and for a period of 24 hours, after floor installation.
- D. Protection of finished floor from damage by subsequent trades shall be the responsibility of the General Contractor.

#### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Material shall be delivered to job site and checked by flooring contractor for completeness and shipping damage prior to job start.
- B. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors.
  - 1. No on site weighing or volumetric measurements allowed.

- C. Material shall be stored in a dry, enclosed area protected from exposure to moisture.
  - 1. Temperature of storage area shall be maintained between 60 and 85-degrees F.

## 1.7 WARRANTY

- A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of one (1) one full years from date of installation, or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of (1) one full year from date of installation. A sample warranty letter must be included with bid package or bid may be disqualified.
  - 1. Resinous manufacturer representative shall return to project within 6 months to conduct inspection of resinous floor area.

## PART 2 - PRODUCTS

### 2.1 RESINOUS FLOORING

- A. Colors:
  - 1. As selected by the Architect from manufacturer's standard colors.
- B. Resinous Flooring
  - 1. Basis of Design: Stonshield UTS, total minimum thickness of 1/4", is comprised of a, four-component mortar consisting of polyurethane resin, curing agent, selected, graded aggregates blended and inorganic pigments, two applications of brightly colored, quartz silica broadcast, and one finish application of a two-component, high performance, clear polyurethane sealer as manufactured and installed by Stonhard, Contact: John Wagner, Ph: (800) 854-0310, [jwagner@stonhard.com](mailto:jwagner@stonhard.com).
- C. System Components: Manufacturer's standard components that are compatible with each other and are as follows:
  - 1. Mortar Base (Stonclad UT Mortar Base):
    - a. Resin: Polyurethane Mortar
    - b. Formulation Description: Four-component mortar consisting of polyurethane resin, curing agent, selected, graded aggregates blended with inorganic pigments.
    - c. Type: Pigmented mortar
    - d. Application Method: Screed Applicator
    - e. Application thickness: 1/4" minimum
  - 2. First Broadcast (Stonshield Broadcast Quartz Aggregate):
    - a. Resin: N/A
    - b. Formulation Description: Brightly colored quartz aggregate

- c. Type: Multi-Color
  - d. Application Method: Stonhard Spraycaster into uncured mortar base
  - e. Finish: N/A
  - f. Number of Applications: 1
3. Undercoat (Stonseal CA7)
- a. Resin: Aspartic Polyurethane
  - b. Formulation Description: Two-component, high performance, UV resistant, solvent free, polyurethane sealer.
  - c. Type: Clear
  - d. Application Method: Squeegee/Roller
  - e. Finish: Gloss
  - f. Number of Coats: 1
4. Second Broadcast (Stonshield Broadcast Quartz Aggregate):
- a. Resin: N/A
  - b. Formulation Description: Brightly colored quartz aggregate
  - c. Type: Multi-Color
  - d. Application Method: Stonhard Spraycaster into uncured Stonshield UTS Sealer
  - e. Finish: N/A
  - f. Number of Applications: 1
5. Sealer (Stonseal CA7):
- a. Resin: Aspartic Polyurethane
  - b. Formulation Description: Two-component, high performance, UV resistant, solvent free, polyurethane sealer.
  - c. Type: Clear
  - d. Application Method: Squeegee/Roller
  - e. Finish: Gloss
  - f. Number of Coats: 1
- D. Surface Texture:
- 1. Stonshield – Medium Texture
    - a. Surface texture shall approximate sample submittal approved by the Architect.
- E. Expansion/Isolation Joint Sealant Materials:
- 1. Stonflex MP7: Two-component, pourable polyurethane sealant.
- G. Coved Base:
- 1. Stonshield Cove Base: Three-component, epoxy cove base mortar applied to the height indicated on Drawings and Finish Schedule.



**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. General: Examine substrate to receive resinous flooring; give written notification of deficiencies. Do not proceed until unsatisfactory conditions are corrected.
  - 1. Substrate must be dry and free of all wax, grease, oils, fats, soil, loose or foreign materials and laitance.
    - a. Laitance and unbonded cement particles must be removed by abrasive blasting, scarifying.
    - b. Other contaminants may be removed by scrubbing with a heavy-duty industrial detergent, "Stonkleen DG9", or equal; and rinsing with clean water.
    - c. The surface must show open pores throughout and have a sandpaper texture.

**3.2 PREPARATION**

- A. Surface Preparation: Concrete preparation shall be by mechanical means and include use of a scabber, scarifier or shot blast machine for removal of bond inhibiting materials such as curing compounds or laitance.

**3.3 MIXING**

- A. General: Mix components only in amounts that can be applied within recommended application life.
  - 1. Discard materials not used within application life.

**3.4 SYSTEM APPLICATION**

- A. General: Apply each component of resinous flooring system in compliance with manufacturer's written directions to produce a uniform monolithic wearing surface of thickness indicated, uninterrupted except at divider strips, sawn joints or other types of joints (if any), indicated or required.
- B. Resinous Flooring:
  - 1. Mortar Base: Mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate at manufacturer's recommended height using specially designed trowel.
  - 2. First Broadcast: Immediately broadcast quartz silica aggregate into the mortar base using manufacturer's specially designed spraycaster. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.
  - 3. Under Coat: Remove any surface irregularities by lightly abrading and

vacuuming the floor surface. Mix and apply undercoat with strict adherence to manufacturer's installation procedures and coverage rates.

4. Second Broadcast: Immediately broadcast quartz silica aggregate into the under coat using manufacturer's specially designed sprycaster. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.
  5. Sealer: Remove excess unbonded granules by lightly brushing and vacuuming the floor surface. Mix and apply sealer with strict adherence to manufacturer's installation procedures.
- C. Cove Base:
1. Mix and apply cove base mortar in conjunction with mortar base of resinous flooring at the height indicated on Drawings and/or Finish Schedule.
- D. Surface Texture:
1. Apply Sealer at a rate to achieve a surface that approximates samples submitted.
- E. Stonflex MP7:
1. Sealant: Mix and apply sealant to properly prepared cut joints (if any). The use of a polyethylene backer rod should be used in expansion and/or isolation joints.

### 3.5 FIELD QUALITY CONTROL

- A. The right is reserved to invoke the following material testing procedure at any time, and any number of times during period of flooring application.
1. The Owner will engage service of an independent testing laboratory to sample materials being used on the job site. Samples of material will be taken, identified and sealed, and certified in presence of Contractor.
  2. Testing laboratory will perform tests for any of characteristics specified, using applicable testing procedures referenced herein, or if none referenced, in manufacturer's product data.
  3. If test results show materials being used do not comply with specified requirements, Contractor may be directed by the Owner to stop work; remove non-complying materials; pay for testing; reapply flooring materials to properly prepared surfaces which had previously been coated with unacceptable materials.

### 3.6 PROTECTION OF ADJACENT WORK

- A. General: Resinous floor system will be installed in locations where other adjacent finish materials, including ornamental metal, lath and plaster, and other finish assemblies may already be in place. Protect all adjacent surfaces during installation and finishing.
  - 1. Installed adjacent finishes shall be completely isolated from epoxy coating system installation. Provide Plastic ("Visqueen") wrap and mask all edges.
  - 2. Provide constant supervision and immediate clean up throughout resinous floor system installation.
  - 3. After resinous floor system has fully cured, remove protection from adjacent surfaces and wipe down surfaces using clean, cotton towels.

### 3.7 CURING, PROTECTION AND CLEANING

- A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process.
  - 1. Close area of application for a minimum of 24 hours.
- B. Protect resinous flooring materials from damage and wear during construction operation.
  - 1. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application.
  - 2. General Contractor is responsible for protection and cleaning of surfaces after final coats.
- C. Cleaning:
  - 1. Remove temporary covering and clean resinous flooring just prior to final inspection.
  - 2. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

**END OF SECTION 09 67 23**

**Section 09 77 00 - FIBER REINFORCED PLASTIC PANELS (FRP)**

**PART 1 - GENERAL**

- A. Work Included: Provide labor, material, equipment and services to furnish and install FRP wall panels as shown on the drawings, as specified herein, and as needed for a complete and proper installation.
- B. Submittals: Submit product data and 8 by 8 inch sample. Color to match existing adjacent FRP panels in the MP room.

**PART 2 - PRODUCTS**

General : Provide products of Kemlite Sequentia or approved equal.

- A. Fiberglass Reinforced Panels (FRP): Equal to Sequentia **"StructoGlas Class 'C' Embossed FTST.**
  - 1. Thickness: 0.09 inches.
  - 2. Color: as selected by the Architect from manufacturer's standard colors..
  - 3. Mouldings / Trim: non-staining one or two-piece vinyl or PVC moldings from manufacturer's standard moldings to finish all exposed panel edges.
  - 4. Caulks and Adhesives: Clear silicone sealant and construction grade adhesives as recommended by panel manufacturer.
  - 5. Fasteners: Non-corroding (nylon or stainless steel) rivets and screws as recommended by panel manufacturer.

**PART 3 - EXECUTION**

- A. Installation: Comply with requirements of General Conditions - Product Requirements for Material Selection, Handling and Installation.
  - 1. Install in accordance with manufacturer's instructions.
  - 2. Install panels with not less that 1/4" gap at top of base and ceiling and 1/8" gap between panels and around pipes and other penetrations.
  - 3. Trim all edges and joints with moldings.
  - 4. Fill gaps with flexible silicone based sealant.
  - 5. Install panel fasteners in pre-drilled holes at 8" centers around panel perimeter and at 12" centers in field. Fasteners shall be 1" from panels edges.
  - 6. Caulk all ceiling and base junctures and fastener holes.

**END OF SECTION 09 77 00 - FRP**

**Section 09 91 00 - PAINTING**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

Labor, materials, equipment and services for painting and surface preparation for interior and exterior unfinished surfaces as scheduled on the drawings, as listed in the Painting Schedule, and as specified herein. Also provide;

1. Repainting and surface preparation at areas of remodeling.
2. Painting and surface preparation of exposed mechanical and electrical piping, conduit, ductwork, and equipment.
3. Painting of entire surface, or plane, where patch painting is required.

Exterior Work: Paint areas of new construction to match existing. Paint where noted on exterior elevations. Allow for two [2] different pigmented colors to be used.

Interior work: Paint areas of new construction to match existing. Paint where noted on finish schedule. Allow for two [2] different pigmented colors to be used.

**1.2 RELATED SECTIONS**

- A. Section 07 60 00 – Sheet Metal Flashing and Trim.

**1.3 REFERENCES**

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of this Project Manual
- C. Referenced Standards:
  1. ASTM D523 – Standard Test Method for Specular Gloss.
  2. The Master Painters Institute, MPI Gloss and Sheen Levels.

**1.4 QUALITY ASSURANCE**

- A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with sufficient documented experience.
- B. Applicator: Company specializing in commercial painting and finishing with sufficient documented experience.
- C. Gloss Levels: Per Master Painters Institute (MPI) gloss standards “MPI Gloss and Sheen Levels,” measured in accordance with ASTM D523.

GLOSS LEVEL	DESCRIPTION	GLOSS AT 60 DEGREES ASTM D523	SHEEN AT 85 DEGREES ASTM D523
G1	A traditional matte finish – flat.	5 units, maximum	and 10 units, maximum
G2	A high side sheen flat - "a velvet-like" finish.	10 units, maximum	and 10 - 35 units
G3	A traditional "eggshell-like" finish.	10 - 25 units	and 10 - 35 units
G4	A "satin-like" finish.	20 - 35 units	and 35 units, minimum
G5	A traditional semi-gloss.	35 - 70 units	-
G6	A traditional gloss.	70 - 85 units	-
G7	A high gloss.	More than 85 units	-

**1.5 REGULATORY REQUIREMENTS**

- A. Conform to California Building Code for flame spread and smoke density requirements for finishes.
- B. Furnish certification that all paint coatings furnished for the location of the project comply with the EPA clean air act for permissible levels of volatile organic content for architectural coatings applied in California as designated by California Air Resources Board (CARB).

**1.6 SUBMITTALS**

- A. Provide product data on all finishing products.
- B. Submit four brush-out samples 8 inches by 10 inches in size illustrating color selected for each surface finishing product scheduled.
- C. Field Sample: Furnish sample of actual paint colors selected on portion of building item to receive paint as directed by Architect, prior to beginning interior and exterior painting.

**1.7 DELIVERY, STORAGE AND HANDLING**

- A. Deliver products to site in manufacturer's original unopened, labeled containers; inspect to verify acceptance.
- B. Store and protect products from abuse and contamination.
- C. Container labeling is to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation and instructions for mixing and reducing.
- D. Store paint materials at minimum ambient temperature of 50 degrees F and a maximum of 90 degrees F, in well-ventilated area, unless required otherwise by manufacturer's instructions.
- E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

**1.8 ENVIRONMENTAL REQUIREMENTS**

- A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 50 degrees F for 24 hours before, during and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instructions.
- C. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior work and interior work, unless required otherwise by manufacturer's instructions.
- D. Provide lighting level of 80 foot candles measured mid-height at substrate surface.

**1.9 EXTRA STOCK**

- A. Provide a new and unopened five-gallon container of each type, color and sheen to Owner.
- B. Label each container with color, in addition to the manufacturer's label.

**PART 2 PRODUCTS**

**2.1 PAINT SYSTEMS, GENERAL**

- A. Material Compatibility:
  - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

**2.2 ACCEPTABLE MANUFACTURERS – PAINT**

- A. Refer to Table at the end of this Section.

**2.3 ACCEPTABLE MANUFACTURERS – PRIMER SEALERS**

- A. Refer to Table at the end of this Section.

**2.4 ACCEPTABLE MANUFACTURERS – STAIN AND CLEAR FINISHES**

- A. Refer to Table at the end of this Section.

**2.5 MATERIALS**

- A. All paint materials shall be provided from a single manufacturer unless noted otherwise in this Section.
- B. Coatings: Ready mixed. Process pigments to a soft paste consistency capable of being readily and uniformly dispersed to a homogeneous coating.

- C. Coatings: Good flow and brushing properties; capable of drying or curing free of streaks or sags.
- D. Accessory Materials: All other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.
- E. All Materials specified by brand name or manufacturer shall be delivered unopened at the job in their original containers.

**2.6 FINISHES**

- A. Refer to schedule at end of Section for surface finish schedule.

**PART 3 EXECUTION**

**3.1 GENERAL**

- A. Storage: All materials used by the painting contractor shall be stored and mixed in a place designated by the Owner or the Architect. The storage place must be kept neat and clean at all times. All cloths, waste or other material that might constitute a fire hazard shall be placed in a suitable metal container or shall be removed from the site or destroyed at the end of each day's work.

**3.2 INSPECTION**

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
  - 1. Plaster; Gypsum Wallboard: 18 percent.
  - 2. Concrete Masonry Units: 10 percent.
  - 3. Interior Located Wood: 15 percent.
  - 4. Exterior Located Wood: 7 percent.
- D. Beginning of application constitutes acceptance of existing surfaces.

**3.3 PREPARATION**

- A. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or painting.
- B. Correct minor defects and clean surfaces that affect work of this Section.
- C. Seal marks that may bleed through surface finishes.
- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. Gypsum Board Surfaces: Latex fill minor defects. Spot-prime defects after repair.



- F. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer, unless otherwise recommended by finish coating system manufacturer.
- G. Shop-Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces as recommended by primer manufacturer. Prime shop-primed steel items with steel primers specified in this Section.
- H. Interior Wood Items Scheduled to Receive Finish: Hand sandpaper and wipe off dust and grit prior to priming. Seal knots, pitch streaks and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.
  - 1. At woodwork with transparent finish, nail holes, cracks or defects shall be filled with wood filler tinted to match color of stain.

### 3.4 PROTECTION

- A. Protect elements surrounding the work of this Section from damage or disfiguration.
- B. Repair damage to other surfaces caused by work of this Section.
- C. Furnish drop cloths, shields and protective methods to prevent spray or droppings from disfiguring other surfaces.
- D. Remove empty paint containers from site.

### 3.5 WORKMANSHIP

- A. All work shall be performed by experienced mechanics in a skillful manner. All materials shall be evenly applied so as to be free from sags, crawls or other defects. Coats shall be of the proper consistency and well brushed out as to show the minimum brush marks, except varnish and enamel which shall be uniformly applied. Brushes shall be clean and in good condition. All areas with a transparent coat will be repainted at contractor's expense.
- B. All painting shall be by brush, except plaster and gypsum board which shall be by brush and roller. Underside of soffits, covered walks, acoustical panels and screens may be completed by spraying.
- C. No work shall be completed under conditions that are unsuitable for the production of good results. No painting shall be completed while plaster is curing, or while wood sawing, sanding or cleaning is in process. Coats shall be thoroughly dry before the succeeding coat is applied. Finishes shall be uniform as to sheen, shine, color and texture, except when glazing is required.
- D. No exterior painting shall be done in rainy, damp, or frosty weather. No Interior painting or finishing shall be permitted until the building has been thoroughly dried out by artificial heat. A minimum temperature of 50 degrees Fahrenheit shall be maintained in areas where the application or drying of paint is occurring.

### 3.6 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.

1. Paint mil thicknesses shall not be less than the minimums recommended by the paint manufacturers.
  2. No Paint, varnish or stain shall be reduced or applied in any way except as herin specifically call for, or recommended by the manufacturer.
- B. Do not apply finishes to surfaces that are not dry.
  - C. Apply each coat to uniform finish.
  - D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
  - E. Sand lightly between coats to achieve required finish.
  - F. Allow applied coat to dry before next coat is applied.
  - G. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
  - H. Prime back surfaces of interior and exterior woodwork with primer paint, type as recommended by manufacturer.
  - I. Prime back surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.
- 3.7 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT
- A. See Divisions 21 – 23 and 25 – 28 for other items requiring painting.
  - B. Paint interior surfaces of air ducts and convector heating cabinets that are visible through grilles and louvers with one) coat of flat black paint, to limit of sight line. Paint dampers exposed behind grilles to match face panels. Paint all new interior and exterior exposed ductwork and ductwork supports. Paint all new conduit, pipes and conduit/pipe supports in exposed interior and exterior locations.
  - C. Reinstall electrical plates, hardware, light fixture trim, and fittings removed for surface preparation or painting.
  - D. Do not paint factory-finished mechanical and electrical equipment.
- 3.8 CLEANING
- A. As Work proceeds, promptly remove paint where spilled, splashed or spattered.
  - B. During progress of Work, maintain premises free of unnecessary accumulation of tools, equipment, surplus materials and debris.
  - C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove from site daily.

- 3.9 PAINTING SCHEDULE – EXTERIOR SURFACES: Descriptions in schedule apply to new surfaces. **See also part 1, 1.1**
- A. Ferrous Metal
    - 1st coat – Alkyd Flat Primer
    - 2nd and 3rd coats – 100 percent Acrylic Semi Gloss
  - B. Ferrous Metal (Industrial)
    - 1st coat – Epoxy Flat Primer
    - 2nd and 3rd coats – Aliphatic Urethane Gloss Enamel
    - For use at exterior metal architectural features/exposed structure
  - C. Galvanized Metal (Handrail and Guardrail Assemblies only)
    - 1st coat – Etch Prep
    - 2nd coat – Epoxy Satin Primer
    - 3rd and 4th coats – High Dispersion Pure Acrylic Polymer
  - D. Galvanized Metal and Aluminum (Except Handrail and Guardrail Assemblies)
    - 1st coat – Etch Prep
    - 2nd coat – Acrylic Flat Primer
    - 3rd and 4th coats – 100 percent Acrylic Semi-Gloss
  - E. Exposed Concrete and Cement Plaster System with Cementitious Finish
    - 1st coat – Acrylic Flat Primer
    - 2nd and 3rd coats – Elastomeric Flat
  - F. Cement Plaster System with Acrylic Finish
    - 1st coat – Acrylic Flat Primer
    - 2nd and 3rd coats – Elastomeric Flat
- 3.10 PAINTING SCHEDULE – INTERIOR SURFACES: Descriptions in schedule apply to new surfaces. \*\*Painting of existing painted surfaces is included in scope of work-see Part 1, 1.1 and Finish Schedule
- A. Gypsum Board
    - 1st coat – PVA Primer Sealer
    - Texture by Section 09 29 00 Contractor
    - 2nd coat – PVA Primer Sealer
    - 3rd and 4th coats – Latex Semi-Gloss Enamel
    - Typical paint system at toilet rooms, storage rooms, kitchen.
  - B. Gypsum Board
    - 1st coat – PVA Primer Sealer
    - Texture by Section 09 29 00 Contractor
    - 2nd coat – PVA Primer Sealer
    - 3rd and 4th coats – Latex Eggshell Enamel
  - C. Gypsum Board
    - 1st coat – PVA Primer Sealer
    - Texture by Section 09 29 00 Contractor
    - 2nd coat – PVA Primer Sealer

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3rd and 4th coats – Latex Flat Enamel

**D. Metal**

1st coat – Alkyd Flat Primer

2nd and 3rd coats – Latex Semi-Gloss Enamel

Typical paint system at all hollow metal doors and pressed metal frames.

Galvanized Metal, Zinc Alloy Metal and Aluminum

**E. 1st coat – Etch Prep**

2nd coat – Acrylic Flat Primer

3rd and 4th coats – Latex Semigloss Enamel

**PAINTING SCHEDULE**

APPLICATION	TYPE	MPI Gloss Level	MANUFACTURERS				
			ICI/Dev oe	Sherwin Williams	Kelly Moore	MDC	Tneme c
<b>PRIMERS</b>							
Exterior Ferrous Metal	Alkyd	G1	4160	B50WZ	1710	-	-
Exterior Ferrous Metal (Industrial)	Epoxy	G1	4030	B58 Series 646	7125	-	-
Exterior Galvanized Metal and Aluminum (Except Handrail and Guardrail Assemblies)	Acrylic	G1	4020	B66W1	1722	-	-
Exterior Galvanized Metal (Handrail and Guardrail Assemblies Only)	Epoxy	G1	-	-	-	-	V69
Exterior Wood and Pressure Treated Wood	Alkyd	G1	2110	B42W4 1	220	-	-
Exterior Cement Plaster and Concrete; and Interior Concrete	Acrylic	G1	2000	A24W3 00	247	-	-
Exterior Cement Plaster System with Acrylic Finish Coat	Acrylic	G1	3210	A100	250	-	-
Exterior and Interior Masonry (Block Filler)	Acrylic	G1	4000	B25W2 5	521	-	-
Interior Gypsum Board	PVA	G1	1030	B28W4 00	971	-	-
Interior Wood	Alkyd	G1	1120	B49WZ 2	975	-	-
Interior Ferrous Metal	Alkyd	G1	4160	B66- 310	1725	-	-
Interior Galvanized Metal	Acrylic	G1	4020	B66W1	1725	-	-
<b>FINISHES</b>							
Exterior Ferrous & Galvanized Metal, Aluminum, Wood and Pressure Treated Wood (Except Handrail and Guardrail	100 percent Acrylic	G5	2406	A8	1250	-	-

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Assemblies)								
Exterior Ferrous Metal (Industrial)	Aliphatic Urethane Enamel	G6	379	B65 Series	-	-	-	-
Exterior Galvanized Metal (Handrail and Guardrail Assemblies Only)	High Dispersion Pure Acrylic	G5	-	-	-	-	-	1029
Exterior Cement Plaster and Concrete	Elastomeric	G1	2260	A5W451	1128	-	-	-
Exterior Wood and Masonry	100 percent Acrylic	G1	2200	A6	1235	-	-	-
Exterior Pressure Treated Wood	100 percent Acrylic	G4	2402	A82	1236	-	-	-
Interior Gypsum Board, Wood, Ferrous Metal, and Galvanized Metal	Latex Enamel	G5	1406	B31W251	1520	-	-	-
Interior Gypsum Board	Latex Enamel	G3	1402	B20W251	1510	-	-	-
Interior Gypsum Board	Latex Enamel	G1	1200	B30W200	1500	-	-	-
Interior Gypsum Board (Whiteboard finish)	2-Part Solvent	G6	-	-	-	IP0050 W	-	-
Interior Existing Plaster	Latex Enamel	G3	1414	B30W251	1510	-	-	-
<b>MISCELLANEOUS</b>								
Interior Wood Stain	Alkyd	G1	1700	A49	1281			-
Interior Wood Sanding Sealer	Alkyd	G5	91142	B27V43	4783			-
Interior Wood Varnish	Alkyd Polyurethane	G4	1902	A66F390	Varathane			-
Interior Wood Varnish	Alkyd Polyurethane	G5	1908	A66V391	Varathane			-
Exterior Heavy Duty Cleaner	Water-Based	N/A	88		Jasco Prep & Prime			-
Exterior & Interior Galvanized Metal Etch Prep.	N/A	N/A		Dissco Eco-Prime 100 or Jasco Prep & Prime				

**END OF SECTION 09 91 00**

**SECTION 10 14 00 – SIGNAGE AND GRAPHICS**

1. GENERAL:

1.1 DESCRIPTION OF WORK:

A. Accessibility Signs meeting the requirements of Title 24 California Accessibility Standards and the Americans with Disabilities Act. Signs required in this project are as follows and are shown on the drawings:

1. Room Identification Signs
2. Toilet Room Door Symbols
3. Exterior Entrance Sign
4. Tactile Exit Signs
5. International Symbol of Accessibility Sign.

QUALITY ASSURANCE:

A. Manufacturer's Data: Provide complete manufacturer's data, including installation instructions and details to contractor's job Superintendent, to facilitate coordination of work.

1.2 SUBMITTALS:

- A. Product Data: Submit manufacturer's descriptive literature and specifications, including color samples of materials for applicable approval.
- B. Samples: Submit full size sample sign of each type, style, and color specified including method of attachment.
- C. Shop Drawings: Submit shop drawings showing sign styles, compliance with California Title 24 Accessibility Standards (where applicable), lettering, locations, and overall dimensions.
- D. Certification: Submit manufacturer's certification that all signs furnished for project comply with requirements specified herein.

2. PRODUCTS:

2.1 ACCESSIBILITY SIGNS:

A. ROOM IDENTIFICATION SIGNS:

1. Where provided, Signs shall be 6" x 6" x 1/8" thick
2. Signs shall have the following characteristics:
  - a. Tactile characters shall be raised 1/32" from sign plate face.
  - b. Signs shall be of one-piece construction; added-on and/or engraved characters are unacceptable.

- c. Text shall be accompanied by California Grade 2 Braille.
- d. Sign shall have a 3/32" wide, 1/32" raised perimeter border with 1/2" outside radius.
- e. All characters shall contrast with their background – either light characters on a dark background or dark characters on a light background. Characters and background shall have a matte finish.

**B. TOILET ROOM DOOR SYMBOLS:**

- 1. Symbols shall be 1/4" thick
- 2. Color of symbols shall contrast with color of doors mounted to – either light color on a dark door or dark color on a light door. Symbol shall have a matte finish.
- 3. Toilet room door symbols shall not have any characters, symbols, or Braille.
- 4. Unisex Restroom Door Symbol:
  - a. 12" diameter Circle with inscribed color contrasting equilateral triangle.

**C. EXTERIOR ENTRANCE SIGN:**

- 1. Signs shall be 8" x 8" x 1/8" thick
- 2. Signs shall have the following characteristics:
  - a. White 6" high International Symbol of Accessibility on Federal Blue Background
  - b. Signs shall be of one-piece construction; added-on and/or engraved characters are unacceptable.
  - c. Signs shall have a 3/32" wide, 1/32" raised perimeter border with 1/2" outside radius.

**D. TACTILE EXIT SIGN:**

- 1. Signs shall be 6" x 4" x 1/8" thick
- 2. Signs shall have the following characteristics:
  - a. Tactile characters/symbols shall be raised 1/32" from sign plate face.
  - b. Signs shall be of one-piece construction; added-on and/or engraved characters are unacceptable.
  - c. Sign shall read "EXIT" –only at the main exit/entry door.
  - d. Text shall be accompanied by California Grade 2 Braille.
  - e. Sign shall have a 3/32" wide, 1/32" raised perimeter border with 1/2" outside radius.

- f. All characters shall contrast with their background – either light characters on a dark background or dark characters on a light background. Characters and background shall have a matte finish.

**F. INTERNATIONAL SYMBOL OF ACCESSIBILITY:**

1. Signs shall be 6" x 6" x 1/8" thick
2. Signs shall have the following characteristics:
  - a. White 6" high International Symbol of Accessibility on Federal Blue Background
  - b. Signs shall be of one-piece construction; added-on and/or engraved characters are unacceptable.
  - c. Signs shall have a 3/32" wide, 1/32" raised perimeter border with 1/2" outside radius.

**G. TACTILE (RAISED) LETTERS AND NUMBERS:**

1. Raised Characters shall comply with Section 11B-703.2 and shall be duplicated in Braille complying with Section 11B-703.3
2. Shall be 1/32" min above background per Section 11B-703.2.1
3. Shall be uppercase per Section 11B-703.2.2.
4. Shall be sans serif, and shall not be italic, oblique, script, highly decorative, or of other unusual form per Section 11B-2.3.
5. Shall be selected from fonts where the width of the uppercase letter "O" is 60% min and 110% max of the height of the uppercase letter "I" per Section 11B-703.2.4.
6. Height measured vertically from the baseline of the character shall be 5/8" min and 2" max based on the height of the uppercase letter "I" per section 11B-703.2.5.
7. Stroke thickness of the uppercase letter "I" shall be 15% max of the height of the character per Section 11B-703.2.6.
8. Spacing shall be measured between the two closest points of adjacent raised characters within a message, excluding word spaces and shall comply with section 11B-703.2.7.
9. Line spacing between the baseline of separate lines within a message shall be 135% min and 170% max of the height per Section 11B-703.2.8.
10. Shall be horizontal format per Section 11B-703.2.9.

**H. CALIFORNIA GRADE 2 BRAILLE:**

1. Braille shall be contracted (Grade 2) and comply with Sections 11B-703.3 and 703.4.



2. Braille dots shall have a domed or rounded shape and shall comply with Table 11B-703.3.1. The indication of an uppercase letter shall only be used before the first word of sentences, proper nouns, and names, individual letters of the alphabet, initials, and acronyms.
3. Braille shall be positioned below the corresponding text in a horizontal format, flush left or centered and comply with Section 11B-703.3.2.

L. COLOR:

1. Color of signs shall be selected by architect from the manufactures standard color palette.

2.2 APPLIED LETTERS AND NUMBERS:

- A. Manufacturer: "Inlaid Tactile Sign" as manufactured by Accent Signage Systems, Inc. of Minneapolis, Minnesota (800) 215-9437, Ellis & Ellis Sign Systems of Sacramento (916) 924-1936, ASI-Modulex of Los Altos, CA, (650) 940-1354, Weidner Architectural Signage of Sacramento , CA, or approved equal.
- B. Style: Minnesota Letters
- C. Material: Integral Color Acrylic
- D. Size: Shown on Drawings
- E. Font: Uppercase Helvetica Font
- F. Hardware: 1" long metal threaded studs
- G. Text and Location as shown on drawings
- H. Color of letters and numbers shall be selected by architect from the manufacturer's standard color palette.

3. EXECUTION

3.1 GENERAL

- A. Field Conditions: Inspect field condition for suitability of proper installation. Inform contractor of conditions requiring attention.

3.2 INSTALLATION

- A. Locate sign units where indicated on drawings, using mounting methods of the type described and in compliance with manufacturer's instructions and as indicated on drawings.
- B. Install signs level, plumb, and at heights indicated on drawings.
- C. Attach and secure signs to walls, doors, poles, fences, or glass with appropriate screws and adhesives or as indicated on drawings.

**END OF SECTION**

**SECTION 10 28 00 - TOILET ACCESSORIES**

**PART 1 - GENERAL**

1.01 SUMMARY

- A. This Section includes the following:
  - 1. Toilet and bath accessories.
- B. Related Sections include the following:
  - 1. Division 5 Section – Cold formed Metal Framing

1.02 SUBMITTALS

- A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Toilet and Bath Accessory Schedule and room designations indicated on Drawings in product schedule.

1.03 QUALITY ASSURANCE

- A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.
- B. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.
  - 1. Other manufacturers' products with equal characteristics may be considered. See Division 1 Section "Substitutions."
  - 2. Do not modify aesthetic effects, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.04 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.05 WARRANTY

- A. General Warranty: Special 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 mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.
  - 1. Minimum Warranty Period: 15 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

- A. Restroom Accessories;
  - 1. Bobrick Washroom Equipment, Inc. (Model numbers indicated)
  - 2. Owner-Provided Equipment

**2.02 MATERIALS**

- A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Brass: ASTM B 19, leaded and unleaded flat products; ASTM B 16 (ASTM B 16M), rods, shapes, forgings, and flat products with finished edges; ASTM B 30, castings.
- C. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.
- D. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180).
- E. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.
- F. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.
- G. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.
- H. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- I. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

**2.03 FABRICATION**

- A. General: One, maximum 1-1/2-inch- (38-mm-) diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each

accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

- B. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
- C. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

**PART 3 - EXECUTION**

**3.01 INSTALLATION**

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.
- C. Install grab bars to withstand a downward load of at least 250 lbs, when tested according to method in ASTM F 446.

**3.02 ADJUSTING AND CLEANING**

- A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

**3.03 TOILET AND BATH ACCESSORY SCHEDULE**

- A. Grab Bars 36" & 42", B-6806: - Contractor-Supplied, Contractor-Installed)
  - 1. Stainless-Steel Nominal Thickness: Minimum 0.05 inch.
  - 2. Mounting: Concealed with manufacturer's standard flanges and anchors.
  - 3. Gripping Surfaces: Manufacturer's standard slip-resistant texture.
  - 4. Outside Diameter: 1-1/2 inches for heavy-duty applications.
- B. SS Framed Mirror, Bobrick B-2990 [18" x 36"]; - Contractor-Supplied, Contractor-Installed.
- C. Toilet Tissue Dispenser - Owner-Supplied, Contractor-Installed.
- D. Paper Towel Dispenser - Owner-Supplied, Contractor-Installed.
- E. Soap Dispenser - Owner-Supplied, Contractor-Installed)

- F. Toilet Seat Cover Dispenser - Owner-Supplied, Contractor-Installed)
- G. Sanitary Napkin Disposal - Owner-Supplied, Contractor-Installed.

**END OF SECTION 10 28 00**

**SECTION 10 44 13 – FIRE EXTINGUISHERS and CABINETS**

1. GENERAL:

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Definition: "Fire Extinguishers" in this section refer to units which can be hand-carried as opposed to those which are equipped with wheels or to fixed fire extinguishing systems, unless otherwise indicated.

B. Types of products in this section include:

1. Fire Extinguishers.
2. Fire Extinguisher Cabinets.

1.3 QUALITY ASSURANCE:

A. Provide portable fire extinguishers, cabinets and accessories by one manufacturer, unless otherwise acceptable to Architect.

B. UL-Listed Products: Provide new portable fire extinguishers which are UL listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

1.4 SUBMITTALS:

A. Product Data: submit manufacturer's technical data and installation instructions for all portable fire extinguishers required. For fire extinguisher cabinets, include roughing-in dimensions, and details showing mounting methods, relationships to surrounding construction door hardware, cabinet type and materials, trim style and door construction, style and materials. Where color selections by Architect are required include color charts showing full range of manufacturer's standard colors and designs available.

2. PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Larsen's Manufacturing Company  
J.L. Industries, Inc

2.2 FIRE EXTINGUISHERS:

A. General: Provide fire extinguishers for each extinguisher cabinet and other locations.

Indicated, in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities.

- B. Abbreviations: indicated below to identify extinguisher types related to UL classification and rating system and not, necessarily, to type and amount of extinguishing material contained in extinguisher.
- C. Multi-Purpose Dry Chemical Type : UL-rated 2A: 10-B:C, five pounds. nominal capacity, in enameled steel container, for Class A, Class B and Class C fires, in Lecture area..
- D. Wet Chemical Type (2A:K) UL-rated 2-A:K, 6 liter nominal capacity, in stainless steel container for Class A and Class K fires. Extinguisher is specifically designed for use in commercial kitchens to fight grease fires. Provide in Kitchen where shown on drawings

### 2.3 MOUNTING BRACKETS:

Provide manufacturer's standard bracket designed to prevent accidental dislodgment of extinguisher, of proper size for type and capacity of extinguisher indicated, in manufacturer's standard plated finish.

### 2.4 FIRE EXTINGUISHER CABINETS:

- A. Standard Fire Extinguisher Cabinet:- provide fire-rated cabinet with Larsen's Flame Shield option:
  - 1. Manufacturer and Model No.: Larsen's FS 2409-6R at 1-hr occupancy separation wall.
  - 2. Type: Semi-Recessed
  - 3. Door: Architectural Series, Full Glass with "Larsen-Loc" and white die cut letters "Fire Extinguisher"
- B. Kitchen Fire Extinguisher Cabinet: - provide fire-rated cabinet with Larsen's Flame Shield option:
  - 1. Manufacturer and Model No.: Larsen's FS B2712-RK or RL at 1-hr occupancy separation wall.
  - 2. Type: Semi-Recessed
  - 3. Door: Architectural Series, Stainless Steel, Full Glass with "Larsen-Loc" and white die cut letters "Fire Extinguisher"

### 2.5 FACTORY FINISHING OF FIRE EXTINGUISHER CABINETS:

- A. General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations except as otherwise indicated. Apply finishes in factory after products are assembled. Protect cabinets with plastic or paper covering, prior to shipment.
- B. Painted Finishes: Apply manufacturer's standard primer suitable for paint coating specified in Division 9 Section.

3. EXECUTION

3.1 INSTALLATION:

- A. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at height to comply with applicable regulations of governing authorities.
- B. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
- C. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.

**END OF SECTION 10 44 16**



**SECTION 21 05 00 - COMMON WORK RESULTS FOR FIRE SUPPRESSION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe, fittings, sleeves, escutcheons, seals, and connections for sprinkler systems.

**1.02 RELATED REQUIREMENTS**

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. Section 21 05 23 - General-Duty Valves for Water-Based Fire-Suppression Piping.
- C. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment: Piping identification.
- D. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.
- E. Division 22 - Plumbing
- F. Division 23 - HVAC
- G. Division 26 - Electrical
- H. Division 28 - Electronic Safety and Security

**1.03 REFERENCE STANDARDS**

- A. ASME A112.18.1 - Plumbing Supply Fittings; 2012.
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2010.
- C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.
- D. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2011.
- E. ASME B16.9 - Factory-Made Wrought Buttwelding Fittings; 2012.
- F. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2014).
- G. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2013.
- H. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.
- I. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2012.
- J. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2012.
- K. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2009.
- L. FM (AG) - FM Approval Guide; current edition.
- M. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.
- N. UL (DIR) - Online Certifications Directory; current listings at [database.ul.com](http://database.ul.com).

1.04 SUBMITTALS

- A. See Section 013300 - Submittals, for submittal procedures.
- B. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.
- C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, seismic restraints and calculations, and piping connections.
- D. Project Record Documents: Record actual locations of components and tag numbering.
- E. Operation and Maintenance Data: Include installation instructions and spare parts lists.
- F. Section 018114 Sustainable Design Requirements.
- G. Section 019113 General Commissioning Requirements.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Fabrication shop must provide welding certifications and copy of weld stamp. Weld stamp to be provided on all pipe at welds.
- C. Installer Qualifications: Company specializing in performing work of the type specified this section.
  - 1. Minimum five years DOCUMENTED experience.
  - 2. Approved by manufacturer.
- D. Conform to FM (AG) and UL (DIR) requirements.
- E. Valves: Bear FM (AG) and UL (DIR) product listing label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- F. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 PRODUCTS

2.01 FIRE PROTECTION SYSTEMS

- A. Sprinkler Systems: Conform work to NFPA 13 and DSA requirements.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

2.02 BURIED PIPING:

PIPING TO 5'-0" OUTSIDE BUILDING FACE

- A. Ames ES.A - Series IBR - In Building Riser

**2.03 ABOVE GROUND PIPING**

- A. Steel Pipe: ASTM A795 Schedule 10 or ASTM A53 Schedule 40, black.
  - 1. Steel Fittings: ASME B16.9, wrought steel, buttwelded.
    - a. Schedule 10 Pipe: Shall be U.L. approved with U.L. approved grooved fittings and couplings for pipe sizes 2-1/2" and larger only. Schedule 10 pipe shall not be used for pipe sizes less than 2-1/2". Threaded fittings shall not be used for any Schedule 10 pipe.
  - 2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
  - 3. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
  - 4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
  - 5. Mechanical formed fittings, including, but not limited to, tees, saddle fittings, bushings and mechanical sprinkler head fittings shall not be used.

**2.04 ESCUTCHEONS**

- A. Material:
  - 1. Metals and Finish: Comply with ASME A112.18.1.
- B. Construction:
  - 1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
  - 2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

**2.05 PIPE HANGERS AND SUPPORTS**

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, split ring.
- C. Vertical Support: Steel riser clamp.
- D. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

**2.06 BACKFLOW PREVENTERS**

- A. Backflow Preventer Manufacturers:
  - 1. Double Check Detector: Ames 4000 SS.
- B. Double Check Detector Assembly Backflow Preventer:
  - 1. The double check detector assembly consists of two independently operating, spring loaded check valves, two UL, FM, OSY resilient wedge gate valves, and bypass assembly. The bypass assembly consists of a meter (cubic ft. or gallons), a double check including shut off valves and required test cocks. Each cam-check shall be internally loaded and provide a positive drip tight closure against reverse flow. Cam-check includes a stainless steel cam arm and spring, rubber faced disc and a replaceable seat. The body shall be manufactured from 300 series stainless steel, 100% lead free, through the water way, with a single two-bolt grooved style access cover. No special tools shall be required for servicing.

**PART 3 EXECUTION**

**3.01 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

- B. Remove scale and foreign material, from inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### 3.02 INSTALLATION

- A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, to not interfere with use of space and other work.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Pipe Hangers and Supports:
  - 1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 2. Place hangers within 12 inches of each horizontal elbow.
  - 3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
  - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- G. Slope piping and arrange systems to drain at low points.
- H. Prepare pipe, fittings, supports, and accessories for finish painting.
- I. Structural Considerations:
  - J. Do not penetrate building structural members unless indicated.
- K. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
  - 1. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.
- L. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

### 3.03 CLEANING

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

**END OF SECTION**

**SECTION 21 05 23 - GENERAL-DUTY VALVES FOR WATER-BASED FIRE SUPPRESSION PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Two-piece ball valves with indicators.
- B. Iron butterfly valves with indicators.
- C. Check valves.
- D. Iron OS&Y gate valves.
- E. Trim and drain valves.

**1.02 RELATED REQUIREMENTS**

- A. Section 21 05 00 - Common Work Results for Fire Suppression: Pipe and fittings.
- B. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment.
- C. Section 21 13 00 - Fire-Suppression Sprinkler Systems.
- D. Section 33 14 16 - Site Water Utility Distribution Piping.

**1.03 ABBREVIATIONS AND ACRONYMS**

- A. EPDM: Ethylene-propylene diene monomer.
- B. NRS: Non-rising stem.
- C. PTFE: Polytetrafluoroethylene.

**1.04 REFERENCE STANDARDS**

- A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013.
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2010.
- C. ASME B31.9 - Building Services Piping; 2014.
- D. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.
- E. AWWA C606 - Grooved and Shouldered Joints; 2011.
- F. FM (AG) - FM Approval Guide; current edition.
- G. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.
- H. UL (DIR) - Online Certifications Directory; current listings at [database.ul.com](http://database.ul.com).
- I. UL 262 - Gate Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- J. UL 312 - Check Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- K. UL 1091 - Standard for Butterfly Valves for Fire-Protection Service; Current Edition, Including All Revisions.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in the District's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Where listed products are specified, provide products listed, classified, and labeled by FM (AG), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for the purpose indicated.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.
- C. Installer and Maintenance Contractor Qualifications:
  - 1. Company specializing in performing the work of this section with minimum five years documented experience.
  - 2. Trained and approved by manufacturer to design, install, test and maintain the equipment specified herein.
  - 3. Complies with manufacturer's certification requirements.
  - 4. Complies with manufacturer's insurance requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, and weld ends.
  - 3. Set valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection and protect flanges and specialties from dirt.
    - a. Provide temporary inlet and outlet caps.
    - b. Maintain caps in place until installation.
  - 2. Store valves in shipping containers and maintain in place until installation.
    - a. Store valves indoors and maintain at higher than ambient dew point temperature.
    - b. If outdoor storage is unavoidable, store valves off the ground in watertight enclosures.
- C. Use the following precautions for handling:
  - 1. Do not use operating handles or stems as lifting or rigging points.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. UL Listed: Provide valves listed in UL (DIR) under following headings and bearing UL mark:
  - 1. Main Level: HAMV - Fire Main Equipment.
    - a. Level 1: HCBZ - Indicator Posts, Gate Valve.
    - b. Level 1: HLOT - Valves.
    - c. Level 3: HLUG - Ball Valves, System Control.
    - d. Level 3: HLXS - Butterfly Valves.
    - e. Level 3: HMER - Check Valves.
    - f. Level 3: HMRZ - Gate Valves.
  - 2. Main Level: VDGT - Sprinkler System & Water Spray System Devices.

- a. Level 1: VQGU - Valves, Trim, and Drain.
- B. ASME Compliance:
  - 1. ASME B16.1 for flanges on iron valves.
  - 2. ASME B1.20.1 for threads on threaded-end valves.
  - 3. ASME B31.9 for building services piping valves.
- C. Comply with AWWA C606 for grooved-end connections.
- D. Comply with NFPA 13 for valves.
- E. Valve Pressure Ratings: Not less than minimum pressure rating indicated or higher as required.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
  - 1. Worm-gear actuator with handwheel for quarter-turn valves, except trim and drain valves.
  - 2. Handwheel: For other than quarter-turn trim and drain valves.
  - 3. Hand-lever: For quarter-turn trim and drain valves 2 NPS and smaller.

#### 2.02 TWO-PIECE BALL VALVES WITH INDICATORS

- A. Description:
  - 1. Minimum Pressure Rating: 175 psig.
  - 2. Body Design: Two piece.
  - 3. Body Material: Forged brass or bronze.
  - 4. Port Size: Full or standard.
  - 5. Seat: PTFE.
  - 6. Stem: Bronze or stainless steel.
  - 7. Ball: Chrome-plated brass.
  - 8. Actuator: Worm gear or traveling nut.
  - 9. Supervisory Switch: Internal or external.

#### 2.03 IRON BUTTERFLY VALVES WITH INDICATORS

- A. UL 1091 and FM (AG) standard listing for indicating valves (butterfly or ball type), Class Number 112.
- B. Minimum Pressure Rating: 175 psig.
- C. Body Material: Cast or ductile iron with nylon, EPDM, epoxy, or polyamide coating.
- D. Seat: EPDM.
- E. Stem: Stainless steel.
- F. Disc: Ductile iron, nickel plated.
- G. Actuator: Worm gear or traveling nut.
- H. Supervisory Switch: Internal or external.
- I. Body Design: Grooved-end connections.

#### 2.04 CHECK VALVES

- A. UL 312 and FM (AG) standard listing for check valves, Class Number 1045.
- B. Minimum Pressure Rating: 175 psig.

- C. Type: Center guided check valve.
- D. Body Material: Cast iron, ductile iron.
- E. Center guided check with elastomeric seal.
- F. Hinge Spring: Stainless steel.
- G. End Connections: Flanged, grooved, or threaded.

#### 2.05 IRON OS&Y GATE VALVES

- A. UL 262 and FM (AG) standard listing for fire-service water control valves (OS&Y and NRS-type gate valves).
- B. Minimum Pressure Rating: 175 psig.
- C. Body and Bonnet Material: Cast or ductile iron.
- D. Wedge: Cast or ductile iron, or bronze with elastomeric coating.
- E. Wedge Seat: Cast or ductile iron, or bronze with elastomeric coating.
- F. Stem: Brass or bronze.
- G. Packing: Non-asbestos PTFE.
- H. Supervisory Switch: External.
- I. End Connections: Flanged.

#### 2.06 TRIM AND DRAIN VALVES

- A. Ball Valves:
  - 1. Description:
    - a. Pressure Rating: 175 psig.
    - b. Body Design: Two piece.
    - c. Body Material: Forged brass or bronze.
    - d. Port Size: Full or standard.
    - e. Seat: PTFE.
    - f. Stem: Bronze or stainless steel.
    - g. Ball: Chrome-plated brass.
    - h. Actuator: Hand-lever.
    - i. End Connections for Valves 1 NPS through 2-1/2 NPS: Threaded ends.
    - j. End Connections for Valves 1-1/4 NPS and 2-1/2 NPS: Grooved ends.
- B. Angle Valves:
  - 1. Description:
    - a. Pressure Rating: 175 psig.
    - b. Body Material: Brass or bronze.
    - c. Ends: Threaded.
    - d. Stem: Bronze.
    - e. Disc: Bronze.
    - f. Packing: Asbestos free.
    - g. Handwheel: Malleable iron, bronze, or aluminum.
- C. Globe Valves:
  - 1. Description:
    - a. Pressure Rating: 175 psig.



- b. Body Material: Bronze with integral seat and screw-in bonnet.
- c. Ends: Threaded.
- d. Stem: Bronze.
- e. Disc Holder and Nut: Bronze.
- f. Disc Seat: Nitrile.
- g. Packing: Asbestos free.
- h. Handwheel: Malleable iron, bronze, or aluminum.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Confirm valve interior to be free of foreign matter and corrosion.
- B. Remove packing materials.
- C. Examine guides and seats by operating valves from the fully open position to the fully closed position.
- D. Examine valve threads and mating pipe for form and cleanliness.
- E. Examine mating flange faces for conditions that might cause leakage.
  - 1. Check bolting for proper size, length, and material.
  - 2. Verify gasket for size, defects, damage, and suitable material composition for service.
  - 3. Replace all defective valves with new valves.

#### **3.02 INSTALLATION**

- A. Comply with specific valve installation requirements and application in the following Sections:
  - 1. Section 21 13 00 for application of valves in wet and dry pipe, fire-suppression sprinkler systems.
  - 2. Section 33 14 16 for application of valves in fire-suppression water-service piping outside the building.
- B. Install listed fire protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections.
  - 1. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in water supply connections and backflow preventer at potable water supply connections.
- D. Valves with threaded connections to have unions at equipment arranged for easy access, service, maintenance, and equipment removal without system shutdown.
- E. Valves in horizontal piping installed with stem at or above the pipe center.
- F. Position valves to allow full stem movement.
- G. Install valve tags. Comply with Section 21 05 53 requirements for valve tags, schedules, and signs on surfaces concealing valves; and the appropriate NFPA standard applying to the piping system in which valves are installed.

**END OF SECTION**

**SECTION 21 05 53 - IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Pipe markers.
- D. Ceiling tacks.

**1.02 RELATED REQUIREMENTS**

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. Section 09 91 23 - Interior Painting: Stencil paint.

**1.03 REFERENCE STANDARDS**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.

**1.04 SUBMITTALS**

- A. See Section 013300 - Submittals, for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and installation instructions.
- E. Project Record Documents: Record actual locations of tagged valves.
- F. Section 018114 Sustainable Design Requirements.
- G. Section 019113 General Commissioning Requirements.

**PART 2 PRODUCTS**

**2.01 IDENTIFICATION APPLICATIONS**

- A. Piping: Tags.
- B. Valves: Nameplates and ceiling tacks where above lay-in ceilings.

**2.02 MANUFACTURERS**

- A. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
- B. Champion America, Inc: [www.Champion-America.com](http://www.Champion-America.com).
- C. Seton Identification Products: [www.seton.com/aec](http://www.seton.com/aec).

**2.03 NAMEPLATES**

- A. Description: Laminated three-layer plastic with engraved letters.
  - 1. Letter Color: White.
  - 2. Letter Height: Equipment, control panels 1 inch.
  - 3. Letter Height: Controls and small components, 1/4 inch.
  - 4. Background Color: Black.

**2.04 TAGS**

- A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

**2.05 PIPE MARKERS**

- A. Color: Comply with ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Secure to pipe using two (2) bands of adhesive tape with flow arrows supplied by the manufacturer. Install securing bands completely around pipe and overlapped.
- D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

**2.06 CEILING TACKS**

- A. Description: Steel with 3/4 inch diameter color coded head.

**PART 3 EXECUTION**

**3.01 PREPARATION**

- A. Degrease and clean surfaces to receive adhesive for identification materials.

**3.02 INSTALLATION**

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- F. Identify valves in main and branch piping with tags.

- G. Identify piping, concealed or exposed, with plastic pipe markers or plastic tape pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

**END OF SECTION**

**SECTION 21 13 00 - FIRE SUPPRESSION SPRINKLER SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Wet-pipe sprinkler system.
- B. System design, installation, and certification.
- C. Fire department connections.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- C. Section 21 05 00 - Common Work Results for Fire Suppression: Pipe and fittings.
- D. Section 21 05 23 - General-Duty Valves for Water-Based Fire-Suppression Piping.
- E. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment: Piping identification.
- F. Division 22 - Plumbing
- G. Division 23 - HVAC
- H. Division 26 - Electrical
- I. Division 28 - Electronic Safety and Security

**1.03 REFERENCE STANDARDS**

- A. FM (AG) - FM Approval Guide; current edition.
- B. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.
- C. UL (DIR) - Online Certifications Directory; current listings at [database.ul.com](http://database.ul.com).

**1.04 SUBMITTALS**

- A. See Section 013300 - Administrative Requirements, for submittal procedures.
- B. See Section 01300 - Submittals, for submittal procedures.
- C. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- D. Shop Drawings: Fire sprinkler system design is not a deferred submittal.
  - 1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
  - 2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, seismic details and calculations, components and accessories. Indicate system controls.
  - 3. Submit shop drawings to LP Engineers for approval.
  - 4. Installation is to conform to approved fire sprinkler plans.

5. Approved documents do not relieve the contractor of field coordination. It is the fire sprinkler contractors' responsibility to coordinate piping locations with the work of other trades.
  6. Preparation of installation and fabrication drawings is the responsibility of the fire sprinkler contractor.
- E. **Material Data:** Approved material data is a guideline. The fire sprinkler system design parameters must be strictly adhered to. Alternate manufacturers may be submitted to LP Consulting Engineers, Inc. for review of project compliance. DSA approval must be obtained prior to installation. A copy of the approved material data must be on the project site for the Project Inspector prior to the commencement of installation.
- F. **Project Record Documents:** Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.
- G. **Manufacturer's Certificate:** Certify that system has been tested and meets or exceeds specified requirements and code requirements.
- H. **Operation and Maintenance Data:** Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.
- I. **Maintenance Materials:** Furnish the following for the District's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
  2. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
  3. Sprinkler Wrenches: For each sprinkler type.
- J. Section 018114 Sustainable Design Requirements.
- K. Section 019113 General Commissioning Requirements.

#### 1.05 QUALITY ASSURANCE

- A. Maintain one copy of referenced design and installation standard on site.
- B. Conform to UL and FM requirements.
- C. **Manufacturer Qualifications:** Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- D. Fabrication shop must provide welding certifications and copy of weld stamp. Weld stamp to be provided on all pipe at welds.
- E. **Installer Qualifications:** Company specializing in performing the work of this section. with minimum five years' experience . Installing company must have a valid State of California contractors' license with a C-16 classification.
- F. **Equipment and Components:** Provide products that bear UL and FM label or marking.
- G. **Products Requiring Electrical Connection:** Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

#### 1.06 STRUCTURAL DESIGN REQUIREMENTS AND SEISMIC RESTRAINTS

- A. Fire protection systems and equipment shall be anchored and seismically braced in accordance with all applicable codes and industry standards.

- B. Contractor shall design seismic bracing for all fire protection equipment and systems to comply with the 2016 California Building Code (CBC) and the latest edition of the Mason Industries "Seismic Restraint Guidelines".
  - 1. Contractor shall submit details and calculations prepared and signed by a licensed professional structural engineer registered in the state in which the Work is performed demonstrating compliance with the above and all applicable codes.
  - 2. Drawings, details and calculations shall be submitted to the Architect for review. Compliance documents shall be approved by the Architect prior to installation.
- C. Fire protection systems and equipment shall include, but are not limited to, all piping, valve assemblies, fire pumps, electrical and control panels, conduits and other components.
- D. Supports, anchorage and restraints, including attachments to building structure, for all piping for standard installation details that comply with the latest edition of the Mason Industries "Seismic Restraint Guidelines", or equal, shall be used wherever possible. The Contractor shall provide all supporting documentation required for the Architect and the reviewing authorities. If compliance with one of these standards is demonstrated, separate structural calculations are not required.
- E. For all non-standard installations not detailed in one of the approved systems, the Contractor shall provide details of supports, anchorages and restraints, including attachments to building structure, with supporting calculations all stamped and signed by a licensed professional structural engineer registered in the State of California.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

### PART 2 PRODUCTS - ALL PRODUCTS SHALL CONFORM TO CONTRACT DOCUMENTS INCLUDING APPROVED MATERIAL DATA.

#### 2.01 SPRINKLER SYSTEM

- A. Sprinkler System: Provide coverage for building areas noted on Drawings, including all areas, rooms, spaces above and below ceilings, entry ways, overhangs (if applicable), etc. and all other areas requiring sprinklers in accordance with NFPA 13.
- B. Occupancy: Class Rooms, Common Areas and Offices - Light hazard; comply with NFPA 13. Storage rooms, Mechanical rooms and Kitchen - Ordinary hazard Group 1; comply with NFPA 13
- C. Interface system with building fire and smoke alarm system.
- D. Provide fire department connections where indicated.
- E. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to fire sprinkler riser. Supply no less than two (3) spare sprinklers of each type and temperature rating used on project. Storage cabinet to include a wrench(s) applicable to sprinkler types.

#### 2.02 SPRINKLERS

- A. Suspended Ceiling Type: Semi-recessed pendant type with matching push on escutcheon plate.
  - 1. Response Type: Quick.
  - 2. Coverage Type: Standard.
  - 3. Finish: Brass.
  - 4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
  - 5. Application: All finished ceilings

6. Installed on return bends
- B. Exposed Area Type: Upright with guard.
  1. Response Type: Quick.
  2. Coverage Type: Standard.
  3. Finish: Brass.
  4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
  5. Application: Areas with exposed construction
- C. Dry Sprinklers: Concealed pendant type with matching push on escutcheon plate.
  1. Response Type: Quick.
  2. Coverage Type: Standard.
  3. Finish: Enamel, color white.
  4. Cover Plate Finish: Brushed Chrome.
  5. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- D. Sidewall Type: Standard horizontal sidewall type with matching push on escutcheon plate .
  1. Response Type: Quick.
  2. Finish: Brass.
  3. Escutcheon Plate Finish: Brass.
  4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

### 2.03 PIPING SPECIALTIES

- A. Electric Alarm: Electrically operated chrome plated gong with pressure alarm switch.
- B. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install in accordance with referenced NFPA design and installation standards, DSA requirements and DSA approved plans.
- B. Approved documents do not relieve the fire sprinkler contractor of field coordination. It is the fire sprinkler contractors' responsibility to coordinate piping locations with the work of other trades.
- C. Strict adherence to the contract design documents is required. Any deviation from the contract documents requiring additional plan review, hydraulic calculations, structural review or calculations, or seismic calculations, shall be submitted to LP Consulting Engineers, Inc. for review prior to making changes. LP Consulting Engineers, Inc. to provide calculations and updated plans for DSA approval.
- D. Install equipment in accordance with manufacturer's instructions.
- E. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.
- F. Preparation of installation and fabrication drawings is the responsibility of the fire sprinkler contractor.
- G. Locate outside alarm gong on building wall as indicated on Fire Sprinkler Shop Drawings.
- H. Place pipe runs to minimize obstruction to other work.
- I. Place piping in concealed spaces above finished ceilings.



- J. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.
- K. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- L. Flush entire piping system of foreign matter.
- M. Install guards on sprinklers where subject to damage as in attic space where mechanical equipment is located and in gymnasium, and mechanical rooms..
- N. Hydrostatically test entire system.
- O. Required test to be witnessed by IOR.
- P. Verification of weld inspection required prior to installation of fire sprinkler system.

### 3.02 INTERFACE WITH OTHER PRODUCTS

- A. Ensure required devices are installed and connected as required to fire alarm system.

**END OF SECTION**

**SECTION 22 05 10 - PLUMBING GENERAL PROVISIONS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. References.
- B. Description of Work.
- C. Drawings and Specifications.
- D. Industry Standards and Codes.
- E. Site Examination.
- F. Permits, Fees and Utility Connections.
- G. Coordination of Work.
- H. Progress of Work.
- I. Submittals
- J. Operation and Maintenance Manuals.
- K. Project Record Documents.
- L. Warranty.
- M. Quality and Care
- N. Access Doors.

**1.2 RELATED SECTIONS**

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

**1.3 REFERENCES**

- A. ANSI - American National Standards Institute.
- B. ASTM - American Society for Testing Materials.
- C. CEC - California Electric Code.
- D. NEC - National Electric Code.
- E. NEMA - National Electric Manufacturers' Association.

- F. NFPA - National Fire Protection Association.
- G. OSHA - Occupational Safety and Health Act.
- H. UL - Underwriters' Laboratories.
- I. See detailed References that are listed in individual sections.

**1.4 DESCRIPTION OF WORK**

- A. The work included in this division of the specifications consists of furnishing labor, tools, equipment, supplies and materials, unless otherwise specified, and in performing operations necessary for the installation of the complete Plumbing System as required by these specifications or shown on the Drawings, subject to the terms and conditions of the Contract Agreement.
- B. The work shall also include the completion of details of plumbing work not mentioned or shown which are necessary for the successful operation of mechanical systems described on the drawings or required by these specifications. Furnish and install any incidental work not shown or specified which is required to provide a complete and operational system.

**1.5 DRAWINGS AND SPECIFICATIONS**

- A. Drawings are schematic and diagrammatic. Drawings indicate the general arrangement of equipment, piping, and other plumbing work. Use judgement and care to install mechanical work to fit the job conditions within the building construction and finishes, and to function properly.
- B. The Contractor shall investigate the building conditions affecting the Work and shall arrange his work accordingly providing offsets, fittings, valves and accessories to fit the actual job conditions. The Contractor shall be responsible to field measure and confirm new and existing mechanical systems locations with respect to other architectural, structural, and electrical work, existing and new. Do not scale distances off of the mechanical drawings. Use actual building dimensions.
- C. The drawings and specifications are complimentary each to the other. What is required by one shall be as binding as if called for by both.
- D. Examine all drawings and specifications prior to bidding the Work. Report any discrepancies to the Engineer.

**1.6 INDUSTRY STANDARDS AND CODES**

- A. The Mechanical Contractor shall comply with the latest provisions of all codes, regulations, laws and ordinances applicable to the work involved. This does not relieve the Contractor from furnishing and installing work shown or specified which may exceed the requirements of such codes, regulations laws and ordinances.
- B. All materials, products, devices, fixtures forms or types of construction included in this project shall meet or exceed the published requirements of the publications listed below. These publications form a part of this specification.
  - 1. California Building Code, 2016.
  - 2. California Mechanical Code, 2016.

3. California Plumbing Code, 2016.
  4. California Electrical Code, 2016.
  5. National Fire Protection Association.
  6. California Fire Code, 2016.
  7. California State Fire Marshal.
  8. Occupational Safety and Health Administration, including CAL-OSHA.
  9. State of California Energy Conservation Standards.
  10. State of California Code of Regulations, Title 24.
  11. Other applicable state laws.
- C. Nothing in the Drawings or Specifications shall be construed to permit work that does not conform these codes. When Contract Documents differ from governing codes, furnish and install to the higher standard required at no extra charge. The Contract Documents are not intended to repeat the code requirements except where necessary for clarity.
- D. Domestic water piping and components shall be provided and installed in accordance with California AB 1953 Legislation (effective January 1, 2010), which limits the allowable lead content in certain domestic water system components.
- E. No material or product installed as a part of the Work shall contain asbestos in any form.

**1.7 SITE EXAMINATION**

- A. Contractor shall examine the site, verify dimensions and locations with Drawings, check utility connection locations, and familiarize himself with the existing conditions and limitations. No extras will be allowed because of the Contractor's misunderstanding of the amount of work involved or his lack of knowledge of any site condition which may affect his work. Any apparent variance of the drawings or specifications from the existing conditions at the site shall be called to the attention of the Engineer immediately.

**1.8 PERMITS, FEES AND UTILITY SERVICES**

- A. Contractor shall pay for and obtain all permits and service required in the installation of this work.
- B. Contractor shall arrange for all required inspections and will secure approvals from authorities having jurisdiction.

**1.9 COORDINATION OF WORK**

- A. It is recognized that the contract documents are diagrammatic in showing certain physical relationships which must be established within the mechanical work, and in its interface with other work and that such establishment is the exclusive responsibility of the contractor.
- B. The Contractor shall give careful consideration to the work of the General, Electrical and other contractors on the job and shall organize his work so that it will not interfere with the

work of other trades. He shall consult the drawings and specifications for work of other trades for correcting information, and the pertinent drawings for details and dimensions.

- C. Arrange plumbing work in a neat, well-organized manner with the piping and similar services running parallel and/or perpendicular to primary lines of the building construction. Locate operating and control equipment properly to provide easy access, and arrange entire mechanical work with adequate access for operation and maintenance.
- D. Verify the location of all equipment, plumbing devices, etc. and if interference develops, the Owner/Engineer's decision will be final and no additional compensation will be allowed for the moving of misplaced air devices or equipment.

**1.10 PROGRESS OF WORK**

- A. This Contractor shall organize his work so that the progress of the mechanical work will conform to the progress of the other trades, and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from defective or ill timed work performed under this section shall be borne by this Contractor.

**1.11 STRUCTURAL DESIGN REQUIREMENTS AND SEISMIC RESTRAINTS**

- A. Plumbing systems and equipment shall be anchored and seismically braced in accordance with all applicable codes and industry standards.
- B. Plumbing systems and equipment shall include, but are not limited to, all piping, water heaters, expansion tanks, air compressors, vacuum pumps, electrical and control panels, conduits and other components.
- C. Supports, anchorage and restraints, including attachments to building structure, for all piping for standard installation details that comply with the latest edition of the latest edition of the Mason Industries "Seismic Restraint Guidelines", the SMACNA "Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems", or equal, shall be used wherever possible. The Contractor shall provide all supporting documentation required for the Engineer and the reviewing authorities. If compliance with one of these standards is demonstrated, separate structural calculations are not required.
- D. For all non-standard installations not detailed in one of the approved systems, the Contractor shall provide details of supports, anchorages and restraints, including attachments to building structure, with supporting calculations all stamped and signed by a licensed professional structural engineer registered in the state in which the Work is performed.

**1.12 SUBMITTALS**

- A. See Section 013300 - Submittals, for additional submittal procedures.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project.
- D. Organize submittals in sequence according to Specification Section. Submit in bound document with tabs identifying each Specification Section. Provide a Table of Contents

identifying the Specifications Sections being submitted and the contents within each tabbed section. Prepare Submittals in multiple volumes if required. Provide a complete Submittal package at one time. Do not submit individual Sections piecemeal.

- E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- F. Furnish, upon request, installation instructions for all equipment and materials to Inspector of Record prior to installation.
- G. Maintain a copy of the fire and smoke damper installation instructions on site for use by the Inspector of Record.

**1.13 SUBSTITUTION PROCEDURES**

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. LP Consulting Engineers, Inc. will consider requests for substitutions only within 7 days after date of Agreement.
- C. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.
- D. Failure by the Contractor to order materials or equipment in a timely manner will not constitute justification for a substitution.
- E. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- F. A request for substitution constitutes a representation that the submitter:
  - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  - 2. Will provide the same warranty for the substitution as for the specified product.
  - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Nevada Union High School.
  - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
  - 5. Will reimburse Nevada Union High School and LP Consulting Engineers, Inc. for review or redesign services associated with reapproval by authorities including obtaining reapproval by authorities.
- G. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- H. If excessive review, as judged by the Engineer, is required caused by complicated, numerous or repetitive requests, Contractor shall reimburse Engineer and its Consultants for such review at their standard billing rates.

- I. Substitution Submittal Procedure:
  1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
  2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
  3. The LP Consulting Engineers, Inc. will notify Contractor in writing of decision to accept or reject request.
  4. Present each substitution individually. If a proposed substitute is not found to be acceptable, then the specified item shall be supplied.

**1.14 OPERATION AND MAINTENANCE MANUALS**

- A. See Section 01700 Closeout Submittals for Operation and Maintenance Manual requirements.
- B. Provide operating and maintenance instructions, diagrams and parts lists for all components of all mechanical systems and each piece of equipment furnished under these specifications.
- C. Operating and maintenance instructions shall be furnished for the following equipment and systems:
  1. Plumbing Systems.
  2. Medical Gas Equipment, Piping and Alarm Systems.
  3. Piping Systems.
  4. Temperature Controls Systems.
  5. Water Balance and Test Reports.
- D. Provide manufacturer's model number, design data, capacities, etc. for each piece of plumbing equipment furnished as a part of the Work.
- E. The operating instructions shall include procedures for starting, stopping and emergency manual operation for all equipment and systems.
- F. Provide maintenance instructions of each item of individual equipment including applicable maintenance data as recommended by the manufacturer, including frequency of lubrication, lubricants, inspections required, adjustment procedures, belt and pulley sizes, etc.
- G. Provide manufacturer's parts bulletins with part numbers for each item of equipment included in the Work. Parts bulletins shall be specific to the equipment provided. Extraneous information that does not apply to the equipment provided shall be eliminated from the literature.
- H. Include copies of test reports (startup, check, etc.) and inspections performed for each piece of equipment provided in the Work.

- I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Nevada Union High School's name and registered with manufacturer.
- J. Provide supplier and manufacturer contacts, telephone numbers and addresses in the front portion of the operation and maintenance manual.

**1.15 PROJECT RECORD DOCUMENTS**

- A. See Section 01700 - Contract Closeout for Project Record Document requirements.
- B. Provide red-lined drawings accurately showing location of equipment and devices and size and routing of piping. Include notes explaining installed condition for complete understanding.

**1.16 QUALITY ASSURANCE**

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from LP Consulting Engineers, Inc. before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have Work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

**1.17 WARRANTY**

- A. See Section 01700 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a one year period after Date of Substantial Completion.

**PART 2 PRODUCTS**

**2.1 QUALITY AND CARE**

- A. All materials shall be new and in perfect condition when installed unless specifically indicated otherwise. Materials shall be tested within the Continental United States by an independent, nationally recognized testing agency and shall be listed in accordance with testing agency requirements. When not otherwise specified, all material shall conform to applicable National Standards (ANSI).
- B. All capacities, sizes and efficiency ratings shown on the drawing are minimum. Gas meter and gas pressure reducing valve capacities are maximum allowable.



- C. Each category of material or equipment shall be of the same brand or manufacturer throughout the Work wherever possible.
- D. The quality of materials and equipment to be provided is defined by the brand names, manufacturers, model and catalog numbers listed on the Drawings and in the Specifications. Contractor shall provide each item listed, of the quality specified, or equal.
- E. Deliver, store, protect, and handle products in conformance with manufacturer's recommended practices as outlined in applicable Installation and Maintenance Manuals.
- F. Inspect and report concealed damage to carrier within their required time period.
- G. Store materials in a clean, dry space. Maintain factory protection and/or provide an additional heavy canvas or heavy plastic cover to protect from dirt, water, construction debris, and traffic.
- H. Equipment which has been damaged, exposed to weather or is, in the opinion of the Engineer or Owner, otherwise unsuitable because of improper fabrication, storage or installation shall be removed and replaced by this Contractor at his expense.

## 2.2 ACCESS DOORS

- A. Coordinate access door requirements with Section 08305. The more stringent requirements shall govern.
- B. Provide access doors where access through floors, walls or ceilings is required to access plumbing equipment and plumbing devices or other systems requiring access for maintenance, test or observation.
  - 1. Access doors requiring hand access or access for observation only shall be 14"x14" minimum usable opening.
  - 2. Access doors where entrance of a service person may be required shall be 24"x30" minimum usable opening.
- C. Established standard: Milcor of types listed below. Other acceptable manufacturers: Cesco, J.L. Industries, Karp, Larsen's, or equal. Comply with the following:
  - 1. Form doors and frames of welded, ground smooth steel construction, 14 gauge for doors, 16 gauge for frames. Provide prime coat finish except for stainless steel type.
  - 2. Concealed hinges to allow 175 degree opening.
  - 3. Locks: flush, screw driver operated cam lock(s).
  - 4. Provide anchoring devices suitable for the construction into which the doors are framed.
- D. Application (as applicable):
  - 1. In gypsum drywall walls and ceilings: Type DW.
  - 2. In ceramic tile walls: Type MS (stainless steel).

3. In fire rated walls: Type Fire Rated (rating as required for wall or ceiling), self closing, 250 F in 30 min. temperature rating.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

##### **A. Access Doors**

1. Coordinate the exact location of access doors to provide proper access to the item concealed. Obtain written approval for access door locations from Architect.
2. Coordinate installation of access doors with the trades performing the construction assemblies into which the access doors are placed.
3. Install all access doors neatly and securely, to open and close completely, and to operate freely and without binding. Install rated doors in accordance with their listing requirements.
4. Test operate all doors and make all adjustments required for satisfactory operation. Replace all damaged materials.
5. Install in accordance with manufacturer's instructions.

#### **3.2 FIELD QUALITY CONTROL**

- A. Perform field inspection and testing in accordance with the requirements within this section.
- B. Test all piping with no leak or loss in pressure in accordance with the requirements within this section.

#### **3.3 GENERAL TESTING REQUIREMENTS FOR MECHANICAL AND PLUMBING SYSTEMS**

- A. Contractor shall assign a responsible person to be an independent representative to witness testing and to sign as witness of times, pressure and losses of testing media for all hydronic, duct and gas piping testing.
  1. Test all piping as noted below with no leak or loss of pressure. Repair or replace defective piping until tests are accomplished successfully.
  2. Submit to the Engineer for review a log of all tests made which shall include time, temperature, pressure, water makeup and other applicable readings, necessary to indicate the systems have been operated and tested in the manner outlined in the construction documents.
  3. After producing the specified test pressure, disconnect the pressurizing source; do not introduce further pressure for the duration of the test period, repair leaky piping and retest. Repeat the procedure until the entire system is proven tight.
- B. Test the following systems with the medium listed to the pressure indicated for the time period listed:
  1. Sanitary Sewer, Drain, Vent Piping: Pressure=10 Ft.Hd. / Medium= Water / Duration=4 Hours.

2. Domestic Water Piping: Pressure=125 Psig / Medium= Water / Duration=4 Hours.
3. Condensate drains: Pressure=10 Ft.Hd. / Medium=Water / Duration=4 Hours.
4. Gas Piping: Pressure=60 Psig / Medium=Air and soap / Duration=8 Hours.

**3.4 CUTTING AND PATCHING**

- A. Submit written request in advance of cutting or alteration which affects:
  1. Structural integrity of any element of Project.
  2. Integrity of weather exposed or moisture resistant element.
  3. Efficiency, maintenance, or safety of any operational element.
  4. Visual qualities of sight exposed elements.
  5. Work of Nevada Union High School or separate Contractor.
- B. Execute cutting and patching to complete the work, to uncover work to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit Products together to integrate with other work.
- C. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- E. Restore work with new Products in accordance with requirements of Contract Documents.
- F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Code requirements, to full thickness of the penetrated element.
- H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

**3.5 PRIMING AND PAINTING**

- A. Apply primer to all exposed ferrous metals that are not factory primed, factory finished, galvanized, stainless steel or anodized. Exposed black steel piping shall be primed and finish painted, including gas piping outdoors.
  1. Primer shall be as recommended by the paint manufacturer for each specific application.

2. Acceptable Products include: Fuller O'Brien Blox-Rust Metal All Purpose Primer, equivalent Rust-Oleum product, or equal. See Section 09900 for other acceptable products.
- B. Apply two coats of primer to metal surfaces of items to be insulated or jacketed, except piping, or factory primed or finished.
- C. Preparation:
1. Do not start work until surfaces to be finished are in proper condition to produce finished surfaces of uniform, satisfactory appearance.
  2. Stains and Marks: Remove completely, if possible, using materials and methods recommended by coating manufacturer; seal stains and marks which cannot be completely removed using Devoe KILSTAIN primers, shellac, or other coating acceptable to paint manufacturer any marks or defects that might bleed through paint finishes.
  3. Remove mildew from impervious surfaces by scrubbing with solution of trisodium phosphate and bleach. Rinse with clean water and allow substrate to thoroughly dry.
  4. Galvanized Surfaces:
    - a. Remove surface contamination and oils by solvent cleaning in accordance with SSPC-SP 1 and allow to dry.
    - b. Apply Devoe MIRROLAC Galvanized Metal Primer in accordance with manufacturer instructions.
  5. Uncoated Steel And Iron Surfaces:
    - a. Remove grease, rust, scale, and dust from steel and iron surfaces using solvent in accordance with SSPC-SP 1.
    - b. Where heavy coatings of scale or contaminants are evident, hand tool clean in accordance with SSPC-SP 2 or use other approved SSPC SP method as needed.
  6. Shop Primed Steel Surfaces: Remove loose primer and dust. Sand and feather edges to smooth surface. Clean areas with solvent and spot prime bare metal surfaces with appropriate Devoe MIRROLAC metal primer or primer recommended by manufacturer.
- D. Application:
1. Apply each coat to uniform coating thickness in accordance with manufacturer's instructions, not exceeding manufacturer's specified maximum spread rate for indicated surface; thins, brush marks, roller marks, orange-peel, or other application imperfections are not permitted.
  2. Allow manufacturer's specified drying time, and ensure correct coating adhesion, for each coat before applying next coat.
  3. Remove dust and other foreign materials from substrate immediately prior to applying each coat.

E. Finish Painting: See Section 09900.

**END OF SECTION**

**SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 GENERAL**

1.1 SECTION INCLUDES

- A. Tags.
- B. Pipe markers.
- C. Ceiling tacks.

1.2 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 09 91 23 - Interior Painting: Identification painting.
- C. Section 22 60 05 - Medical Air, Gas, and Vacuum Systems: Supply of pipe labels for placement under this section.

1.3 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.
- B. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.

1.4 SUBMITTALS

- A. Product Data: Provide manufacturers catalog literature for each product required.

**PART 2 PRODUCTS**

2.1 IDENTIFICATION APPLICATIONS

- A. Piping: Pipe markers.
- B. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.2 MANUFACTURERS

- A. Brady Corp.
- B. Seton Identification Products.

2.3 TAGS

- A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.4 PIPE MARKERS

- A. Comply with ASME A13.1.

- B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Secure to pipe using two (2) bands of adhesive tape with flow arrows supplied by the manufacturer. Install securing bands completely around pipe and overlapped.

2.5 CEILING TACKS

- A. Description: Steel with 3/4 inch diameter color coded head.

**PART 3 EXECUTION**

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 91 23 for stencil painting.

3.2 INSTALLATION

- A. Install tags with corrosion resistant chain.
- B. Install plastic pipe markers in accordance with manufacturer's instructions.
- C. Identify valves in main and branch piping with tags.
- D. Identify piping, concealed or exposed, with plastic pipe markers. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

**END OF SECTION**

**SECTION 22 07 19 - PLUMBING PIPING INSULATION**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Piping insulation.
- B. Jackets and accessories.

**1.2 RELATED REQUIREMENTS**

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

**1.3 REFERENCE STANDARDS**

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.
- C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2015.
- D. ASTM C585 - Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing; 2010.
- E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- H. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.
- I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

**1.4 SUBMITTALS**

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.



1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.7 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

**PART 2 PRODUCTS**

2.1 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER

- A. Manufacturers:
  - 1. Knauf Insulation: [www.knaufusa.com](http://www.knaufusa.com).
  - 2. Johns Manville Corporation: [www.jm.com](http://www.jm.com).
  - 3. Owens Corning Corp: [www.owenscorning.com](http://www.owenscorning.com).
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
  - 1. 'K' value: ASTM C 177, 0.22 to 0.28 at 100 degrees F.
  - 2. Maximum Service Temperature: 850 degrees F.
  - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
- D. Vapor Barrier Lap Adhesive: Compatible with insulation.
  - 1. Compatible with insulation.

2.3 JACKETS

- A. PVC Plastic.
  - 1. Manufacturers:

- a. Proto Corporation, Proto-Wrap 30 LoSmoke.
- b. Johns Manville Corporation: [www.jm.com](http://www.jm.com).
2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
  - a. Minimum Service Temperature: 0 degrees F.
  - b. Maximum Service Temperature: 150 degrees F.
  - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
  - d. Thickness: 10 mil.
  - e. Connections: Brush on welding adhesive.
3. Covering Adhesive Mastic: Compatible with insulation.
  - a. Compatible with insulation.
- B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
  1. Thickness: 0.016 inch sheet.
  2. Finish: Embossed.
  3. Joining: Longitudinal slip joints and 2 inch laps.
  4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
  5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

#### **3.2 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Glass fiber insulated pipes conveying fluids below ambient temperature:
  1. Provide vapor barrier jackets, factory-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with molded PVC fitting covers.

- D. Glass fiber insulated pipes conveying fluids above ambient temperature:
  - 1. Provide standard jackets, with vapor barrier, factory-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
  - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with molded PVC fitting covers.
- E. Inserts and Shields:
  - 1. Application: Piping 1-1/2 inches diameter or larger.
  - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  - 3. Insert Location: Between support shield and piping and under the finish jacket.
  - 4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
  - 5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- F. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, use a UL rated fire penetration assembly, 3M or equal.
- G. Pipe in Supply Air Plenum or Finished Spaces: Finish with PVC jacket and fitting covers.
- H. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.
- I. Exterior Applications (exposed to the weather): Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

### 3.3 SCHEDULES

- A. Plumbing Systems:
  - 1. Domestic Hot and Tempered Water Supply:
    - a. Glass Fiber Insulation:
      - 1) Pipe Size Range: 1 inch and larger.
        - (a) Thickness: 1.5 inch.
      - 2) Pipe Size Range: 3/4 inch and smaller.
        - (a) Thickness: 1 inch.
  - 2. Domestic Cold Water Located in Unheated Areas:
    - a. Glass Fiber Insulation:

- 1) Pipe size range: Up to and including 2": Insulation thickness 1".
- 2) Pipe size range: Over 2": Insulation thickness 1.5".

**END OF SECTION**

**SECTION 22 10 05 - PLUMBING PIPING**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Pipe, pipe fittings, specialties, and connections for piping systems.
  - 1. Sanitary sewer.
  - 2. Drains.
  - 3. Domestic water.
  - 4. Flanges, unions, and couplings.
  - 5. Pipe hangers and supports.
  - 6. Valves.

**1.2 RELATED REQUIREMENTS**

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- C. Section 22 07 19 - Plumbing Piping Insulation.

**1.3 REFERENCE STANDARDS**

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.
- C. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; 2011.
- D. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; 2012.
- E. ASME B31.9 - Building Services Piping; 2014.
- F. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2015.
- G. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- H. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.
- I. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2013.
- J. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2010.
- K. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2002 (Reapproved 2010).

- L. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).
- M. AWWA C651 - Disinfecting Water Mains; 2005.
- N. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 2009.
- O. 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; 2011.
- P. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.
- Q. MSS SP-67 - Butterfly Valves; 2011.
- R. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.
- S. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.
- T. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.
- U. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).
- V. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.4 SUBMITTALS

- A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- B. Project Record Documents: Record actual locations of valves.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with State of California, standards.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
- D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.

1.6 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with State of California plumbing code.
- B. Domestic water piping and components shall be provided and installed in accordance with California AB 1953 Legislation (effective January 1, 2010), which limits the allowable lead content in certain domestic water system components.
- C. Conform to applicable code for installation of backflow prevention devices.

- D. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

**PART 2 PRODUCTS**

**2.1 GENERAL REQUIREMENTS**

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

**2.2 DRAIN PIPING, ABOVE GRADE**

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- B. Copper Tube: ASTM B 306, DWV or ASTM B 88 (ASTM B 88M), Type M (C), Drawn (H).
  - 1. Application: Condensate drains.
  - 2. Fittings: ASME B16.29, wrought copper, or ASME B16.23, solvent.
  - 3. Joints: ASTM B32, alloy Sn50 solder.

**2.3 DOMESTIC WATER PIPING, ABOVE GRADE**

- A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
  - 1. Fittings: ASME B16.18, cast copper alloy.
  - 2. Joints: For sizes 1-1/2" and smaller, ASTM B 32, alloy Sn95 solder.
  - 3. Joints: For sizes 2" and larger, AWS A5.8, BCuP5 silver braze.
- B. Provide full solder cup for all fittings.
- C. Schedule 40 Screwed Brass: Capped or plugged outlets.

**2.4 FLANGES, UNIONS, AND COUPLINGS**

- A. Unions for Pipe Sizes 2 Inches and Under:
  - 1. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

**2.5 PIPE HANGERS AND SUPPORTS**

- A. Provide hangers and supports that comply with MSS SP-58.
  - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
  - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
  - 4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Drain, Waste, and Vent:
  - 1. Conform to MSS SP-58.
  - 2. Steel hanger rods and clevis shall be cadmium or zinc plated.
  - 3. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  - 4. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  - 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
  - 6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
  - 7. Vertical Support: Steel riser clamp.
  - 8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  - 9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Plumbing Piping - Water:
  - 1. Conform to MSS SP-58.
  - 2. Steel hanger rods and clevis shall be cadmium or zinc plated.
  - 3. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  - 4. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.



5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Vertical Support: Steel riser clamp.
7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

**2.6 BALL VALVES**

**A. Manufacturers:**

1. Nibco, Inc; \_\_\_\_\_: [www.nibco.com](http://www.nibco.com).
2. Crane Co., Valve Division
3. Milwaukee Valve Company; \_\_\_\_\_: [www.milwaukeevalve.com](http://www.milwaukeevalve.com).
4. Stockham.

- B. Construction, 4 Inches and Smaller:** MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, stainless steel ball, full port, teflon seats and stuffing box ring, stainless steel blow-out proof stem, lever handle with balancing stops, threaded ends with union.

**2.7 BUTTERFLY VALVES**

- A. Construction 1-1/2 Inches and Larger:** MSS SP-67, 200 psi CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, lug ends, extended neck, 10 position lever handle.
- B. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.**

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that excavations are to required grade, dry, and not over-excavated.**

**3.2 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.**
- B. Remove scale and dirt, on inside and outside, before assembly.**
- C. Prepare piping connections to equipment with flanges or unions.**

**3.3 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.**
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.**
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.**
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.**
- E. Group piping whenever practical at common elevations.**

- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
- I. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
- J. Install valves with stems upright or horizontal, not inverted. Refer to Section 22 05 23.
- K. Install water piping to ASME B31.9.
- L. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- M. Sleeve pipes passing through partitions, walls and floors.
- N. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9.
  - 2. Support horizontal piping as indicated.
  - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 4. Place hangers within 12 inches of each horizontal elbow.
  - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 6. Provide copper plated hangers and supports for copper piping.
  - 7. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
  - 8. Support cast iron drainage piping at every joint.

#### 3.4 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

#### 3.5 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.

- B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

**3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM**

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

**3.7 SCHEDULES**

- A. Pipe Hanger Spacing:
  - 1. Metal Piping:
    - a. Pipe Size: 1/2 inches to 1-1/4 inches:
      - 1) Maximum Hanger Spacing: 6.5 ft.
      - 2) Hanger Rod Diameter: 3/8 inches.
    - b. Pipe Size: 1-1/2 inches to 2 inches:
      - 1) Maximum Hanger Spacing: 10 ft.
      - 2) Hanger Rod Diameter: 3/8 inch.
    - c. Pipe Size: 2-1/2 inches to 3 inches:
      - 1) Maximum Hanger Spacing: 10 ft.
      - 2) Hanger Rod Diameter: 1/2 inch.
    - d. Pipe Size: 4 inches to 6 inches:
      - 1) Maximum Hanger Spacing: 10 ft.
      - 2) Hanger Rod Diameter: 5/8 inch.

**END OF SECTION**

**SECTION 22 40 00 - PLUMBING FIXTURES**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Water closets.
- B. Lavatories.
- C. Sinks.
- D. Drinking fountains.

**1.2 RELATED REQUIREMENTS**

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 22 10 05 - Plumbing Piping.
- C. Section 22 10 06 - Plumbing Piping Specialties.

**1.3 REFERENCE STANDARDS**

- A. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008.
- B. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2002).
- C. ASME A112.18.1 - Plumbing Supply Fittings; 2012.
- D. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2013.
- E. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2011.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- G. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).
- H. NSF 372 - Drinking Water System Components - Lead Content; 2011.

**1.4 SUBMITTALS**

- A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- B. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Nevada Union High School's name and registered with manufacturer.

**1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

**1.6 REGULATORY REQUIREMENTS**

- A. Perform Work in accordance with State of California plumbing code.
- B. Domestic water piping and components shall be provided and installed in accordance with California AB 1953 Legislation (effective January 1, 2010), which limits the allowable lead content in certain domestic water system components.
- C. Conform to applicable code for installation of backflow prevention devices.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

**1.8 WARRANTY**

- A. See Section 01700 - Contract Closeout, for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

**PART 2 PRODUCTS****2.1 GENERAL REQUIREMENTS**

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

**2.2 GENERAL REQUIREMENTS:**

- A. Refer to Architectural drawings for exact locations, fixture mounting heights and ADA accessibility requirements.
- B. Insulate domestic hot water, tempered water and waste piping below handicapped plumbing fixtures with molded single piece removable insulation covers, foam, fire resistant, Truebro, or equal. Install insulation covers in accordance with ADA requirements.
- C. Provide 85% IPS red brass pipe for each connection to faucets, stops, hose bibs, and other fixtures/trim. Securely anchor brass pipe to structure. Install stop valves on water supply lines for each fixture, except hose bibbs.
- D. Provide compression shutoff control stop valves with IPS inlets and threaded brass nipples at pipe connection on water supplies to each fixture. Provide stops with lock shield loose key and key handle for each stop. For combination fixtures, provide with compression stop and IPS inlet on each water supply fitting.
- E. Provide cast brass escutcheons, except escutcheons exposed to view shall have chrome plated finish.

- F. Provide chromium-plated finish on fittings and accessories exposed to view.
- G. Fixture fittings and trim: Conform to ASME A112.18.1M and ASME A112.19.5, as applicable.
- H. Centerset faucets: Top-mounted with inlets on not greater than 4 inch centers, unless specified otherwise below.
- I. Separate faucets and combination supply fittings: Provide inlets on 8 inch centers.
- J. Zinc-alloy or plastic handles are not permitted for faucets and valves.
- K. Provide special roughing-in for wheelchair fixtures.
- L. Provide 0.5 GPM flow restrictor for all public lavatories.
- M. Provide water hammer arrestors at end of pipe runs to two or more fixtures, properly sized with sufficient displacement volume to dissipate calculated energy in the piping systems. Water hammer arrestors shall be stainless steel shell with stainless steel bellows contained within the casing, Zurn Model Z-1700, or equal. See Section 15146. Locate in accessible location or provide access panel with location approved by Architect.
- N. Fixture dimensions specified are nominal.
- O. See plumbing schedule for fixture requirements.

**PART 3 EXECUTION****3.1 EXAMINATION**

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

**3.2 PREPARATION**

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

**3.3 INSTALLATION**

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.
- E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.4 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.5 CLEANING

- A. Clean plumbing fixtures and equipment.

**END OF SECTION**

**SECTION 23 05 10 - MECHANICAL GENERAL PROVISIONS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. References.
- B. Description of Work.
- C. Drawings and Specifications.
- D. Industry Standards and Codes.
- E. Site Examination.
- F. Permits, Fees and Utility Connections.
- G. Coordination of Work.
- H. Progress of Work.
- I. Submittals
- J. Operation and Maintenance Manuals.
- K. Project Record Documents.
- L. Warranty.
- M. Quality and Care
- N. Access Doors.
- O. Starting Equipment and Systems.

**1.2 RELATED SECTIONS**

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

**1.3 REFERENCES**

- A. ANSI - American National Standards Institute.
- B. ASTM - American Society for Testing Materials.
- C. CEC - California Electric Code.
- D. NEC - National Electric Code.



- E. NEMA - National Electric Manufacturers' Association.
- F. NFPA - National Fire Protection Association.
- G. OSHA - Occupational Safety and Health Act.
- H. UL - Underwriters' Laboratories.
- I. See detailed References that are listed in individual sections.

**1.4 DESCRIPTION OF WORK**

- A. The work included in this division of the specifications consists of furnishing labor, tools, equipment, supplies and materials, unless otherwise specified, and in performing operations necessary for the installation of the complete Mechanical System as required by these specifications or shown on the Drawings, subject to the terms and conditions of the Contract Agreement.
- B. The work shall also include the completion of details of mechanical work not mentioned or shown which are necessary for the successful operation of mechanical systems described on the drawings or required by these specifications. Furnish and install any incidental work not shown or specified which is required to provide a complete and operational system.

**1.5 DRAWINGS AND SPECIFICATIONS**

- A. Drawings are schematic and diagrammatic. Drawings indicate the general arrangement of equipment, piping, ductwork and other mechanical work. Use judgement and care to install mechanical work to fit the job conditions within the building construction and finishes, and to function properly.
- B. The Contractor shall investigate the building conditions affecting the Work and shall arrange his work accordingly providing offsets, fittings, valves and accessories to fit the actual job conditions. The Contractor shall be responsible to field measure and confirm new and existing mechanical systems locations with respect to other architectural, structural, and electrical work, existing and new. Do not scale distances off of the mechanical drawings. Use actual building dimensions.
- C. The drawings and specifications are complimentary each to the other. What is required by one shall be as binding as if called for by both.
- D. Examine all drawings and specifications prior to bidding the Work. Report any discrepancies to the Engineer.

**1.6 INDUSTRY STANDARDS AND CODES**

- A. The Mechanical Contractor shall comply with the latest provisions of all codes, regulations, laws and ordinances applicable to the work involved. This does not relieve the Contractor from furnishing and installing work shown or specified which may exceed the requirements of such codes, regulations laws and ordinances.
- B. All materials, products, devices, fixtures forms or types of construction included in this project shall meet or exceed the published requirements of the publications listed below. These publications form a part of this specification.
  - 1. California Building Code, 2016.

2. California Mechanical Code, 2016.
  3. California Plumbing Code, 2016.
  4. California Electrical Code, 2016.
  5. National Fire Protection Association.
  6. California Fire Code, 2016.
  7. California State Fire Marshal.
  8. Occupational Safety and Health Administration, including CAL-OSHA.
  9. State of California Energy Conservation Standards.
  10. State of California Code of Regulations, Title 24.
  11. Other applicable state laws.
- C. Nothing in the Drawings or Specifications shall be construed to permit work that does not conform these codes. When Contract Documents differ from governing codes, furnish and install to the higher standard required at no extra charge. The Contract Documents are not intended to repeat the code requirements except where necessary for clarity.
- D. No material or product installed as a part of the Work shall contain asbestos in any form.

**1.7 SITE EXAMINATION**

- A. Contractor shall examine the site, verify dimensions and locations with Drawings, check utility connection locations, and familiarize himself with the existing conditions and limitations. No extras will be allowed because of the Contractor's misunderstanding of the amount of work involved or his lack of knowledge of any site condition which may affect his work. Any apparent variance of the drawings or specifications from the existing conditions at the site shall be called to the attention of the Engineer immediately.

**1.8 PERMITS, FEES AND UTILITY SERVICES**

- A. Contractor shall pay for and obtain all permits and service required in the installation of this work.
- B. Contractor shall arrange for all required inspections and will secure approvals from authorities having jurisdiction.

**1.9 COORDINATION OF WORK**

- A. It is recognized that the contract documents are diagrammatic in showing certain physical relationships which must be established within the mechanical work, and in its interface with other work and that such establishment is the exclusive responsibility of the contractor.
- B. The Contractor shall give careful consideration to the work of the General, Electrical and other contractors on the job and shall organize his work so that it will not interfere with the work of other trades. He shall consult the drawings and specifications for work of other trades for correcting information, and the pertinent drawings for details and dimensions.

- C. Arrange mechanical work in a neat, well-organized manner with the piping, conduit, and similar services running parallel and/or perpendicular to primary lines of the building construction. Locate operating and control equipment properly to provide easy access, and arrange entire mechanical work with adequate access for operation and maintenance.
- D. Verify the location of all equipment, and devices, etc. and if interference develops, the Owner/Engineer's decision will be final and no additional compensation will be allowed for the moving of misplaced air devices or equipment.

**1.10 PROGRESS OF WORK**

- A. This Contractor shall organize his work so that the progress of the mechanical work will conform to the progress of the other trades, and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from defective or ill timed work performed under this section shall be borne by this Contractor.

**1.11 STRUCTURAL DESIGN REQUIREMENTS AND SEISMIC RESTRAINTS**

- A. Mechanical systems and equipment shall be anchored and seismically braced in accordance with all applicable codes and industry standards.
- B. Mechanical systems and equipment shall include, but are not limited to, all piping, heating and ventilating equipment, electrical and control panels, conduits and other components.
- C. Supports, anchorage and restraints, including attachments to building structure, for all piping and ductwork for standard installation details that comply with the latest edition of the Mason Industries "Seismic Restraint Guidelines", the latest edition of the SMACNA "Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems", or equal, shall be used wherever possible. The Contractor shall provide all supporting documentation required for the Engineer and the reviewing authorities. If compliance with one of these standards is demonstrated, separate structural calculations are not required.
- D. For all non-standard installations not detailed in one of the approved systems, the Contractor shall provide details of supports, anchorages and restraints, including attachments to building structure, with supporting calculations all stamped and signed by a licensed professional structural engineer registered in the state in which the Work is performed.

**1.12 SUBMITTALS**

- A. See Section 013300 - Submittal Procedures, for additional submittal procedures.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project.
- D. Organize submittals in sequence according to Specification Section. Submit in bound document with tabs identifying each Specification Section. Provide a Table of Contents identifying the Specifications Sections being submitted and the contents within each tabbed section. Prepare Submittals in multiple volumes if required. Provide a complete Submittal package at one time. Do not submit individual Sections piecemeal.

- E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- F. Furnish, upon request, installation instructions for all equipment and materials to Inspector of Record prior to installation.
- G. Maintain a copy of the fire and smoke damper installation instructions on site for use by the Inspector of Record.

**1.13 SUBSTITUTION PROCEDURES**

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. LP Consulting Engineers, Inc. will consider requests for substitutions only within 7 days after date of Agreement.
- C. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.
- D. Failure by the Contractor to order materials or equipment in a timely manner will not constitute justification for a substitution.
- E. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- F. A request for substitution constitutes a representation that the submitter:
  - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  - 2. Will provide the same warranty for the substitution as for the specified product.
  - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Nevada Union High School.
  - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
  - 5. Will reimburse Nevada Union High School and LP Consulting Engineers, Inc. for review or redesign services associated with reapproval by authorities including obtaining reapproval by authorities.
- G. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- H. If excessive review, as judged by the Engineer, is required caused by complicated, numerous or repetitive requests, Contractor shall reimburse Engineer and its Consultants for such review at their standard billing rates.
- I. Substitution Submittal Procedure:
  - 1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.

2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
3. The LP Consulting Engineers, Inc. will notify Contractor in writing of decision to accept or reject request.
4. Present each substitution individually. If a proposed substitute is not found to be acceptable, then the specified item shall be supplied.

1.14 OPERATION AND MAINTENANCE MANUALS

- A. See Section 01700 Closeout Submittals for Operation and Maintenance Manual requirements.
- B. Provide operating and maintenance instructions, diagrams and parts lists for all components of all mechanical systems and each piece of equipment furnished under these specifications.
- C. Operating and maintenance instructions shall be furnished for the following equipment and systems:
  1. Air Conditioning Systems.
  2. Piping Systems.
  3. Temperature Controls Systems.
  4. Motors.
  5. Hydronic Balance and Test Reports.
- D. Provide manufacturer's model number, design data, capacities, etc. for each piece of mechanical equipment furnished as a part of the Work.
- E. The operating instructions shall include procedures for starting, stopping and emergency manual operation for all equipment and systems.
- F. Provide maintenance instructions of each item of individual equipment including applicable maintenance data as recommended by the manufacturer, including frequency of lubrication, lubricants, inspections required, adjustment procedures, belt and pulley sizes, etc.
- G. Provide manufacturer's parts bulletins with part numbers for each item of equipment included in the Work. Parts bulletins shall be specific to the equipment provided. Extraneous information that does not apply to the equipment provided shall be eliminated from the literature.
- H. Include copies of test reports (startup, check, etc.) and inspections performed for each piece of equipment provided in the Work.
- I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Nevada Union High School's name and registered with manufacturer.
- J. Provide supplier and manufacturer contacts, telephone numbers and addresses in the front portion of the operation and maintenance manual.

1.15 PROJECT RECORD DOCUMENTS

- A. See Section 017700 - Closeout Procedures.
- B. Provide red-lined drawings accurately showing location of equipment and devices and size and routing of ductwork. Include notes explaining installed condition for complete understanding.

1.16 QUALITY ASSURANCE

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from LP Consulting Engineers, Inc. before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have Work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

1.17 WARRANTY

- A. See Section 017700 - Closeout Procedures, for additional warranty requirements.
- B. Correct defective Work within a one year period after Date of Substantial Completion.

**PART 2 PRODUCTS**

2.1 QUALITY AND CARE

- A. All materials shall be new and in perfect condition when installed unless specifically indicated otherwise. Materials shall be tested within the Continental United States by an independent, nationally recognized testing agency and shall be listed in accordance with testing agency requirements. When not otherwise specified, all material shall conform to applicable National Standards (ANSI).
- B. All capacities, sizes and efficiency ratings shown on the drawing are minimum.
- C. Each category of material or equipment shall be of the same brand or manufacturer throughout the Work wherever possible.
- D. The quality of materials and equipment to be provided is defined by the brand names, manufacturers, model and catalog numbers listed on the Drawings and in the Specifications. Contractor shall provide each item listed, of the quality specified, or equal.

- E. Deliver, store, protect, and handle products in conformance with manufacturer's recommended practices as outlined in applicable Installation and Maintenance Manuals.
- F. Inspect and report concealed damage to carrier within their required time period.
- G. Store materials in a clean, dry space. Maintain factory protection and/or provide an additional heavy canvas or heavy plastic cover to protect from dirt, water, construction debris, and traffic.
- H. Equipment which has been damaged, exposed to weather or is, in the opinion of the Engineer or Owner, otherwise unsuitable because of improper fabrication, storage or installation shall be removed and replaced by this Contractor at his expense.

## 2.2 ACCESS DOORS

- A. Coordinate access door requirements with Section 083113. The more stringent requirements shall govern.
- B. Provide access doors where access through floors, walls or ceilings is required to access mechanical, plumbing, control system components, fire dampers and fire alarm system components (such as smoke detectors, fire/smoke dampers, etc.) or other systems requiring access for maintenance, test or observation.
  - 1. Access doors requiring hand access or access for observation only shall be 14"x14" minimum usable opening.
  - 2. Access doors where entrance of a service person may be required shall be 24"x30" minimum usable opening.
- C. Established standard: Milcor of types listed below. Other acceptable manufacturers: Cesco, J.L. Industries, Karp, Larsen's, or equal. Comply with the following:
  - 1. Form doors and frames of welded, ground smooth steel construction, 14 gauge for doors, 16 gauge for frames. Provide prime coat finish except for stainless steel type.
  - 2. Concealed hinges to allow 175 degree opening.
  - 3. Locks: flush, screw driver operated cam lock(s).
  - 4. Provide anchoring devices suitable for the construction into which the doors are framed.
- D. Application (as applicable):
  - 1. In gypsum drywall walls and ceilings: Type DW.
  - 2. In ceramic tile walls: Type MS (stainless steel).
  - 3. In fire rated walls: Type Fire Rated (rating as required for wall or ceiling), self closing, 250 F in 30 min. temperature rating.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

**A. Access Doors**

1. Coordinate the exact location of access doors to provide proper access to the item concealed. Obtain written approval for access door locations from Architect.
2. Coordinate installation of access doors with the trades performing the construction assemblies into which the access doors are placed.
3. Install all access doors neatly and securely, to open and close completely, and to operate freely and without binding. Install rated doors in accordance with their listing requirements.
4. Test operate all doors and make all adjustments required for satisfactory operation. Replace all damaged materials.
5. Install in accordance with manufacturer's instructions.

**3.2 FIELD QUALITY CONTROL**

- A. Perform field inspection and testing in accordance with the requirements within this section.
- B. Test all piping with no leak or loss in pressure in accordance with the requirements within this section.

**3.3 GENERAL TESTING REQUIREMENTS FOR MECHANICAL AND PLUMBING SYSTEMS**

- A. Contractor shall assign a responsible person to be an independent representative to witness testing and to sign as witness of times, pressure and losses of testing media for all hydronic piping and duct testing.
  1. Test all piping as noted below with no leak or loss of pressure. Repair or replace defective piping until tests are accomplished successfully.
  2. Submit to the Engineer for review a log of all tests made which shall include time, temperature, pressure, water makeup and other applicable readings, necessary to indicate the systems have been operated and tested in the manner outlined in the construction documents.
  3. After producing the specified test pressure, disconnect the pressurizing source; do not introduce further pressure for the duration of the test period, repair leaky piping and retest. Repeat the procedure until the entire system is proven tight.
- B. Test the following systems with the medium listed to the pressure indicated for the time period listed:
  1. Hydronic Piping: Pressure=125 Psig / Medium= Water / Duration=4 Hours.

**3.4 CUTTING AND PATCHING**

- A. Submit written request in advance of cutting or alteration which affects:



1. Structural integrity of any element of Project.
  2. Efficiency, maintenance, or safety of any operational element.
  3. Visual qualities of sight exposed elements.
  4. Work of Nevada Union High School or separate Contractor.
- B. Execute cutting and patching to complete the work, to uncover work to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit Products together to integrate with other work.
- C. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing.
- D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- E. Restore work with new Products in accordance with requirements of Contract Documents.
- F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Code requirements, to full thickness of the penetrated element.
- H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

### 3.5 PRIMING AND PAINTING

- A. Apply primer to all exposed ferrous metals that are not factory primed, factory finished, galvanized, stainless steel or anodized. Exposed black steel piping shall be primed and finish painted to match Architectural finish requirements.
1. Primer shall be as recommended by the paint manufacturer for each specific application.
  2. Acceptable Products include: Fuller O'Brien Blox-Rust Metal All Purpose Primer, equivalent Rust-Oleum product, or equal. See Section 092216 for other acceptable products.
- B. Apply two coats of primer to metal surfaces of items to be insulated or jacketed, except ductwork and piping, or factory primed or finished.
- C. Preparation:
1. Do not start work until surfaces to be finished are in proper condition to produce finished surfaces of uniform, satisfactory appearance.
  2. Stains and Marks: Remove completely, if possible, using materials and methods recommended by coating manufacturer; seal stains and marks which cannot be

completely removed using Devoe KILSTAIN primers, shellac, or other coating acceptable to paint manufacturer any marks or defects that might bleed through paint finishes.

3. Remove mildew from impervious surfaces by scrubbing with solution of trisodium phosphate and bleach. Rinse with clean water and allow substrate to thoroughly dry.
  4. Galvanized Surfaces:
    - a. Remove surface contamination and oils by solvent cleaning in accordance with SSPC-SP 1 and allow to dry.
    - b. Apply Devoe MIRROLAC Galvanized Metal Primer in accordance with manufacturer instructions.
  5. Uncoated Steel And Iron Surfaces:
    - a. Remove grease, rust, scale, and dust from steel and iron surfaces using solvent in accordance with SSPC-SP 1.
    - b. Where heavy coatings of scale or contaminants are evident, hand tool clean in accordance with SSPC-SP 2 or use other approved SSPC SP method as needed.
  6. Shop Primed Steel Surfaces: Remove loose primer and dust. Sand and feather edges to smooth surface. Clean areas with solvent and spot prime bare metal surfaces with appropriate Devoe MIRROLAC metal primer or primer recommended by manufacturer.
- D. Application:
1. Apply each coat to uniform coating thickness in accordance with manufacturer's instructions, not exceeding manufacturer's specified maximum spread rate for indicated surface; thins, brush marks, roller marks, orange-peel, or other application imperfections are not permitted.
  2. Allow manufacturer's specified drying time, and ensure correct coating adhesion, for each coat before applying next coat.
  3. Remove dust and other foreign materials from substrate immediately prior to applying each coat.
- E. Finish Painting: See Section 092216.

**3.6 STARTING EQUIPMENT AND SYSTEMS/COMMISSIONING**

- A. Start equipment and systems in accordance with manufacturer's written instructions..
- B. Provide manufacturer's field representative to prepare and start equipment and systems.
- C. Adjust for proper operation within manufacturer's published tolerances.
- D. Demonstrate proper operation of equipment to Nevada Union High School's designated representative.

- E. Description:
1. Comply with all start up of mechanical and electrical equipment systems as required in the various sections and herein.
  2. Coordinate all testing and startup procedures with all other trades so that all non-mechanical and non-electrical work is completed and operational so that the specified testing can be performed.
- F. Preliminary Work:
1. Prior to the startup, the Contractor shall ensure that the systems are ready to operate, and the following items have been completed and checked including but not limited to:
    - a. Proper motor and pump rotation.
    - b. Flushing and cleaning of the system.
    - c. Wiring
    - d. Auxiliary connections
    - e. Lubrication.
    - f. Venting.
    - g. Controls.
    - h. Installation of filters and strainers.
  2. All electrical testing must be completed and test results submitted before equipment startup to avoid power interruptions during mechanical equipment startup and testing.
  3. The Contractor shall submit at least 10 days in advance a schedule listing the date of completion of his work as it will be ready for equipment startup of Electrical/Mechanical equipment. This schedule shall include work on a system by system, floor by floor basis.
  4. Two weeks prior to the startup of any major equipment, the Contractor shall certify in writing that the systems will be complete and ready for startup. Completeness shall not only include physical installation of individual pieces of equipment, but all related elements of other crafts to make all equipment operate as a system.
    - a. The startup checklist will cover all related crafts, e.g., controls, electrical, mechanical, and a clean environment for equipment startup.
  5. The Contractor shall schedule a tour with the Owner's representative and the Engineer to review startup conditions prior to equipment startup. This tour shall take place during the associated Engineer's regularly scheduled visit. This tour does not relieve the Contractor of any responsibilities to properly start equipment. The Engineer will issue a notice of deficiencies that will be required to be corrected prior to equipment startup. The Contractor will be required to

reschedule a back check with the Engineer prior to attempting an equipment startup.

6. Equipment of systems should not be started until systems and associated subsystems are completed. Verify that other continuing work could not possibly damage completed systems if they are in operation. Furnish signed off prestartup check sheet.

G. Startup and Commissioning:

1. System Startup and Operation:

- a. The Contractor shall provide all labor, materials and services necessary for the initial startup and operation of all systems and equipment furnished and installed under this section.
- b. The Contractor shall provide for the services of qualified factory representatives for all major equipment prestart setup, startup and initial operation. Such periods shall be sufficient to insure the proper operation of systems and equipment. Major equipment to include, but not limited to all HVAC equipment, temperature controls, chillers, pump sets, electrical systems, etc.
- c. After initial startup and operation of systems, the Contractor shall submit a report, showing proper operation before commencement of the final "Operation Test".
- d. During initial operation of the system and until substantial completion, qualified personnel shall be provided and designated for maintaining the equipment and systems in good running order. Items such as strainers, cleanouts, filter replacement, bearing lubrication, packing replacement, and other consumables shall be provided without cost to the Owner. Failure of equipment during this period due to lack of proper supervision is the responsibility of the Contractor and continued failures shall be grounds for the Owner to provide such services with back charges to the Contractor. Submit written schedule of completed maintenance to the Engineer.

H. System Acceptance:

1. General: The system installation shall be complete and tested for proper operation prior to acceptance testing "Operation Test" for the Owners authorized representative. A letter shall be submitted to the Engineer requesting system acceptance. This letter shall certify that all controls are installed and the software programs have been completely exercised for proper equipment operation. Acceptance testing shall commence at a mutually agreeable time within ten (10) calendar days of request. When the field test procedures have been demonstrated to the Owner's representative and pass, the system will be accepted. The warranty period may begin at this time.

I. Operation Test:

1. Provide all labor, equipment, and materials required to perform test.

2. The test shall occur after all major equipment startup and balance services have been performed as specified. The purpose is to demonstrate that individual pieces of equipment and all related elements operate as one complete system and not to identify incomplete or defective work.
3. All equipment is to be run in an automatic operating position and exercised for 72 hours to verify that they perform in accordance with the specified sequence of operation and designed operation logic.
4. The Engineer's representative shall be notified and may be present for the initiation of the test.
5. A log shall be prepared by the Contractor, to be submitted to the Engineer, of all tests including, but not limited to: time, temperatures, pressures, and other readings to prove all equipment is operating as specified.
6. All temperatures, pressures, status indication, etc., shall be verified by at least one other means of measurement or visual verification of condition.
7. Change set points and simulate conditions as directed to demonstrate:
  - a. Ability to control to new set point.
  - b. Interface between systems, fire alarm/fire sprinkler systems.
  - c. Proper sequence and operation.
  - d. Equipment safety systems and all automatic changeover/backup systems and alarms are functioning or will function.
8. If unsatisfactory performance or a system failure is experienced for any reason, the test shall be repeated until 72 hour consecutive hours are achieved. The Engineer's representative shall make all final decisions of a satisfactory test.

**END OF SECTION**

**SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**

**PART 1 GENERAL**

1.1 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe markers.
- D. Ceiling tacks.

1.2 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.

1.3 RELATED SECTIONS

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

1.4 SUBMITTALS

- A. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- B. Product Data: Provide manufacturers catalog literature for each product required.
- C. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

**PART 2 PRODUCTS**

2.1 IDENTIFICATION APPLICATIONS

- A. Air Handling Units: Nameplates.
- B. Air Terminal Units: Tags.
- C. Dampers: Ceiling tacks, where located above lay-in ceiling.
- D. Major Control Components: Nameplates.
- E. Piping: Pipe markers.

2.2 MANUFACTURERS

- A. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).

- B. Seton Identification Products: [www.seton.com/aec](http://www.seton.com/aec).

### 2.3 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved letters.
  - 1. Letter Color: White.
  - 2. Letter Height: 1/4 inch.
  - 3. Background Color: Black.

### 2.4 TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

### 2.5 PIPE MARKERS

- A. Color: Comply with ASME A13.1.
- B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

### 2.6 CEILING TACKS

- A. Description: Steel with 3/4 inch diameter color coded head.
- B. Color code as follows:
  - 1. Heating/Cooling Valves: Blue.

## **PART 3 EXECUTION**

### 3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

### 3.2 INSTALLATION

- A. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- B. Identify air handling units, pumps, heat transfer equipment, tanks, fire/smoke damper access doors, and water treatment devices with nameplates. Small devices, such as terminal units, in-line pumps, may be identified with tags.
- C. Identify thermostats/sensors relating to terminal boxes or valves with tags.
- D. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

## **END OF SECTION**

**SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Testing, adjustment, and balancing of air systems.

**1.2 RELATED REQUIREMENTS**

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.

**1.3 REFERENCE STANDARDS**

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.
- B. AABC MN-1 - AABC National Standards for Total System Balance; 2002.
- C. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.
- D. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems; 2015, Eighth Edition.
- E. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

**1.4 SUBMITTALS**

- A. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
  - 1. Submit to LP Consulting Engineers, Inc. within 2 days after completion of testing, adjusting, and balancing.
  - 2. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
  - 3. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
  - 4. Units of Measure: Report data in I-P (inch-pound) units only.
  - 5. Test Reports: Indicate data on AABC MN-1 forms, forms prepared following ASHRAE Std 111, or NEBB forms.
  - 6. Include the following on the title page of each report:
    - a. Name of Testing, Adjusting, and Balancing Agency.
    - b. Address of Testing, Adjusting, and Balancing Agency.
    - c. Telephone number of Testing, Adjusting, and Balancing Agency.
    - d. Project name.



- e. Project location.
  - f. Project Engineer.
  - g. Project altitude.
  - h. Report date.
- B. Test and balance shall be performed by an independent test and balance agency.
- C. Perform total system balance in accordance with AABC MN-1, ASHRAE Std 111, or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.
- D. TAB Agency Qualifications: Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years documented experience certified by AABC or NEBB.
- E. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor experienced in performance of this Work and licensed at the Nevada.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.1 GENERAL REQUIREMENTS**

- A. Perform total system balance in accordance with one of the following:
- 1. AABC (NSTSB), AABC National Standards for Total System Balance.
  - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
  - 3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
  - 4. SMACNA (TAB).
- B. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- C. TAB Agency Qualifications:
- 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
  - 2. Having minimum of three years documented experience.
  - 3. Certified by one of the following:
    - a. AABC, Associated Air Balance Council: [www.aabc.com/#sle](http://www.aabc.com/#sle); upon completion submit AABC National Performance Guaranty.
    - b. NEBB, National Environmental Balancing Bureau: [www.nebb.org/#sle](http://www.nebb.org/#sle).

- c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: [www.tabbcertified.org/#sle](http://www.tabbcertified.org/#sle).
    - D. TAB Supervisor Qualifications: Certified by same organization as TAB agency.
- 3.2 TESTING, ADJUSTING, AND BALANCING AGENCIES
  - A. RS Analysis, 916-358-5673.
- 3.3 EXAMINATION
  - A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
    - 1. Systems are started and operating in a safe and normal condition.
    - 2. Temperature control systems are installed complete and operable.
  - B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
  - C. Beginning of work means acceptance of existing conditions.
- 3.4 PREPARATION
  - A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to LP Consulting Engineers, Inc. to facilitate spot checks during testing.
  - B. Provide additional balancing devices as required.
- 3.5 ADJUSTMENT TOLERANCES
  - A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 5 percent of design for return and exhaust systems.
- 3.6 RECORDING AND ADJUSTING
  - A. Ensure recorded data represents actual measured or observed conditions.
  - B. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
  - C. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
  - D. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Nevada Union High School.
- 3.7 AIR SYSTEM PROCEDURE
  - A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
  - B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

- C. Measure air quantities at air inlets and outlets.
- D. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- E. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- F. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- G. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

**3.8 SCOPE**

- A. Test, adjust, and balance the following:
  - 1. Air Handling Units.
  - 2. Fans.
  - 3. Air Filters.
  - 4. Air Inlets and Outlets.

**3.9 MINIMUM DATA TO BE REPORTED**

- A. Electric Motors:
  - 1. Manufacturer.
  - 2. Model/Frame.
  - 3. HP/BHP.
  - 4. Phase, voltage, amperage; nameplate, actual, no load.
  - 5. RPM.
  - 6. Service factor.
  - 7. Starter size, rating, heater elements.
  - 8. Sheave Make/Size/Bore.
- B. Cooling Coils:
  - 1. Location.
  - 2. Service.
  - 3. Manufacturer.
  - 4. Air flow, design and actual.

5. Entering air DB temperature, design and actual.
  6. Entering air WB temperature, design and actual.
  7. Leaving air DB temperature, design and actual.
  8. Leaving air WB temperature, design and actual.
  9. Saturated suction temperature, design and actual.
  10. Air pressure drop, design and actual.
- C. Air Moving Equipment:
1. Location.
  2. Manufacturer.
  3. Model number.
  4. Serial number.
  5. Arrangement/Class/Discharge.
  6. Air flow, specified and actual.
  7. Return air flow, specified and actual.
  8. Outside air flow, specified and actual.
  9. Total static pressure (total external), specified and actual.
  10. Inlet pressure.
  11. Discharge pressure.
  12. Sheave Make/Size/Bore.
  13. Number of Belts/Make/Size.
  14. Fan RPM.
- D. Return Air/Outside Air/Exhaust Air:
1. Identification/location.
  2. Design air flow (determined by initial test)
  3. Actual air flow.
  4. Design return air flow (determined by initial test)
  5. Actual return air flow.
  6. Design outside air flow (determined by initial test)
  7. Actual outside air flow.

8. Return air temperature.
  9. Outside air temperature.
  10. Actual mixed air temperature.
- E. Duct Traverses:
1. System zone/branch.
  2. Duct size.
  3. Area.
  4. Design velocity.
  5. Design air flow.
  6. Test velocity.
  7. Test air flow.
  8. Duct static pressure.
  9. Air temperature.
  10. Air correction factor.

**END OF SECTION**

**SECTION 23 07 13 - DUCT INSULATION**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Duct insulation.

**1.2 RELATED REQUIREMENTS**

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 23 05 53 - Identification for HVAC Piping and Equipment.

**1.3 REFERENCE STANDARDS**

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.
- B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- E. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.
- F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

**1.4 RELATED SECTIONS**

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

**1.5 SUBMITTALS**

- A. See Section 013300 - Submittals, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of experience and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.8 FIELD CONDITIONS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

**PART 2 PRODUCTS**

2.1 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
  - 1. Owens-Corning Fiberglas; Model [All Service Faced Duct Wrap].
  - 2. Knauf Insulation; \_\_\_\_\_: [www.knaufinsulation.com](http://www.knaufinsulation.com).
  - 3. Johns Manville; \_\_\_\_\_: [www.jm.com/#sle](http://www.jm.com/#sle).
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
  - 1. 'K' value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
  - 2. Duct Application: 2" thick, 3/4 pound density.
  - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.029 ng/Pa s m (0.02 perm inch), when tested in accordance with ASTM E96/E96M.
  - 3. Secure with pressure sensitive tape.

- D. Vapor Barrier Tape:
  - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

**3.2 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Insulated ducts conveying air below ambient temperature:
  - 1. Provide insulation with vapor barrier jackets.
  - 2. Finish with tape and vapor barrier jacket.
  - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
  - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- C. Insulated ducts conveying air above ambient temperature:
  - 1. Provide with or with standard vapor barrier jacket.
  - 2. Finish with tape and vapor barrier jacket.
  - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
  - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

**3.3 SCHEDULES**

- A. Supply Ducts: Insulate all unlined supply ducts, except ducts exposed in conditioned spaces.

**END OF SECTION**



**SECTION 23 09 11 - DIRECT DIGITAL CONTROL SYSTEM FOR HVAC**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. System description.
- B. Operator interface.
- C. Controllers.

**1.02 RELATED REQUIREMENTS**

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Division 16 - Equipment Wiring: Electrical characteristics and wiring connections.

**1.03 REFERENCE STANDARDS**

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

**1.04 SUBMITTALS**

- A. See Section 01300 - Submittals, for submittal procedures.
- B. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- C. Manufacturer's Instructions: Indicate manufacturer's installation instructions for all manufactured components.
- D. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
  - 1. Revise shop drawings to reflect actual installation and operating sequences.
- E. Operation and Maintenance Data:
  - 1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
  - 2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
  - 3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
- F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Twin Rivers Unified School District's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with California Electric Code.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.
- D. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for purpose specified and indicated.

1.06 WARRANTY

- A. See Section 01700 - Contract Closeout, for additional warranty requirements.
- B. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- C. Provide 5 year manufacturer's warranty for system equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Pelican Wireless.

2.02 SYSTEM DESCRIPTION

- A. The Energy Management System (EMS) shall consist of thermostats, gateways and related accessories as indicated below and all related programming for a complete and fully operational web based management system using a cloud server program complying with the following specifications.
- B. The entire Energy Management Solution (EMS) shall include a network of commercial Internet programmable thermostats which use IEEE 802.15.4 mesh wireless communication protocol to reach a Wireless Gateway (WG). The WG must connect to the owner's wide area network (WAN) over a TCP/IP connection. Access and control of EMS is through a web based management tool which sits on a cloud server and must be accessible either locally or remotely via the Internet.

2.03 OPERATOR INTERFACE

- A. The Web Based App (WBA) shall be able to run on any PC that uses Safari, Chrome, Firefox, or any other web browser that meets these browsers' functionality.
- B. The WBA Platform shall be able to run on any Internet Accessible Smartphone and/or Tablet that has a Web Browser compatible with HTML5.
- C. The WBA shall not require any on-site servers or software to run to be usable by client.
- D. The WBA shall allow up to a minimum of 100 simultaneous users/clients to access the Energy Management System.
- E. The Web Based client shall support at a minimum, the following functions:
  - 1. User log-on identification and password shall be required.

2. HTML programming shall not be required to display any graphics or data on the Web page.
  3. Storage of data shall reside on cloud server and shall not sit within the client's computer or device. EMS that requires data storage on a client computer or on-site server is not acceptable.
  4. Users shall have administrator and user definable access privileges.
  5. OpenAPI interface with XML data output.
- F. Schedules:
1. The WBA shall provide user with access to setting Internet Programmable Thermostat (IPT) schedules. Up to 12 schedule periods per day shall be available for each IPT.
  2. Schedules shall be available as Weekly (7-day), Daily, or Weekday/Weekend (5-2).
  3. The WBA shall provide the user the ability to:
    - a. View Schedules.
    - b. Add/Modify Schedules.
    - c. Assign Thermostat to a Group Schedule.
    - d. Delete Schedules.
    - e. Create Share Schedules
    - f. Create Event Based Schedules
- G. Trending
1. The WBA shall provide real-time trend information on:
    - a. Each space temperature.
    - b. Each temperature set points.
    - c. Each current call; heat, cool, and/or fan.
    - d. Each call for economization
    - e. Each damper position
  2. The WBA shall be able to record and provide at least two years of past trend data for every thermostat in the wireless network. Trend data shall include:
    - a. space temperature; with resolution of every 1/10th of a degree Fahrenheit.
    - b. IPT's temperature set points.
    - c. c. indication of whether the thermostat was calling for; heat, cool, and/or fan.

3. Trend data shall be viewable on the WBS
4. Alarm Notifications
  - a. The WBA shall provide automatic alarming functionally based on real-time monitoring of at least:
    - 1) space temperature and temperature change.
    - 2) IPT's temperature set points.
    - 3) IPT's current call; heat, cool, and/or fan.
  - b. The WBA shall be able to provide a user with the ability to:
    - 1) View Alarms.
    - 2) Set Alarm Notification sensitivity level to High, Medium, or Low.
    - c. Delete Alarms.
  - c. Alarms shall be able to be sent via email and/or text message to up to 100 or more clients.

**H. Consumption Usage**

1. The WBA shall be able to calculate and graphically display the consumption of running a single zone HVAC unit based on a user defined HVAC unit heat and/or cool consumption rate multiplied by the thermostat heat/cool call time.
2. The WBA shall be able to calculate and graphically display the cost of consumption of running a single zone HVAC unit based on taking a user defined HVAC unit heat and/or cool consumption and multiplying that by the client defined cost per kw and/or therm.
3. The WBA shall be able to display consumption usage for a single thermostat, multiple thermostats at a single time, or all the thermostats in the EMS.
4. The WBA shall be able to record and display up to at least two years of consumption usage information.

**2.04 CONTROLLERS**

**A. WIRELESS GATEWAY (WG)**

1. A single WG shall be capable of providing communication between a dedicated cloud server using TCP/IP and the on-site Internet Programmable Thermostats using the IEEE 802.15.4 wireless communication protocol. Additional WGs can be used for a single site, but each WG must meet or exceed these requirements.
2. The WG must provide the following hardware features as a minimum:
  - a. Single Ethernet Port.
  - b. One micro-USB 5VDC power input.
  - c. 2.4 GHz IEEE std. 802.15.4 built-in communication processor.

3. The WG shall provide the communication link between the entire system and a cloud based server. Communication with cloud server shall be secured using AES (Advanced Encryption Standard).
  4. The WG shall be able to support 2000 Internet Programmable Thermostats.
- B. INTERNET PROGRAMMABLE THERMOSTAT (IPT)
1. Internet Programmable Thermostat shall be a wireless communicating commercial programmable thermostat that uses IEEE 802.15.4 for networking communication and a wiring terminal block for controlling a single zone HVAC unit.
  2. The IPT shall provide a keypad for setting:
    - a. Temperature Set points.
    - b. System Mode (Heat, Cool, Auto, Off).
    - c. Fan Mode (Auto, On).
    - d. Light Button.
  3. The IPT shall include a wiring terminal for controlling a single zone HVAC unit or a single zone damper actuator. The wiring terminal must be able to be removed from the IPT for installations where only 3-wires exist or are available between where the IPT will be placed and its connection with the equipment it will be controlling. The thermostat must be able to control the HVAC unit based on these specifications.
  4. The IPT must be configurable using a Web Based App. No thermostat configuration, other than setting the IPT to Conventional, Heat Pump - O, or Heat Pump -B, shall be done at the thermostat. Web based Configuration Setting options shall include:
    - a. Naming the thermostat
    - b. Grouping multiple thermostats.
    - c. System Type: Heat Pump, Conventional, or Damper Actuator system setting.
    - d. If Heat Pump; reversing valve O or B setting.
    - e. Cycles Per Hour (1 - 6).
    - f. Anticipation Degrees (0°F - 0.5°F)
    - g. Calibration Degrees (2.0°F - -2.0°F)
    - h. Heat Stages (0 - 2)
    - i. If Heat Pump; Aux Heat (Disabled and/or Enabled Option)
    - j. Cool Stages (0 - 2)
    - k. Fan Stages (1 - 2)

- l. Fan Circulation Minutes Per Hour.
  - m. Temperature Display (Fahrenheit or Celsius)
  - n. Heat Range Temperature Setting Limitation
  - o. Cool Range Temperature Setting Limitation
  - p. Ability to disable and enable Keypad Control through schedule.
  - q. Heat consumption (kw, btu, ton, or watt)
  - r. Damper Type: Open/Close or Floating
  - s. Reheat Type: Open/Close or Floating
  - t. Cool consumption (kw, btu, ton, or watt)
  - u. Notification Sensitivity (High, Medium, Low)
  - v. Alarm of exceeding temperature based on a Safe Range
  - w. Schedule set times (2, 3, 4, or Variable).
5. IPT settings and control through the Web Base App shall be in real-time and include:
- a. Space Temperature
  - b. System Mode (Heat, Cool, Auto, Off).
  - c. Fan Mode (Auto, On).
  - d. Current set point.
  - e. Relay status (Heat/Cool and Fan).
  - f. Historical Trend Graphs.
  - g. Scheduling
  - h. Lock and Unlock Entire Thermostat's Keypad
  - i. Lock and Unlock the Thermostat's Fan Mode setting Only
- C. Internet Enabled Economizer (IEE)
- 1. The IEE must be California Title 24 compliant economization control.
  - 2. IEE shall use up to three 10K Type II external thermistor temperature sensor input.
  - 3. Web Based App shall be able to record and provide at least two years of past data for IEE. Data must represent historical representations of:
    - a. Calls for Economization

- b. Outside Air Damper Position
- c. Supply and Outside Air Temperature
- 4. The trend data shall be viewable on the WBA.
- 5. IEE must be able to send California Title 24 Fault and Diagnostics codes to the WBA, email addresses, and or text messages.
- 6. IEE must have a settable 0-10VDC output for Outside Air Damper Actuator control.
- 7. IEE must have a 0-10VDC input for Outside Air Damper Position Feedback.
- D. Internet Enabled Air Handler Controller (IEAHC)
  - 1. The IEACH shall be able to wirelessly communicate with all Internet Programmable Thermostat (ITS) which are controlling a damper actuator that the IEACH is going to provide conditioned air too.
  - 2. ITS that meet the above statement must send IEACH information on what type of conditioned air the zone requires and how much of this conditioned air will be required to properly condition the zone.
  - 3. IEACH must be able to accept information from ITS and automatically calculate a supply air temperature target based on ITS demand.
  - 4. IEACH must not run air conditioning when there is no air conditioning demand by an ITS.
  - 5. IEACH must not run the air conditioning when there is reheat demand from an ITS.
  - 6. IEACH must be able to provide Demand Control Ventilation if an ITS has a CO2 sensor.
  - 7. No wire must be required between the IEACH and a zone damper or zone thermostat/sensor.
  - 8. The IEACH must be configurable using a Web Based App. No configuration, shall be done at the IEACH. Web based Configuration Setting options shall include:
    - a. 1. Name of the IEACH location
    - b. 2. Description of what the IEACH is controlling
    - c. 3. System Type: Heat Pump or Conventional
    - d. 4. Heat stages: 1 - 3
    - e. 5. Cool stages: 1 - 3
    - f. 6. Fan Stages: 1, 2, or Variable
    - g. 7. Variable Speed Fan: Minimum Fan Speed

- h. 8. Bypass Controller: Open damper position (VDC), Closed damper position (VDC)
- i. 9. Static Pressure:
  - 1) Target Operating Static: Static during a heating or cooling cycle
  - 2) Target Circulation Static: Static during a ventilation cycle
  - 3) Minimum Static: Low static safety for automatic reset
  - 4) Maximum Static: High static safety for automatic reset
- j. 10. Input Sensor: Supply Air Temperature
- k. 11. Input Sensor: Return Air Temperature
- l. 12. Input Sensor: Outside Air Temperature

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify existing conditions before starting work.

**3.02 INSTALLATION**

- A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.
- B. Provide conduit and electrical wiring in accordance with Division 16. Electrical material and installation shall be in accordance with appropriate requirements of Division 16.

**3.03 SYSTEM PROGRAMMING**

- A. The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software.
- B. Contractor shall work with owner's representative to determine programming parameters including but not limited to hours of operation, set points, system variables, thermostat naming, and site naming. Thermostat & Site naming shall be performed by the contractor. Naming convention (equipment # or name, or space served) shall be provided by or agreed upon with the Owner.

**3.04 COMMISSIONING AND STARTUP**

- A. EMS device functional testing.
  - 1. Each system for which a EMS device has been installed shall be tested for proper installation and functional operation. Test shall include on-site control test to verify each wireless device is responding to signals sent from cloud based servers and responding in accordance with manufacture's specifications.

**END OF SECTION**



**SECTION 23 31 00 - HVAC DUCTS AND CASINGS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Metal ductwork.

**1.2 RELATED REQUIREMENTS**

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 230713 - Duct Insulation.
- C. Section 23 33 00 - Air Duct Accessories.
- D. Section 23 37 00 - Air Outlets and Inlets.
- E. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

**1.3 REFERENCE STANDARDS**

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- C. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.
- D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.
- E. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.
- F. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; current edition, including all revisions.

**1.4 RELATED SECTIONS**

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

**1.5 SUBMITTALS**

- A. Product Data: Provide data for duct materials.

- B. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for all ductwork systems. Provide 1/4"=1'-0" ductwork layout plans showing duct routing, offsets, fittings, duct accessories, fire/smoke dampers, hydronic piping, seismic bracing, etc. Shop drawings shall be fully coordinated with all other trades, including the building structure, finishes, fire sprinkler piping, plumbing piping, hydronic piping and electrical systems.
- C. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

1.7 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

**PART 2 PRODUCTS**

2.1 DUCT ASSEMBLIES

- A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.

2.2 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.
- B. Insulated Flexible Ducts:
  - 1. Flexible ducts shall be U.L. listed and shall comply with UMC Standard 6-1.
  - 2. Flexible ducts shall have a flame spread index of not more than 25 and a smoke-density index not exceeding 50 when tested as a composite material.
  - 3. The maximum length of flexible ductwork shall be 5 feet. Ductwork shall be extended to full length whenever possible without severe bends or kinks. Bends shall be made to maintain R/W equal to 1.5.
  - 4. Black polymer film supported by helically wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.
    - a. Pressure Rating: 4 inches WG positive and 0.5 inches WG negative.
    - b. Insulation shall be 1-1/2 inch thick fiberglass.

- c. Maximum Velocity: 4000 fpm.
- d. Temperature Range: -20 degrees F to 175 degrees F.

**2.3 DUCTWORK FABRICATION**

- A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.
- B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- C. Round ductwork shall be spiral lockseam, 24 gauge minimum. Round ductwork exposed within occupied spaces shall be spiral lockseam, 20 gauge minimum.
- D. Rectangular ductwork exposed within occupied spaces shall be 20 gauge minimum.
- E. Ductwork exposed within occupied spaces shall be internally sealed to provide a clean exterior appearance.
- F. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- G. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).
- H. Fittings shall be spot welded and internally sealed.
- I. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- C. Duct sizes indicated are inside dimensions. For lined ducts, duct sizes must be increased to account for lining.
- D. Indoor Applications: Seal all standing seams and transverse joints in all sheetmetal ductwork with Hardcast "Iron Grip" premium flexible water based duct sealant.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- F. Use double nuts and lock washers on threaded rod supports.
- G. Connect diffusers boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

**END OF SECTION**

**SECTION 23 33 00 - AIR DUCT ACCESSORIES**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Air turning devices.
- B. Duct access doors.
- C. Duct test holes.
- D. Volume control dampers.

**1.2 RELATED REQUIREMENTS**

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 23 31 00 - HVAC Ducts and Casings.

**1.3 REFERENCE STANDARDS**

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- B. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2014.
- C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

**1.4 RELATED SECTIONS**

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

**1.5 SUBMITTALS**

- A. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, and hardware used. Include electrical characteristics and connection requirements.

**1.6 PROJECT RECORD DOCUMENTS**

- A. Record actual locations of access doors and test holes.

**1.7 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

**PART 2 PRODUCTS**

2.1 AIR TURNING DEVICES

- A. Manufacturers:
  - 1. ProRail, Ductmate Industries, Inc.
  - 2. Duro Dyne Corp.
- B. Manufactured turning vanes with 2" single thickness curved blades set at 1-1/2" on-center mounted in 2" vane rails, self-aligning, hot dipped galvanized steel.
- C. Turning vanes, vane rails and mounting shall be constructed and installed in accordance with the SMACNA "HVAC Duct Construction Standards".

2.2 DUCT ACCESS DOORS

- A. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.
- B. Access doors with sheet metal screw fasteners are not acceptable.

2.3 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.4 VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Single Blade Dampers for Round Ductwork and Rectangular Ductwork up to 10 inches in Height: 16 gauge steel minimum.
- C. Multi-Blade Damper for Rectangular Ductwork: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware; Model CD35 Manufactured by Ruskin. Provide Ruskin Model CD50 for installation in medium pressure ductwork and/or ducts with velocities exceeding 1500 FPM.
- D. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings, Ventlok Model 607. On multiple blade dampers, provide oil impregnated nylon or sintered bronze bearings.
- E. Quadrants:
  - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.

2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

**PART 3 EXECUTION**

3.1 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 31 00 for duct construction and pressure class.
- B. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 by 8 inch size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch for balancing dampers only. Review locations prior to fabrication.
- C. Provide duct test holes where indicated and required for testing and balancing purposes.
- D. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- E. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

**END OF SECTION**

**SECTION 23 34 23 - HVAC POWER VENTILATORS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Roof exhausters.

**1.2 RELATED REQUIREMENTS**

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 23 33 00 - Air Duct Accessories: Backdraft dampers.

**1.3 REFERENCE STANDARDS**

- A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; <http://www.amca.org/certified/search/company.aspx>.
- B. AMCA 99 - Standards Handbook; 2010.
- C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2005.
- D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2007.
- E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.
- F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2014.
- G. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

**1.4 RELATED SECTIONS**

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

**1.5 SUBMITTALS**

- A. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- B. Manufacturer's Instructions: Indicate installation instructions.
- C. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND PROTECTION

- A. Protect units from physical damage by storing indoors or off site until roof mounting curbs or other mountings are in place, ready for immediate installation of units.

1.8 WARRANTY

- A. See Section 01700 - Contract Closeout, for additional warranty requirements.
- B. Provide a full parts warranty for one year from start-up or 18 months from shipment, whichever occurs first.

1.9 FIELD CONDITIONS

1.10 EXTRA MATERIALS

- A. Supply two sets of belts for each fan.

**PART 2 PRODUCTS**

2.1 MANUFACTURERS

- A. Greenheck Fan Corporation; \_\_\_\_\_: [www.greenheck.com/#sle](http://www.greenheck.com/#sle).
- B. Loren Cook Company; \_\_\_\_\_: [www.lorencook.com/#sle](http://www.lorencook.com/#sle).

2.2 POWER VENTILATORS - GENERAL

- A. Static and Dynamically Balanced: AMCA 204 - Balance Quality and Vibration Levels for Fans.
- B. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
- C. Sound Ratings: AMCA 301, tested to AMCA 300 and bearing AMCA Certified Sound Rating Seal.
- D. Fabrication: Comply with AMCA 99.
- E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**PART 3 EXECUTION**

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide sheaves required for final air balance.



- C. Provide speed control on direct drive fans required for final air balance.
- D. Provide backdraft dampers on outlet from cabinet and ceiling exhaust fans and as indicated.

**END OF SECTION**

**SECTION 23 81 19 - SELF-CONTAINED AIR CONDITIONERS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Packaged terminal air conditioning units.
- B. Packaged terminal heat pump units.
- C. Controls.

**1.2 REFERENCE STANDARDS**

- A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008.
- B. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment; 2008.

**1.3 SUBMITTALS**

- A. Product Data: Provide drawings indicating dimensions, rough-in connections, and electrical characteristics and connection requirements.
- B. Manufacturer's Instructions: Include assembly instructions, support details, connection requirements, and start-up instructions.
- C. Operation and Maintenance Data: Provide maintenance data, parts lists, controls, and accessories. Include trouble-shooting guide.
- D. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Nevada Union High School's name and registered with manufacturer.

**1.4 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Protect finished cabinets from physical damage by leaving factory packing cases in place before installation and providing temporary covers after installation.

**1.6 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide a five year warranty to include coverage for refrigeration compressors.

**PART 2 PRODUCTS**

**2.1 MANUFACTURERS**

- A. Trane, a brand of Ingersoll Rand; \_\_\_\_\_: [www.trane.com/#sle](http://www.trane.com/#sle).

**2.2 AIR CONDITIONING UNITS**

- A. Description: Packaged, self-contained, through-the-wall air cooled terminal air conditioning units, with wall sleeve, room cabinet, electric refrigeration system, electric heating, outside air louvers, built-in temperature controls; fully charged with refrigerant and filled with oil.
- B. Energy Efficiency:

**2.3 CABINET**

- A. Discharge Grille and Access Door: Removable punched louver discharge grilles, allowing 4-way discharge air pattern with hinged door in top of cabinet for access to controls.

**2.4 WALL SLEEVES AND LOUVERS**

- A. Wall Sleeves: \_\_\_\_\_ inches deep, 16 gage, 0.0598 inch galvanized steel with protective mastic coating.
- B. Louvers: Provide flush anodized aluminum with enamel finish, \_\_\_\_\_ color as selected.

**2.5 CHASSIS**

- A. Refrigeration System:
1. Direct expansion cooling coil.
  2. Hermetically sealed compressor with internal spring isolation, external isolation, permanent split capacitor motor and overload protection.
  3. Accumulator.
  4. Condenser coil and fan.
- B. Coaxial tube in tube condenser with water regulating valve.
1. Capillary restrictor and constant pressure expansion valve.
  2. Reversing valve.
- C. Air System: Centrifugal forward curved tangential evaporator fans with two speed permanent split capacitor motor, permanent washable filters, positive pressure ventilation damper with concealed manual operator.
- D. Heating Coil: Electric.
- E. Condensate Drain: Drain pan to direct condensate to condenser coil for re-evaporation.
- F. Condenser Fan: Centrifugal, forward curved type with separate permanent split capacitor motor.

2.6 CONTROLS

- A. Control Module: Unit mounted adjustable thermostat with heat anticipator, heat-off-cool switch, high-low fan switch.

**END OF SECTION**

SECTION 26 01 10 - GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 CONTRACT PROVISIONS

- A. The requirements of this Section are in addition to the requirements of Division 1, General Conditions and Supplementary Conditions.

1.2 SUMMARY

- A. This section describes the requirements for the electrical work includes, among others, the furnishing and installation of the following:
  1. Electrical service from the Main Switchboard to the building Distribution Panel including transformer, conduit and trenching, conductors.
  2. Power distribution system.
  3. Grounding system.
  4. Lighting and lighting control systems.
  5. Wiring systems including power wiring to plumbing and HVAC and other misc. appliances and equipment.
  6. Communications management system (voice/video/media/clock)
  7. Computer data systems, outlets, raceway and cabling.
  8. Emergency egress lighting.
  10. Fire alarm system.
  11. Testing and commissioning.
- B. Furnish and install all electrical equipment and systems as shown on the Drawings and as described in this Division of the Specifications to provide a complete and functional electrical installation. This work includes but is not limited to all material and labor required for installation of electrical and special systems complete as described herein this specification and drawings; and connections (and installation where not otherwise provided for) of electrical equipment furnished by others. Provide and install all items of equipment, devices, supports, etc., which are incidental to the major components shown on the Drawings or described in these Specifications.

1.3 RELATED WORK INCLUDED IN OTHER DIVISIONS

- A. Finish painting except factory applied finishes and repair of factory finishes shall be provided in accordance with appropriate sections of this Specification. Coordinate "painting" requirements of this Division with other trades as required to assure timely and satisfactory completion of required work. In finished areas, all exposed raceway, boxes, galvanized steel box covers (where allowed), and other electrical "structure" shall be finished to match adjacent structures. Verify that all raceway openings are closed and box covers are in place prior to finishing work done by others.
- B. Examine the drawings and specification for mechanical equipment and provide electrical installation for heating, ventilation and air conditioning equipment, motors, pumps and associated motor starters and controls as described in Division 23.

- C. Examine the Architectural drawings and specification for electrical appliances and equipment which may not be shown on the plans to include and provide electrical installations as described in the architectural division of work.
- D. Examine the Architectural drawings and provide all construction necessary to maintain the integrity of the fire rated barriers.
- E. Examine the Architectural drawings and coordinate with the Architect to provide access doors, whether shown on drawings or not, where floors, walls, or ceiling must be penetrated for access to electrical equipment, outlet boxes, devices, etc., and as specified in this specification.
- F. Provide and install, as part of the work described in this Division, all power and control wiring fed from a source of 30 Volts or more (i.e. all wiring except temperature control wiring) for mechanical equipment described in Division 23.
- G. Examine the fire sprinkler system drawings and specifications for electrical work which may not be shown on the electrical and/or fire detection and alarm plans to be included in the electrical work as necessary as described in the Division 21 fire sprinkler system.

#### 1.4 APPLICATION OF OTHER DIVISIONS

- A. Where carpentry, masonry, concrete work, painting, etc., is required in the installation of equipment specified under this Division, the work shall be done in accordance with the applicable Division of these Specifications. This work could include for example: work associated with panelboard installation, equipment pads or bases, support structures, etc.

#### 1.5 DRAWINGS AND SPECIFICATIONS

- A. The information presented in these Specifications, and on the drawings, is intended to describe the utilitarian and physical aspects of the systems shown as well as the quality of the entire installation. All information is as complete and thorough as possible, but every condition or situation cannot be anticipated. Exact locations, dimensions, elevations, etc. must be determined "on the job" with careful attention to the "intent" of the Drawings and Specifications.
- B. The above paragraph shall not be construed as to allow significant deviation from either the Drawings or Specifications without prior approval of the Architect, but minor changes in conduit routing or equipment locations may be required or desired due to specific conditions encountered. This work shall be accomplished in accordance with these Specifications and no "extra charges" are to be created for any unanticipated labor or material.
- C. Any error or omissions of detail in either the drawings or the specifications shall not relieve the Contractor from correctly installing all materials necessary for complete and operating electrical systems.
- D. Contractor shall inspect the site and verify all measurements and conditions. No extra compensation will be allowed because of differences between work shown on the drawings and measurements at the site.
  - 1. The Drawings are diagrammatic in nature, but the locations of devices, equipment, outlets, and lighting fixtures are shown approximately where installations are intended. Architectural, structural, mechanical, audio/video, theatrical lighting and other drawings shall be examined, noting all conditions that may affect this work. Report conflicting

conditions to the Architect/Engineer for adjustment before proceeding with the work. Should the Contractor proceed with work without reporting the matter, he does so on his own responsibility and shall alter work if directed by the Architect/Engineer at his own expense.

- E. Examine the architectural, structural, mechanical, fire sprinkler and manufacturer's drawings for various equipment in order to determine exact routing and final terminations for all conduits and cables. Conduits shall be stubbed up as near as possible to equipment enclosure.
- F. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The Owner reserves the right to require minor changes in location of outlets or equipment, prior to rough in without incurring any additional cost or changes.
- G. If significant departures from the Drawings or Specifications are considered necessary by the Contractor, details of the changes and the reasons therefore shall be submitted to the Architect as within thirty days after award of contract. Prior written acceptance of the Architect is required for these departures.
- H. Clarification of plans and specifications for the purpose of facilitating construction, but not involving additional labor and materials, may be prepared during construction by the Architect/Engineer. Said revised plans and specifications shall become a part of the contract. The Contractor shall conform to the revised plans and specifications at no additional cost to the District.

**1.6 CODES, STANDARDS, RULES AND REGULATIONS**

- A. All work and materials shall be in full accordance with the latest rules, codes, and/or regulations and not limited to the following:
- B. California Electrical Code (CEC) - 2016 Edition
- C. NFPA 101 - Life Safety Code
- D. NFPA 72 - Fire Alarm Code
- E. Title 24 - State of California Administrative Code
- F. Uniform Building Code (UBC) OR California Building Code (CBC)
- G. City or County Electrical Code as applicable.
- H. Utility rules and regulations.
- I. Any applicable additional codes and regulatory documents effective at the project site.
- J. Nothing on the Drawings or in the Specifications shall be construed to allow work not in conformance with these rules, codes, and regulations.
  - 1. The Drawings and/or Specifications shall take precedence where work and material described therein exceeds that required by rules, codes, or regulations.

**1.7 MANUFACTURER'S INSTRUCTIONS**

- A. Follow the manufacturer's instructions when specific installation or connection details are not indicated or specified on the contract documents.
- B. Notify the Architect/Engineer of conflicts between the manufacturer's instructions and installation or connection details prior to the installation of materials.

**1.8 WORKMANSHIP**

- A. High quality workmanship shall be evidenced in the installation of all electrical equipment and materials. Use the National Electrical Contractors Association's "Standard of Installation" as a guide to the workmanship required. Be prepared to replace or repair any material or equipment damaged by or installed in a manner exhibiting evidence of poor workmanship.

**1.9 COORDINATION WITH OTHER TRADES**

- A. Examine the Electrical Drawings and refer to the Drawings and Specifications describing other work to be accomplished. Verify and coordinate prior to bid. Continue to coordinate work planning and all work in the field to avoid conflicts, errors, and/or delays. No compensation will be allowed for extra work necessitated by lack of coordination.

**1.10 AUTHORITY OF THE ARCHITECT**

- A. As used in this paragraph only, the word "Architect" shall mean the Architect of record or his designated representative.
- B. The authority of the Architect shall be absolute with respect to all performance under this Specification. In case of dispute, the decision of the Architect shall be final.
- C. Where optional materials, methods, or installation techniques are allowed under the provisions of this Specification, they may be used at the discretion of the Architect. The Architect may require specific materials, methods, or techniques to be used in specific situations where use of other materials, methods, or techniques might in his judgment result in loss of aesthetics, accidental damage, life safety hazard, or loss of utility over the system design lifetime.
- D. No additional charges will be allowed for work or material require to be supplied under the conditions of this paragraph unless the need for such material or work could not have been anticipated by thorough study of the site, Drawings, and Specifications and knowledge of all applicable codes, laws, and ordinances.

**1.11 EXAMINATION OF THE SITE**

- A. The contractor is required to visit the site of construction prior to bid to determine existing conditions and their effect upon the work he will be required to perform. No additional compensation will be allowed for any extra expenses incurred by failure to detect and evaluate all existing conditions that will affect his work to be included in the bid to accomplish this contract document's goal.



1.12 STRUCTURAL REQUIREMENTS:

- A. Secure all anchors for electrical equipment in a manner, which will not decrease the structural value of any structure to an unsafe level. Install all equipment, fixtures, etc. to resist seismic movements. Inform the Architect in advance and provide drawings of any proposed modifications to the structure that involves cutting or patching of concrete, masonry, steel, or wood in this project.

1.13 PERMITS, FEES, AND, INSPECTIONS

- A. Obtain all permits and licenses as required and pay all fees incidental to construction.
- B. Inspections required by prevailing Local Authorities, and/or ordinances, shall be coordinated and arranged by the contractor. Provide the Architect with a schedule of inspections, where applicable, and submit all certificates of inspection to the Architect.
- C. The Contractor shall cooperate with the Architect and shall provide assistance at all times for the inspection of the electrical work. Remove covers, operate equipment, or perform any reasonable work, which, in the opinion of the Architect, will be necessary to determine the quality or adequacy of the work. Work shall not be closed in or covered before inspection and approval by the Architect. Cost of uncovering and making repairs where un-inspected work has been closed in shall be borne by the Contractor. If any material does not conform with these specifications the Contractor shall, within three days after being notified by the Architect, remove the materials from the premises.

1.14 PRODUCT DELIVERY, STORAGE, AND HANDLING:

- A. Deliver materials and equipment to project site in manufacturer's original packaging with labeling showing product name, brand, model, project name, address, and Contractor's name. Store in a location as agreeable to District. Secure material from weather or accidental damage.

1.15 OPERATING INSTRUCTIONS

- A. Instruct the District as to function, operation, maintenance, and adjustment of each system and piece of equipment provided.

1.16 RECORD DRAWING

- A. The Contractor shall keep a separate set of Electrical Drawings at the job site to be used as RECORD Drawings. These Drawings are to be kept current and in a neat and clean condition at all times. They are to be available for inspection by the Architect or Engineer at any time during site visitations. These Drawings shall be "red lined" to indicate all changes in equipment, device, and outlet locations; and to indicate the true locations of all concealed or underground work where different from that shown on the Drawings. Each sheet of this set shall be clearly and permanently marked "RECORD DRAWINGS".
- B. Upon completion of the project and prior to final payment, transfer all RECORD DRAWINGS information to the provided original drawings. All information shall be clearly drawn with "RED"

ink. The drawings shall be scanned, 100% edited, and converted into an AutoCAD “.dwg” version 2002 (or higher) electronic file. Deliver the original, final sets, and electronic files (CD) to the Architect for review and delivery to the District/Owner.

**1.17 GUARANTEE**

- A. All electrical work, material, and equipment shall be guaranteed to be free from defects in workmanship or material for a period of two (2) year from the date of final acceptance. Repair or replace all such defects in a timely manner and any damage to the owner's property resulting from such defect or repair thereof. All equipment and material provided and all work accomplished under the requirements of this section shall be at no expense to the District.

**PART 2 – PRODUCTS**

**2.1 MATERIALS**

- A. Unless specifically indicated otherwise, all material shall be new and free from defects; it shall be listed by Underwriters' Laboratories where applicable. Like items shall be of the same manufacturer (except lighting fixtures - which shall be as specified).
- B. Except as noted otherwise, where material of a particular manufacturer is specified, the intent is to describe the quality and function of the item. The term "...or acceptable equal" is implied. A substitution of any of these items will require that the item be presented in a submittal whether specifically listed in the "Submittals" paragraph below or not.

**2.2 SUBMITTALS**

- A. Material submittals shall be complete and submitted all at the same time. The individual groups of submittal types (e.g.: lighting fixtures, wiring devices, distribution equipment, etc.) MUST be prefaced with a list of contents identifying each item by its project name or symbol, manufacturer, and complete catalog number. Each copy of each submittal group shall have the list of contents attached. These lists will be used to report submittal comments. The Contractor is responsible for submitting this information in a timely manner so that material may be ordered early enough to meet the construction schedule. If material is not ordered in time for whatever reason, pay such premium prices and special handling charges as are required to meet the construction schedule. No substitution of an "accepted" item will be allowed due to failure to plan for adequate material procurement lead time.
- B. Shop drawings shall be drawn to scale or completely dimensioned and shall give all information required to completely describe the item. The Contractor shall carefully check all the shop drawings for compliance with these specifications and the Plans.
- C. If the shop drawings show variations from the Contract requirements because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in order that if (acceptable) suitable action may be taken for proper adjustment of the Contract. The Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract, even though the shop drawings have been reviewed.

- D. Work requiring shop drawings shall not be started before receipt of the Architect's review and acceptance.
- E. The Architect's/Engineer's review of the submitted materials, items and shop drawings are for general compliance with the plans and specifications and general design and arrangement only. Therefore, it shall not relieve the Contractor from responsibility for errors of any sort in the materials, items, shop drawings or schedules. The Contractor shall verify all dimensions and job site conditions affecting the work, and shall be responsible for furnishing and installing the proper materials required by the Contract, whether or not indicated on the drawings and specifications.
- F. As a minimum, submittals are required for the following items:
  - 1. RACEWAY COMPONENTS
  - 2. WIRE AND CABLE
  - 3. WIRING DEVICES
  - 4. MAIN SWITCHBOARD AND DISTRIBUTION PANELS
  - 5. PANELBOARDS
  - 6. PULL BOXES
  - 8. SAFETY SWITCHES, DISCONNECTS AND CIRCUIT BREAKERS
  - 9. LIGHTING FIXTURES, CONTROL SYSTEMS, PEDESTALS AND POLES
  - 11. FIRE ALARM SYSTEM
  - 12. COMMUNICATIONS SYSTEM
  - 13. DATA DISTRIBUTION SYSTEM
  - 15. TERMINAL CABINETS

### 2.3 SUBSTITUTIONS

- A. Specific brand names and catalog numbers are used to describe materials in order to establish of performance and quality.
- B. Only one substitution will be considered for any item. Substitute materials must be equal in quality and function to that specified. Allowance of a substitution does not permit any reduction of system performance or utility, and the Contractor is responsible for additional costs incurred due to use of a substituted item. If the proposed substitute item is "rejected", the specified item shall be provided (re-submittal required) without further discussions or delay.
- C. Any Contractor's proposed substitution of material, article, or method in the opinion of the Architect/Engineer are equal to that specified will be accepted, provided the Contractor submits a single written request, in triplicate, to the Architect, with the following information for each item:
  - Name of Manufacturer or supplier
  - Trade or brand names.
  - Type, model, style, and/or catalog number.
    - 1. Size or capacity rating.
- D. After receipt of a written request from the contractor, the engineer of record will review product substitutions fourteen (14) days prior to the bid date. If system substitutions are submitted after the award of the project contract, the analysis for the whole system substitution will be charged to the contractor at senior engineer hourly rates.

- E. The decision of the Architect/Engineer shall govern as to what is equal to the item specified in the plans and specifications. Equality will be judge on the basis of the following:
  - 1. Conformance with description or performance required.
  - 2. Equal in quality.
  - 3. Comparable in appearance and artistic effect where these are in considerations.
  - 4. Comparable operation, maintenance and performance.
  - 5. Equal in longevity and service under conditions of climate and usage.
  - 6. Conformance with space allocations and requirements for operations from in details and construction of related work.
  - 7. Conformance with all applicable codes and regulations.
  
- F. If the Architect/Engineer considers it necessary, tests to determine the quality of the proposed materials shall be made, at the expense of the Contractor, by an unbiased laboratory, satisfactory to the Architect.

## 2.4 ENCLOSURES

- A. Provide enclosures suitable for the specific type of location in which they are installed.
  - 1. Provide NEMA 1 or NEMA 12 boxes and enclosures for dry locations. Dry locations are all indoor areas that do not fall within the definitions below for wet or damp locations.
  - 2. Provide NEMA 3R boxes and enclosures for wet locations. Wet locations are all locations exposed to weather, whether under a roof or not.
  - 3. Provide NEMA 4 boxes and enclosures for damp locations. Damp locations are all indoor spaces wholly or partially underground or any area subject to water spray.

## PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. All equipment shall be set square and plumb, securely mounted, adequately supported, and permanent. Provide workspace around items of electrical equipment as required by California Electrical Code (CEC). In general, equipment is to be installed in accordance with manufacturer's instructions; but the requirements of these specifications shall take precedence where conflicts exist.
  
- B. WIRING METHODS: The cables and conductors of all systems specified in the Specification are required to be installed in raceway.

### 3.2 ELECTRICAL WORK FOR EQUIPMENT PROVIDED UNDER OTHER SECTIONS

- A. Install power conductors and terminate on equipment provided under other specification sections. Verify specific requirements.
  
- B. Install and terminate electrical controls as described on the Electrical Drawings (For mechanical equipment specified in Division 23).
  
- C. Line voltage control wiring of exhaust fans is to be accomplished under this Division. The controlling device may be specified elsewhere.

- D. Provide and install all disconnect/safety switches and motor starters except those devices specified to be furnished with equipment specified elsewhere.
- E. Unless provided for in another Division, install all items of electrical equipment provided by others.
- F. Assist others in equipment testing to verify that wiring and connections made under this Division are correct.

**3.3 EQUIPMENT IDENTIFICATION**

- A. Nameplates shall be installed on all items of electrical equipment as follows: switchboard(s) and switchboard circuit breakers, panelboards, terminal cabinets, time switches, contactors, motor control switches, wall switches (where noted on the Drawings), motor starters provided under this Division where the function is not immediately obvious, and safety switches.
- B. The nameplate shall identify the item by Drawing name where applicable and describe its use or function in this installation.
- C. Permanently mark all utility outlets to show source of power panel and circuit breaker number.

**3.4 EXCAVATION AND BACKFILL**

- A. Excavation and backfill shall be accomplished as required for installation of electrical equipment as shown on the Drawings. Restore all surfaces, roadways, walks, etc., and any existing underground structures which might be disturbed during this work to their original condition in a manner acceptable to the Architect.
- B. Trenches shall be straight except where otherwise indicated. Depth shall be as noted on the Drawings and at least as required to provide the minimum cover specified by applicable codes and regulations for the equipment installed. Bottom of trench shall be smooth and free of any rock points. Place a 4" sand bed in trench if these conditions cannot be met with native material.
- C. Backfill shall be clean and free of rocks and debris. Backfill is to be tamped in 6" layers to nominal 95% compaction using a mechanical tamper manufactured specifically for this purpose. In an area of engineered fill or other area of specified compaction, backfill shall be compacted to match that specified for that area.
- D. At a depth of 12" below finished grade and at least 6" above installed equipment, lay a 6" wide yellow warning tape on the compacted backfill for the full length of the trench. Do not stretch the tape. Use Brady "Identoline" stating: "CAUTION BURIED ELECTRICAL LINE". Installation under building slabs is not required unless noted otherwise.
- E. If at any time during a period of one-year dating from the date of final acceptance of the project, there shall be any settlement of conduit trenches, the Architect may notify the Contractor to immediately provide additional fill and to make such repairs or replacements in paving, planting, or structures, as may be deemed necessary at the Contractor's expense
- F. Cooperate and coordinate with others in planning for and execution of all trench work.

1. The Contractor is expected to exercise due care when excavating in an area of existing utilities to avoid damage to these facilities. Where it can be determined that underground facilities are likely to exist (either from the Drawings or inspection of the site), the Contractor is required to determine the exact locations of these existing installations. Damage to existing facilities, due to failure to properly accomplish the above, shall be repaired at the Contractors expense to the approval by the Architect and satisfaction of the District.
2. CALL AN UNDERGROUND SERVICE FIRM BEFORE TRENCHING, CALL U.S.A. (800) 624-2444.

### 3.5 SEALING PENETRATIONS

- A. Flash and counter flash roof and wall penetrations with equipment manufactured for the purpose and as described in other Divisions of these Specifications or as Directed by the Architect. Apply mastic as required to seal absolutely watertight.
- B. Conduits penetrating floor slabs or block or concrete walls shall be grouted and sealed watertight.

### 3.6 CUTTING AND PATCHING

- A. Obtain the Architect's acceptance prior to cutting existing surfaces or surfaces under construction. All such surfaces must be repaired or patched to the satisfaction of the Architect.

### 3.7 EQUIPMENT ANCHORING

- A. Seismic Withstand Requirements: Freestanding or wall-hung equipment shall be anchored in place by methods, which will meet the requirements of the Uniform Building code for seismic loads. The CONTRACTOR shall submit calculations in accordance with "Contractor Submittals", for the design of the anchoring systems for all equipment, including panels, transformers, etc. in excess of 250 pounds. Calculations shall be performed, signed and stamped by a Structural Engineer or a Civil Engineer experienced in structural design and licensed in the State of California. The calculation shall provide an analysis of lateral and overturning forces and shall include a factor of safety against overturning equal to 1.5. The calculation shall also provide an analysis of both the anchoring system and the foundation or wall system to receive the anchor loads and shall show that the foundation is capable of resisting all anchor loads. Submittal shall include data on attachment hardware and methods that will satisfy withstand criteria.
- B. Seismic bracing for light fixtures cable or pendant suspended from ceiling or roof structure shall be seismically braced to prevent fixture from swaying 45 degree in either direction of suspension point. Contractor shall use same cable used to suspend light fixture. Where pendants are use the contractor shall use air craft light fixture suspension cable. Submittal shall include data on attachment hardware and methods that will satisfy withstand criteria referred to in above paragraph.

**3.8 PROTECTION CLEANING AND REPAIRS**

- A. All electrical equipment shall be protected from damage or degradation during construction. Electrical equipment stored or installed shall be protected from dust, water, or damage from other sources.
- B. After all other work has been accomplished, such as plastering, painting, etc., and prior to final review by the Architect; all electrical equipment, especially equipment enclosures, panelboards, switchboards, and lighting fixtures shall be thoroughly cleaned (inside and out) of all dirt, water, grease, plaster, paint, or other construction debris. All surfaces shall be clean and in "new" condition. All scratches, dents, marks, cracks, etc., shall be repaired to the satisfaction of the Architect or the equipment shall be replaced at no additional cost.

**3.9 ELECTRICAL EQUIPMENT DELIVERABLES**

- A. Retain and safeguard all detachable and spare devices, equipment, and literature (O&M manuals, instruction books, wiring diagrams, test reports, keys, fixtures, etc.) until completion of work. At this time, all items will be delivered to the District as directed by the Architect.

**3.10 TESTS**

- A. Prior to energization of equipment, check the insulation resistance of listed circuits, with a 500 volt "Megger".
- B. Take precaution during the testing period to insure the safety of personnel and equipment.
- C. Test all wiring for continuity and grounds before any fixtures or equipment are connected. Where such tests indicate faulty installation or other defects, the fault(s) shall be located and repaired at the Contractor's expense. The repaired installation shall then be retested.
- D. Verify rotation of all three phase motors and reconnect if necessary.
- E. Verify the resistance of the grounding electrode system(s).
- F. Balance all loads on each panelboard and all other types of distribution equipment as applicable.

END OF SECTION 26 01 10

**SECTION 26 02 10 - ELECTRICAL DEMOLITION GENERAL REQUIREMENTS**

**PART 1 GENERAL**

1.1 CONTRACT PROVISIONS

- A. The requirements of this Section are in addition to the requirements of Division 1, General Conditions and Supplementary Conditions.

1.2 RELATED DOCUMENTS

- A. Section 260110- General Requirements, Electrical.
- B. Notes and requirements on drawings.

1.3 REQUIREMENTS INCLUDED

- A. The Contractor shall furnish materials, equipment, and labor necessary to perform and complete demolition work.
- B. The work includes demolition of the existing electrical and fire alarm work.
- C. The work shall include, but not limited to, removal of existing electrical and fire alarm equipment and devices, conduits, and wiring.
- D. Manufactured articles, materials, equipment, and accessories shall be demolished in accordance with the manufacturer's specifications and recommendations, and industry standards.
- E. Notify Vernon Greer's (Owner) representative at least 72 hours prior to any electrical systems shutdown.

1.4 PROTECTION

- A. It is essential that there be minimal interruption of existing systems such as power, fire protection, and other systems, in addition to the normal operations of Vernon Greer's (Owner) facilities.
- B. Take care to ensure that there will be no damage to structural elements or portions there-of-which are not to be removed. Erect and maintain temporary shoring, bracing, and other means to safeguard the structural integrity of the existing buildings and structures.
- C. Erect and maintain temporary bracing, shoring, lights, barricades, signs, and other means to protect the public, workers, and other persons; finishes and improvements to remain; and adjoining property from damage from demolition work; all in accordance with application regulatory requirements.



- D. Protect existing structures, facilities, and plant life from damage. Items damaged as a result of demolition operations shall be repaired or replaced, at no cost to Vernon Greer (Owner).
- E. Perform demolition to provide the least interference and most protection to existing facilities and improvements to remain.
- F. Demolish concrete in small sections.
- G. Perform demolition as much as possible with small tools.
- H. Jack-hammering:
  - 1. Jack-hammering will be permitted only to a limited degree, and only with the prior written approval of the Owner.
  - 2. Do not jackhammer within 2-inches of reinforcing or structural steel to remain; remove final 2-inches of material with chipping gun.

#### 1.5 CUTTING AND PATCHING

- A. Make new openings neat, as close as possible to profiles indicated, and only to extent necessary for new work.
- B. Do not cut or alter structural members unless specifically indicated or approved, and do not damage reinforcing or structural steel to remain.
- C. At concrete, masonry, paving, and other materials where edges of cuts and holes will remain exposed in the completed work, make cuts using power-sawing and coring equipment. Do not over cut at corners of cut openings – saw overruns will not be permitted. Core hole at corner of proposed openings to insert blade and chip square.
- D. Upon completion of cutting and coring, clean remaining surfaces of loose particles and dust.
- E. Repair and patch all holes and openings from the removed electrical equipment, outlet boxes, etc. Coordinate with the General Contractor and the Architect to include and provide finished to match adjacent area.

#### 1.6 PIPES, DUCTS, AND CONDUITS

- A. Remove deactivated electrical conduit, including fastenings, connections, and other related appurtenances and accessories which would otherwise be exposed in the completed work or interfere with construction operations.
- B. Unless noted otherwise, remove existing exposed conduits and abandon existing concealed conduits in walls, ceiling and underground whether shown on drawings or not.

- C. Cap deactivated piping systems at points of cutoff.

**1.7 DEMOLITION DEBRIS**

- A. All equipment and associated materials must be disposed of in an approved manner and in accordance with all applicable federal, state, and local environmental laws.
- B. Regularly remove debris from the site so that it's presence will not delay the progress of the work.
- C. Nothing to be removed from the site shall be stored, sold, or burned on the site without Vernon Greer/Owner's prior written acceptance.

**1.8 RECONDITIONING EXISTING SUBSTRATES**

- A. Clean surfaces on which new materials will be applied, removing adhesives, bitumen, and other adhering materials, as necessary to furnish acceptable substrates for new materials.
- B. Perform sandblasting, chipping, grinding, acid washing, etching, and other work as required by conditions encountered and new materials involved
- C. Use of acids or other cleaning agents shall include neutralizing, washing, rinsing, and drying, as applicable.
- D. Determine substrate requirements for reconditions surfaces in cooperation with the manufacturer's representative and installer of each new installer involved.
- E. Clean surfaces on which new materials will be applied, removing adhesives, bitumen, and other adhering materials, as necessary to furnish acceptable substrates for new materials.

**1.9 DISPOSAL OF FLUORESCENT LAMPS AND BALLASTS**

- A. All existing fluorescent lamps and ballasts shall be properly disposed or recycled according to the Environmental Protection Agency (EPA) and Resource Conservation and Recovery Act (RCTA) standards. Include all costs for disposal or recycling in the bid proposal.
  - 1. Lamps: Dispose or recycle through "Allied Technology Group", 47375 Freemont Boulevard, Freemont, California, 94538, (510) 490-3008 or equal.
  - 2. Ballasts: Dispose or recycle through "Fulcircle Ballast Recyclers", 550 Montori Court, Pleasanton, California, 94556, (510) 417-5967 or equal.

**1.10 ASBESTOS**

- A. In the event asbestos is found to be present in areas conflicting with electrical work, before continuation of work in those areas, notify the General Contractor and/or Vernon Greer (Owner) representative and if applicable, for the removal of such hazardous material by a certified asbestos contractor.

**END OF SECTION 26 02 10**

SECTION 26 05 19 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wire and cable for 600 volts and less.
- B. Wiring connectors and connections.

1.2 RELATED REQUIREMENTS

- A. 260110 General Requirements, Electrical.
- B. Division 31 for additional requirements, for excavation, bedding and backfilling.
- C. Section 260553 - Identification for Electrical Systems.

1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- B. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association.
- C. 2016 California Electrical Code.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide for each cable assembly type.
- C. Test Reports: Indicate procedures and values obtained.
- D. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency.
- F. Project Record Documents: Record actual locations of components and circuits.

1.5 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.
- C. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.1 WIRING REQUIREMENTS

- A. Concealed Dry Interior Locations: Use only building wire in raceway.
- B. Exposed Dry Interior Locations: Use only building wire in raceway.
- C. Above Accessible Ceilings: Use only building wire in raceway.
- D. Wet or Damp Interior Locations: Use only building wire with Type insulation in raceway.
- E. Exterior Locations: Use only building wire with Type THWN insulation in raceway.
- F. Underground Installations: Use only building wire with Type THWN insulation in raceway.
- G. Use solid conductor for feeders and branch circuits 10 AWG and smaller.
- H. Use stranded conductors for control circuits.
- I. Use conductor not smaller than 12 AWG for power and lighting circuits.
- J. Use conductor not smaller than 16 AWG for control circuits.
- K. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.
- L. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.
- M. Conductor sizes are based on copper unless indicated as aluminum or "AL".

2.2 WIRE MANUFACTURERS (LISTED IN ALPHABETICALLY ORDER ONLY AND NOT NECESSARY BY PREFERENCE)

- A. Cerro Wire Inc: [www.cerrowire.com](http://www.cerrowire.com).
- B. Industrial Wire & Cable, Inc: [www.iewc.com](http://www.iewc.com).
- C. Southwire Company: [www.southwire.com](http://www.southwire.com).

- D. Or Equal.
- E. Substitutions: See Section 016000 - Product Requirements.

### 2.3 BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor: Copper.
  - 1. For Sizes Smaller Than 4 AWG: Copper.
  - 2. For Sizes 4 AWG and Larger: Copper.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation: 2016 CEC, Type THW.

### 2.4 SERVICE ENTRANCE CABLE

- A. Description: 2016 CEC, Type SE.
- B. Conductor: Copper.
  - 1. For Sizes Smaller Than 4 AWG: Copper.
  - 2. For Sizes 4 AWG and Larger: Copper.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation: Type RH.

### 2.5 WIRING CONNECTORS

- A. Solderless Pressure Connectors:
- B. Compression Connectors:

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that mechanical work likely to damage wire and cable has been completed.
- C. Verify that raceway installation is complete and supported.
- D. Verify that field measurements are as indicated.

**3.2 PREPARATION**

- A. Completely and thoroughly swab raceway before installing wire.

**3.3 INSTALLATION**

- A. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA.
- B. Route wire and cable as required to meet project conditions.
  - 1. Wire and cable routing indicated is approximate unless dimensioned.
  - 2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.
  - 3. Include wire and cable of lengths required to install connected devices within 10 ft of location shown.
- C. Use wiring methods indicated.
- D. Pull all conductors into raceway at same time.
- E. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- F. Protect exposed cable from damage.
- G. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.
- H. Use suitable cable fittings and connectors.
- I. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- J. Clean conductor surfaces before installing lugs and connectors.
- K. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- L. Where aluminum conductors are allowed for use as indicated on plans, terminate aluminum conductors with tin-plated aluminum-bodied compression connectors only. Fill with anti-oxidant compound before installing conductor.
- M. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
- N. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
- O. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
- P. Trench and backfill for direct burial cable installation as specified in Sections 312316 and 312323. Install warning tape along entire length of direct burial cable, within 3 inches of grade, as specified in Section 260553.

- Q. Identify and color code wire and cable under provisions of Section 260553. Identify each conductor with its circuit number or other designation indicated.

3.4 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 014000.
- B. Inspect and test in accordance with NETA STD ATS, except Section 4.
- C. Perform inspections and tests listed in NETA STD ATS, Section 7.3.2.

END OF SECTION 26 05 19



SECTION 26 05 26 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Grounding and bonding components.
- B. Provide all components necessary to complete the grounding system(s) consisting of:
  - 1. Existing metal underground water pipe.
  - 2. Metal underground water pipe.
  - 3. Metal frame of the building.
  - 4. Steel water storage tank and supports.
  - 5. Concrete-encased electrode.
  - 6. Ground ring.
  - 7. Existing metal underground gas piping system.
  - 8. Metal underground gas piping system.

1.2 RELATED REQUIREMENTS

- B. Section 032000 - Concrete Reinforcing.
- C. Section 033000 - Cast-in-Place Concrete.

1.3 REFERENCE STANDARDS

- A. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association.
- B. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association.
- C. 2016 California Electrical Code.

1.4 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: 5 ohms.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide for grounding electrodes and connections.

- C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Quality Assurance. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Project Record Documents: Record actual locations of components and grounding electrodes.
- F. Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

#### 1.6 QUALITY ASSURANCE

- A. Conform to requirements of 2016 California Electrical Code.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience with service facilities within 100 miles of Project.
- C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Cooper Power Systems: [www.cooperpower.com](http://www.cooperpower.com).
- B. Framatome Connectors International: [www.fciconnect.com](http://www.fciconnect.com).
- C. Or Equal..
- D. Substitutions: See Section 016000 - Product Requirements.

#### 2.2 ELECTRODES

- A. Manufacturers:
  - 1. Cooper Power Systems: [www.cooperpower.com](http://www.cooperpower.com).
  - 2. Framatome Connectors International: [www.fciconnect.com](http://www.fciconnect.com).
  - 3. Or Equal..
  - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Rod Electrodes: Copper.
  - 1. Diameter: 3/4 inch.
  - 2. Length: 10 feet.
- C. Foundation Electrodes: 2/0 AWG. Unless noted on plan.

**2.3 CONNECTORS AND ACCESSORIES**

- A. Mechanical Connectors: Bronze.
- B. Exothermic Connections:
- C. Wire: Stranded copper.
- D. Grounding Electrode Conductor: Size to meet 2016 CEC requirements.
- E. Grounding Well:
  - 1. Well Pipe: 8 inch by 24 inch long clay tile pipe with belled end.
  - 2. Well Cover: Cast iron with legend "GROUND" embossed on cover.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Verify existing conditions prior to beginning work.
- B. Verify that final backfill and compaction has been completed before driving rod electrodes.

**3.2 INSTALLATION**

- A. Install ground electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
- B. Provide grounding well pipe with cover at each rod location. Install well pipe top flush with finished grade.
- C. Install 4 AWG bare copper wire in foundation footing where indicated.
- D. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where indicated. Bond steel together.
- E. Provide bonding to meet requirements described in Quality Assurance.
- F. Provide isolated grounding conductor for circuits supplying personal computers and applicable electronic equipment.
- G. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- H. Interface with other site grounding system where installed.

**3.3 FIELD QUALITY CONTROL**

- A. Provide field inspection in accordance with Section 014000.
- B. Inspect and test in accordance with NETA STD ATS except Section 4.

- C. Perform inspections and tests listed in NETA STD ATS, Section 7.13.

END OF SECTION 26 05 26

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Conduit and equipment support.
- B. Anchors and fasteners.

1.2 REFERENCE STANDARDS

- A. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements
- B. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements;
- C. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements
- D. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
- E. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- F. 2016 California Electrical Code.

1.3 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog data for fastening systems.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.4 QUALITY ASSURANCE

- A. Conform to requirements of 2016 CEC.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS (LISTED IN ALPHABETICALLY ORDER ONLY AND NOT NECESSARY BY PREFERENCE)

- A. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
- B. Threaded Rod Company: [www.threadedrod.com](http://www.threadedrod.com).
- C. Or Equal.
- D. Substitutions: See Section 016000 - Product Requirements.

2.2 SUPPORTS

- A. Pipe hangers for individual conduits shall be factory made, consisting of a pipe ring and threaded suspension rod. The pipe ring shall be malleable iron, split and hinged, or shall be springable wrought steel. Rings shall be bolted to or interlocked with the suspension rod socket.
- B. Pipe racks for groups of parallel conduits shall be constructed of galvanized structural steel preformed channels of length as required, suspended on threaded rods and secured thereto with nuts above and below the cross bar.
- C. Factory made pipe straps shall be one hole malleable iron or two hole galvanized clamps.
- D. Supporting rods shall be at least 3/8" diameter and channel shall be at least 3/4" deep. Supporting hardware shall be galvanized steel.

**2.3 MATERIALS**

- A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.
- B. Supports: Fabricated of structural steel or formed steel members; galvanized.
- C. Anchors and Fasteners:
- D. Concrete Structural Elements: Use precast inserts, expansion anchors, powder-actuated anchors, or preset inserts.
- E. Steel Structural Elements: Use beam clamps, steel spring clips, steel ramset fasteners, or welded fasteners.
- F. Concrete Surfaces: Use self-drilling anchors or expansion anchors.
- G. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
- H. Solid Masonry Walls: Use expansion anchors or preset inserts.
- I. Sheet Metal: Use sheet metal screws.
- J. Wood Elements: Use wood screws.
- K. Fastener Types:
  - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
  - 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
  - 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.

- 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
- 5. Other Types: As required.
- 6. Manufacturers:
  - a. Powers Fasteners, Inc: [www.powers.com](http://www.powers.com).
  - b. Or Equal.
  
- L. Formed Steel Channel:
  
- M. Substitutions: See Section 01 60 00 - Product Requirements.
  
- N. Powder-Actuated Anchors:
  
- O. Substitutions: See Section 01 60 00 - Product Requirements.
  
- P. Steel Spring Clips:
  
- Q. Substitutions: See Section 01 60 00 - Product Requirements.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.
  - 1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
  - 2. Obtain permission from the Architect and the Structural Engineer before drilling or cutting structural members.
  
- B. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.



- C. Install surface-mounted cabinets and panelboards with minimum of four anchors.
  
- D. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch off wall.
  
- E. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION 26 05 29

SECTION 26 05 34 - RACEWAYS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Conduit, fittings and conduit bodies.

1.2 RELATED REQUIREMENTS

- A. Section 337119 - Electrical Underground Ducts and Manholes.
- B. Section 078400 - Firestopping.
- C. Section 260526 - Grounding and Bonding for Electrical Systems.
- D. Section 260529 - Hangers and Supports for Electrical Systems.
- E. Section 260553 - Identification for Electrical Systems.
- F. Section 260537 - Boxes.

1.3 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC).
- B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT).
- C. ANSI C80.5 - American National Standard for Electrical Rigid Aluminum Conduit (ERAC).
- D. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- E. NECA 101 - Standard for Installing Steel Conduit (Rigid, IMC, EMT); National Electrical Contractors Association.
- F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association.
- G. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; National Electrical Manufacturers Association.
- H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit; National Electrical Manufacturers Association.
- I. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association.

- J. 2016 California Electrical Code.

#### 1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, nonmetallic conduit, fittings, and conduit bodies.
- C. Project Record Documents: Accurately record actual routing of conduits larger than 1 1/4 inches.

#### 1.5 QUALITY ASSURANCE

- A. Conform to requirements of 2016 CEC.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept conduit on site. Inspect for damage.
- B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- C. Protect PVC conduit from sunlight.

### PART 2 - PRODUCTS

#### 2.1 CONDUIT REQUIREMENTS

- A. Conduit Size: Comply with 2106 CEC.
  - 1. Minimum Size: 3/4 inch unless otherwise specified.
- B. Underground Installations:
  - 1. More than 5 Feet from Foundation Wall: Use plastic coated conduit or thickwall non-metallic conduit.
  - 2. Within 5 Feet from Foundation Wall: Use rigid steel conduit.
  - 3. In or Under Slab on Grade: Use plastic coated conduit or thickwall non-metallic conduit.
  - 4. Minimum Size: 1 inch.
- C. Outdoor Locations Above Grade: Use rigid steel conduit or intermediate metal conduit.
- D. In Slab Above Grade:
  - 1. Use intermediate metal conduit or thickwall nonmetallic conduit.
  - 2. Maximum Size Conduit in Slab: 3/4 inch; 1/2 inch for conduits crossing each other.

- E. Wet and Damp Locations: Use rigid steel conduit or intermediate metal conduit.
- F. Dry Locations:
  - 1. Concealed: Use electrical metallic tubing.
  - 2. Exposed: Use rigid steel conduit or intermediate metal conduit for installation up to 8 feet.

## 2.2 METAL CONDUIT

- A. Manufacturers:
  - 1. Allied Tube & Conduit: [www.alliedtube.com](http://www.alliedtube.com).
  - 2. Beck Manufacturing, Inc: [www.beckmfg.com](http://www.beckmfg.com).
  - 3. Wheatland Tube Company: [www.wheatland.com](http://www.wheatland.com).
  - 4. Or Equal..
  - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Intermediate Metal Conduit (IMC): Rigid steel.
- D. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

## 2.3 PVC COATED METAL CONDUIT

- A. Manufacturers:
  - 1. Allied Tube & Conduit: [www.alliedtube.com](http://www.alliedtube.com).
  - 2. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
  - 3. Robroy Industries: [www.robroy.com](http://www.robroy.com).
  - 4. Or Equal.
  - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Description: NEMA RN 1; rigid steel conduit with external PVC coating.
- C. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

## 2.4 FLEXIBLE METAL CONDUIT

- A. Manufacturers:
  - 1. AFC Cable Systems, Inc: [www.afcweb.com](http://www.afcweb.com).
  - 2. Electri-Flex Company: [www.electriflex.com](http://www.electriflex.com).
  - 3. International Metal Hose: [www.metalhose.com](http://www.metalhose.com).
  - 4. Or Equal..
  - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Description: Interlocked steel construction.
- C. Fittings: NEMA FB 1.

**2.5 LIQUIDTIGHT FLEXIBLE METAL CONDUIT**

- A. Manufacturers:
  - 1. AFC Cable Systems, Inc: [www.afcweb.com](http://www.afcweb.com).
  - 2. Electri-Flex Company: [www.electriflex.com](http://www.electriflex.com).
  - 3. International Metal Hose: [www.metalhose.com](http://www.metalhose.com).
  - 4. Or Equal..
  - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Description: Interlocked steel construction with PVC jacket.
- C. Fittings: NEMA FB 1.

**2.6 ELECTRICAL METALLIC TUBING (EMT)**

- A. Manufacturers:
  - 1. Allied Tube & Conduit: [www.alliedtube.com](http://www.alliedtube.com).
  - 2. Beck Manufacturing, Inc: [www.beckmfg.com](http://www.beckmfg.com).
  - 3. Wheatland Tube Company: [www.wheatland.com](http://www.wheatland.com).
  - 4. Or Equal.
- B. Description: ANSI C80.3; galvanized tubing.
- C. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron compression type.

**2.7 NONMETALLIC TUBING SHALL NOT BE USED FOR THIS PROJECT, NO EXCEPTIONS.**

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Verify that field measurements are as shown on drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

**3.2 INSTALLATION**

- A. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install steel conduit as specified in NECA 101.
- C. All conduits shall be run concealed in walls and/or ceiling. Where conduits can not be run concealed in wall and/or ceiling space, the Constructor shall coordinate with the architectural and structural plans and the Architect for installing and routing of exposed conduits.

- D. Arrange supports to prevent misalignment during wiring installation.
- E. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- F. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- G. Fasten conduit supports to building structure and surfaces under provisions of Section 260529.
- H. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- I. Do not attach conduit to ceiling support wires.
- J. Arrange conduit to maintain headroom and present neat appearance.
- K. Route exposed conduit parallel and perpendicular to walls.
- L. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- M. Route conduit in and under slab from point-to-point.
- N. Do not cross conduits in slab.
- O. Maintain adequate clearance between conduit and piping.
- P. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- Q. Bring conduit to shoulder of fittings; fasten securely.
- R. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- S. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations.
- T. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one shot bender to fabricate bends in metal conduit larger than 2 inch size.
- U. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- V. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic.
- W. Provide suitable pull string in each empty conduit except sleeves and nipples.
- X. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- Y. Ground and bond conduit under provisions of Section 260526.
- Z. Identify conduit under provisions of Section 260553.

3.3 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

END OF SECTION 26 05 34

SECTION 26 05 37 - BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wall and ceiling outlet boxes.
- B. Floor boxes.
- C. Pull and junction boxes.

1.2 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 262716 - Electrical Cabinets and Enclosures.
- C. Section 262726 - Wiring Devices: Wall plates in finished areas.

1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- B. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association.
- C. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association.
- E. 2016 California Electrical Code.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

1.5 QUALITY ASSURANCE

- A. Conform to requirements of 2016 CEC.
- B. Products: Provide products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.



**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Appleton Electric: [www.appletonelec.com](http://www.appletonelec.com).
- B. Arc-Co./Division of Arcade Technology; [www.arc-co.com](http://www.arc-co.com).
- C. Unity Manufacturing: [www.unitymfg.com](http://www.unitymfg.com).
- D. Or Equal.
- E. Substitutions: See Section 016000 - Product Requirements.

**2.2 OUTLET BOXES**

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
  - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
  - 2. Concrete Ceiling Boxes: Concrete type.
- B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.
- C. Wall Plates for Finished Areas: As specified in Section 262726.

**2.3 FLOOR BOXES**

- A. Floor Boxes: NEMA OS 1, fully adjustable, 1-1/2 inches deep.
- B. Material: Cast metal.
- C. Shape: Round.
- D. Service Fittings: As specified in Section 262726.

**2.4 PULL AND JUNCTION BOXES**

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Hinged Enclosures: As specified in Section 262716.
- C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
  - 1. Material: Galvanized cast iron.
  - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- D. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting:

1. Material: Galvanized cast iron.
2. Cover: Smooth cover with neoprene gasket and stainless steel cover screws.
3. Cover Legend: "ELECTRIC".

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Verify locations of floor boxes and outlets prior to rough-in.

**3.2 INSTALLATION**

- A. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by 2016 CEC.
- C. Coordinate installation of outlet boxes for equipment connected under Section 262717.
- D. Set wall mounted boxes at elevations to accommodate mounting heights indicated.
- E. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
  1. Adjust box locations up to 10 feet if required to accommodate intended purpose.
- F. Orient boxes to accommodate wiring devices oriented as specified in Section 262726.
- G. Maintain headroom and present neat mechanical appearance.
- H. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- I. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- J. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- K. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- L. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
- M. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- N. Use flush mounting outlet box in finished areas.
- O. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- P. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in fire-rated and acoustic rated walls.

- Q. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- R. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- S. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- T. Use adjustable steel channel fasteners for hung ceiling outlet box.
- U. Do not fasten boxes to ceiling support wires.
- V. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.
- W. Use gang box where more than one device is mounted together. Do not use sectional box.
- X. Use gang box with plaster ring for single device outlets.
- Y. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- Z. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.
- AA. Set floor boxes level.
- AB. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

### 3.3 ADJUSTING

- A. Adjust floor boxes flush with finish flooring material.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused box openings.

### 3.4 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION 26 05 37

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.
- D. Field-painted identification of conduit.

1.2 RELATED REQUIREMENTS

- A. Section 099000 - Painting and Coating.

1.3 REFERENCE STANDARDS

- A. 2016 California Electrical Code.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittals procedures.

1.5 QUALITY ASSURANCE

- A. Conform to requirements of 2016 CEC.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

- A. Buried Electrical Lines: Underground warning tapes.
- B. Communication Cabinets: Nameplates.
- C. Conduit: Conduit markers.

- D. Control Device Station: Labels.
- E. Electrical Distribution and Control Equipment Enclosures: Nameplates.

## 2.2 MANUFACTURERS

- A. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
- B. Seton Identification Products: [www.seton.com/aec](http://www.seton.com/aec).
- C. HellermannTyton: [www.hellermanntyton.com](http://www.hellermanntyton.com).
- D. Or equal.
- E. Substitutions: See Section 016000 - Product Requirements.

## 2.3 NAMEPLATES AND LABELS

- A. Manufacturers:
  - 1. Kolbi Pipe Marker Co.; [www.kolbipipemarkers.com](http://www.kolbipipemarkers.com).
  - 2. Seton Identification Products; [www.seton.com](http://www.seton.com).
  - 3. Or Equal.
- B. Nameplates: Engraved three-layer laminated plastic, black letters on white background.
- C. Locations:
  - 1. Each electrical distribution and control equipment enclosure.
  - 2. Communication cabinets.
- D. Letter Size:
  - 1. Use 1/8 inch letters for identifying individual equipment and loads.
  - 2. Use 1/4 inch letters for identifying grouped equipment and loads.
- E. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use only for identification of individual wall switches and receptacles, control device stations, and \_\_\_\_\_.

## 2.4 WIRE MARKERS

- A. Manufacturers:
  - 1. Brady Corporation; [www.bradycorp.com](http://www.bradycorp.com).
  - 2. Seton Identification Products; [www.seton.com](http://www.seton.com).
  - 3. HellermannTyton; [www.hellermanntyton.com](http://www.hellermanntyton.com).
  - 4. Or Equal.
- B. Description: Vinyl cloth type self-adhesive wire markers.
- C. Description: Cloth type wire markers.

- D. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, and junction boxes each load connection.
- E. Legend:
  - 1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
  - 2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings.

## 2.5 CONDUIT MARKERS

- A. Manufacturers:
  - 1. Brady Corporation; [www.bradycorp.com](http://www.bradycorp.com).
  - 2. Seton Identification Products; [www.seton.com](http://www.seton.com).
  - 3. HellermannTyton; [www.hellermanntyton.com](http://www.hellermanntyton.com).
  - 4. Or Equal.
- B. Location: Furnish markers for each conduit longer than 6 feet.
- C. Spacing: 20 feet on center.
- D. Color:
  - 1. Fire Alarm System: Red.

## 2.6 UNDERGROUND WARNING TAPE

- A. Manufacturers:
  - 1. Brady Corporation; [www.bradycorp.com](http://www.bradycorp.com).
  - 2. Seton Identification Products; [www.seton.com](http://www.seton.com).
  - 3. HellermannTyton; [www.hellermanntyton.com](http://www.hellermanntyton.com).
  - 4. Or Equal.
- B. Description: 3 inch wide polyethylene tape, detectable type colored red with suitable warning legend describing buried electrical lines.
- C. Description: 4 inch wide plastic tape, detectable type colored red with suitable warning legend describing buried electrical lines.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Degrease and clean surfaces to receive nameplates and labels.

### 3.2 INSTALLATION

- A. Install nameplates and labels parallel to equipment lines.

- B. Secure nameplates to equipment front using screws.
- C. Secure nameplates to inside surface of door on panelboard that is recessed in finished locations.
- D. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches below finished grade.

END OF SECTION 26 05 53

SECTION 26 09 23 -LIGHTING CONTROL DEVICES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Occupancy sensors.
- B. Time switches.
- C. In-wall time switches.
- D. Outdoor photo controls.
- E. Daylighting controls.

1.2 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260537 - Boxes.
- C. Section 260553 - Identification for Electrical Systems: Labels for lighting control devices.
- D. Section 262716 - Electrical Cabinets and Enclosures.
- E. Section 262726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, fan speed controllers, and wall plates.
- F. Section 265100 - Interior Lighting.
- G. Section 265600 - Exterior Lighting.

1.3 REFERENCE STANDARDS

- A. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing
- B. ANSI C136.24 - American National Standard for Roadway and Area Lighting Equipment - Nonlocking (Button) Type Photocontrols.
- C. NECA 1 - Good Workmanship in Electrical Construction.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- E. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Fluorescent Ballasts; National Electrical Manufacturers Association.



- F. 2016 California Electrical Code (CEC)
- G. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.
- H. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.
- I. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
  - 3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
  - 4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
  - 5. Notify the Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.
- B. Sequencing:
  - 1. Do not install lighting control devices until final surface finishes and painting are complete.

#### 1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
  - 1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.
- C. Shop Drawings:
  - 1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
  - 2. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.
- D. Field Quality Control Reports.
- E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

- F. Operation and Maintenance Data: Include detailed information on device programming and setup.
- G. Maintenance Materials: Furnish the following for District's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
- H. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.6 QUALITY ASSURANCE

- A. Conform to requirements of 2016 CEC.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND PROTECTION

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.8 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for all occupancy sensors.
- C. Provide five year manufacturer warranty for utility grade locking receptacle-mounted outdoor photo controls.
- D. Provide two year manufacturer warranty for all daylighting controls.

PART 2 - PRODUCTS

2.1 ALL LIGHTING CONTROL DEVICES

- A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.
- C. Products for Switching of Electronic Fluorescent Ballasts: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

## 2.2 OCCUPANCY SENSORS

- A. Manufacturers:
  - 1. WattStopper; [www.wattstopper.com](http://www.wattstopper.com).
  - 2. Substitutions: See Section 016000 - Product Requirements.
  - 3. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. All Occupancy Sensors:
  - 1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
  - 2. Sensor Technology:
    - a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
    - b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
    - c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
    - d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.
  - 3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
  - 4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
  - 5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
  - 6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
  - 7. Turn-Off Delay: Field adjustable, up to a maximum time delay setting of not less than 15 minutes and not more than 30 minutes.
  - 8. Sensitivity: Field adjustable.
  - 9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
  - 10. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above the selected level.
  - 11. Compatibility: Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
  - 12. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on the drawings.

13. Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.
- C. Wall Switch Occupancy Sensors:
1. All Wall Switch Occupancy Sensors:
    - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
    - b. Unless otherwise indicated or required to control the load indicated on the drawings, provide line voltage units with self-contained relay.
    - c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.
    - d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
    - e. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
    - f. Finish: Match finishes specified for wiring devices in Section 262726, unless otherwise indicated.
    - g. Provide vandal resistant lenses for passive infrared (PIR) and dual technology wall switch occupancy sensors where indicated.
  2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.
  3. Ultrasonic Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 400 square feet.
  4. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.
- D. Ceiling Mounted Occupancy Sensors:
1. All Ceiling Mounted Occupancy Sensors:
    - a. Description: Low profile occupancy sensors designed for ceiling installation.
    - b. Unless otherwise indicated or required to control the load indicated on the drawings, provide low voltage units, for use with separate compatible accessory power packs.
  2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:
    - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
    - b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
  3. Ultrasonic Ceiling Mounted Occupancy Sensors:
    - a. Standard Range Sensors: Capable of detecting motion within an area of 500 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
    - b. Medium Range Sensors: Capable of detecting motion within an area of 1,000 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
    - c. Extended Range Sensors: Capable of detecting motion within an area of 2,000 square feet at a mounting height of 9 feet.
  4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
    - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
    - b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
  5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:

- a. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet.
- E. Directional Occupancy Sensors:
1. All Directional Occupancy Sensors: Designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.
  2. Passive Infrared (PIR) Directional Occupancy Sensors:
    - a. Long Range Sensors: Capable of detecting motion within a distance of 80 feet at a mounting height of 10 feet.
  3. Passive Infrared/Ultrasonic Dual Technology Directional Occupancy Sensors: Capable of detecting motion within a distance of 40 feet at a mounting height of 10 feet.
- F. Luminaire Mounted Occupancy Sensors: Designed for direct luminaire installation and control, suitable for use with specified luminaires.
- G. Power Packs for Low Voltage Occupancy Sensors:
1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
  2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on the drawings.
  3. Input Supply Voltage: Dual rated for 120/277 V ac.
- H. Accessories:
1. Provide heavy duty coated steel wire protective guards compatible with specified occupancy sensors where indicated.

## 2.3 TIME SWITCHES

- A. Digital Electronic Time Switches:
1. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
  2. Program Capability:
  3. Schedule Capacity: Not less than 16 programmable on/off operations.
  4. Provide automatic daylight savings time and leap year compensation.
  5. Provide power outage backup to retain programming and maintain clock.
  6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
  7. Input Supply Voltage: As indicated on the drawings.
  8. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:
- B. Electromechanical Time Switches:
1. Description: Factory-assembled controller with motor-operated timing dial mechanism and adjustable trippers for setting on/off operations, listed and labeled as complying with UL 917.
  2. Program Capability:
  3. Schedule Capacity:
  4. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
  5. Input Supply Voltage: As indicated on the drawings.
  6. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:

**2.4 IN-WALL TIME SWITCHES**

- A. Digital Electronic In-Wall Time Switches:
1. Description: Factory-assembled solid state programmable controller with LCD display, suitable for mounting in standard wall box, and listed and labeled as complying with UL 916 or UL 917.
  2. Program Capability:
  3. Schedule Capacity: Not less than 40 programmable on/off operations.
  4. Provide power outage backup to retain programming and maintain clock.
  5. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
  6. Switch Configuration: Suitable for use in either SPST or 3-way application.
- B. Electromechanical In-Wall Time Switches:
1. Description: Factory-assembled controller with motor-operated timing dial mechanism and adjustable trippers for setting on/off operations, suitable for mounting in standard wall box, and listed and labeled as complying with UL 917.
  2. Program Capability: 24-hour time switch with same schedule for each day of the week.
  3. Schedule Capacity: Accommodating not less than 24 selected on/off operations per day.
  4. Manual override: Capable of permanently overriding current schedule.
  5. Switch Configuration: SPST.

**2.5 OUTDOOR PHOTO CONTROLS**

- A. Stem-Mounted Outdoor Photo Controls:
1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
  2. Housing: Weatherproof, impact resistant polycarbonate.
  3. Photo Sensor: Cadmium sulfide.
  4. Provide external sliding shield for field adjustment of light level activation.
  5. Light Level Activation: 1 to 5 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
  6. Voltage: As required to control the load indicated on the drawings.
  7. Failure Mode: Fails to the on position.
  8. Load Rating: As required to control the load indicated on the drawings.

**2.6 DAYLIGHTING CONTROLS**

- A. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.
- B. Daylighting Control Photo Sensors: Low voltage class 2 photo sensor units with output signal proportional to the measured light level and provision for zero or offset based signal.
1. Sensor Type: Filtered silicon photo diode.
  2. Sensor Range:
    - a. Indoor Photo Sensors: 5 to 100 footcandles.
    - b. Skylight Photo Sensors: 1,000 to 6,000 footcandles.
- C. Dimming Photo Sensors: Photo sensor units with integral controller compatible with specified dimming ballasts, for direct continuous dimming of up to 50 ballasts.

- D. Daylighting Control Switching Modules: Low voltage class 2 control unit compatible with specified photo sensors, for switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
  - 1. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
  - 2. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
  - 3. Control Capability:
  
- E. Daylighting Control Dimming Modules: Low voltage class 2 control unit compatible with specified photo sensors and with specified dimming ballasts, for both continuous dimming of compatible dimming ballasts and switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
  - 1. Operation: Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.
  - 2. Control Capability: Capable of controlling up to three separately programmable channels, with up to 50 ballasts per channel.
  - 3. Dimming and Fade Rates: Adjustable from 5 to 60 seconds.
  - 4. Cut-Off Delay: Selectable and adjustable from 0 to 20 minutes.
  
- F. Power Packs for Daylighting Control Modules:
  - 1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage daylighting control modules for switching of line voltage loads. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on the drawings.
  - 2. Input Supply Voltage: Dual rated for 120/277 V ac.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

**3.2 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

**3.3 INSTALLATION**

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1, including mounting heights specified in that standard unless otherwise indicated
- B. Coordinate locations of outlet boxes provided under Section 260537 as required for installation of lighting control devices provided under this section.
  - 1. Mounting Heights, measured to the top of the box: Unless otherwise indicated, as follows:
    - a. Wall Switch Occupancy Sensors: 48 inches max. above finished floor.
    - b. In-Wall Time Switches: 48 inches max. above finished floor.
    - c. In-Wall Interval Timers: 48 inches max. above finished floor.
  - 2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
  - 3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify the Engineer to obtain direction prior to proceeding with work.
- C. Install lighting control devices in accordance with manufacturer's instructions.
- D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- E. Install lighting control devices plumb and level, and held securely in place.
- F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 262726.
- G. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- H. Occupancy Sensor Locations:
  - 1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
  - 2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
- I. Outdoor Photo Control Locations:
  - 1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.



2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.
  - J. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.
  - K. Daylighting Control Photo Sensor Locations:
    1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for proper control of respective room or area based on manufacturer's recommendations for installed devices.
    2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
    3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.
  - L. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.
  - M. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.
- 3.4 FIELD QUALITY CONTROL
- A. See Section 014000 - Quality Requirements, for additional requirements.
  - B. Inspect each lighting control device for damage and defects.
  - C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
  - D. Test time switches to verify proper operation.
  - E. Test outdoor photo controls to verify proper operation, including time delays where applicable.
  - F. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.
  - G. Correct wiring deficiencies and replace damaged or defective lighting control devices.
- 3.5 ADJUSTING
- A. Adjust devices and wall plates to be flush and level.
  - B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Engineer.

- C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.
- D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.
- E. Adjust time switch settings to achieve desired operation schedule as indicated or as directed the Engineer. Record settings in written report to be included with submittals.
- F. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Engineer.
- G. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by engineer.

### 3.6 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### 3.7 COMMISSIONING

- A. See Section 019113 for commissioning requirements.

### 3.8 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals, for closeout submittals.
- B. See Section 017900 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of lighting control devices to the Engineer, and correct deficiencies or make adjustments as directed.
- D. Training: Train Los Rios District's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
  - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
  - 2. Provide minimum of two hours of training.
  - 3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
  - 4. Location: At project site.

END OF SECTION 26 09 23

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.

1.2 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260553 - Identification for Electrical Systems.

1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- B. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC; National Electrical Manufacturers Association.
- C. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association.
- D. NEMA PB 1 - Panelboards; National Electrical Manufacturers Association.
- E. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; National Electrical Manufacturers Association.
- F. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association.
- G. 2016 California Electrical Code.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

- C. Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.
- D. Maintenance Materials: Furnish the following for Los Rios Community College District's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Panelboard Keys: Two of each different key.

1.5 QUALITY ASSURANCE

- A. Conform to requirements of 2016 CEC.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Eaton Corporation; Cutler-Hammer Products: [www.eaton.com](http://www.eaton.com).
- B. Schneider Electric; Square D Products:
- C. Siemens
- D. Or equivalent subject to substitution process

2.2 POWER DISTRIBUTION PANELBOARDS

- A. Description: NEMA PB 1, circuit breaker type.
- B. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.
- C. Minimum integrated short circuit rating: As indicated.
  - 1. 240 Volt Panelboards: amperes rms symmetrical per plan.
  - 2. 480 Volt Panelboards: amperes rms symmetrical per plan.
- D. Molded Case Circuit Breakers: With integral thermal and instantaneous magnetic trip in each pole; UL listed. For air conditioning equipment branch circuits provide circuit breakers UL listed as Type HACR.
- E. Controllers: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower, with bimetal overload relay.
  - 1. Coil operating voltage: 120 volts, 60 Hz.
  - 2. Size as shown on Drawings.
- F. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated.

- G. Enclosure: NEMA PB 1, Type 1, cabinet box.
- H. Cabinet Front: Surface type, fastened with concealed trim clamps, hinged door with flush lock, metal directory frame, finished in manufacturer's standard gray enamel.

### 2.3 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.
- B. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard; provide insulated ground bus where scheduled.
- C. Minimum Integrated Short Circuit Rating: As indicated.
- D. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, bolt-on type, with common trip handle for all poles; UL listed.
  - 1. Type SWD for lighting circuits.
  - 2. Type HACR for air conditioning equipment circuits.
  - 3. Class A ground fault interrupter circuit breakers where scheduled.
  - 4. Do not use tandem circuit breakers.
- E. Enclosure: NEMA PB 1, Type 1.
- F. Cabinet Box: 6 inches deep, 20 inches wide for 240 volt and less panelboards, 20 inches wide for 480 volt panelboards.
- G. Cabinet Front: Flush cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.
- B. Install panelboards plumb. Install recessed panelboards flush with wall finishes.
- C. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.
- D. Provide typed or neatly handwritten circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- E. Provide engraved plastic nameplates under the provisions of Section 260553.
- F. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.
  - 1. Minimum spare conduits: 5 empty 1 inch.

- G. Ground and bond panelboard enclosure according to Section 260526.

**3.2 FIELD QUALITY CONTROL**

- A. Perform field inspection and testing in accordance with Section 014000.
- B. Inspect and test in accordance with NETA STD ATS, except Section 4.
- C. Perform inspections and tests listed in NETA STD ATS, Section 7.5 for switches, Section 7.6 for circuit breakers.

**3.3 ADJUSTING**

- A. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION 26 24 16

**SECTION 26 27 16 - ELECTRICAL CABINETS AND ENCLOSURES**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Hinged cover enclosures.
- B. Cabinets.
- C. Terminal blocks.
- D. Accessories.

**1.2 RELATED REQUIREMENTS**

- A. Section 260529 - Hangers and Supports for Electrical Systems.

**1.3 REFERENCE STANDARDS**

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association.
- C. NEMA ICS 4 - Industrial Control and Systems: Terminal Blocks; National Electrical Manufacturers Association.
- D. 2016 California Electrical Code.

**1.4 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard data for enclosures and cabinets.
- C. Cabinet Keys: Deliver to District in accordance with Section 016000 for maintenance materials.

**1.5 QUALITY ASSURANCE**

- A. Conform to requirements of 2016 CEC.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**PART 2 - PRODUCTS**

**2.1 ENCLOSURE MANUFACTURERS**

- A. Cooper B-Line: [www.bline.com](http://www.bline.com).
- B. Qube Corporation: [www.qubeinc.com](http://www.qubeinc.com).
- C. Robroy Industries: [www.robroy.com](http://www.robroy.com).
- D. Or equal.
- E. Substitutions: See Section 016000 - Product Requirements.

**2.2 HINGED COVER ENCLOSURES**

- A. Construction: NEMA 250, Type 1 steel enclosure.
- B. Covers: Continuous hinge, held closed by flush latch operable by screwdriver.
- C. Provide interior plywood panel for mounting terminal blocks and electrical components; finish with white enamel.
- D. Enclosure Finish: Manufacturer's standard enamel.

**2.3 CABINETS**

- A. Boxes: Galvanized steel.
- B. Backboard: Provide 3/4-inch-thick plywood backboard for mounting terminal blocks. Paint matte white.
- C. Fronts: Steel, flush type with concealed trim clamps, door with concealed hinge, and flush lock keyed to match branch circuit panelboard. Finish with gray baked enamel.
- D. Provide metal barriers to form separate compartments wiring of different systems and voltages.
- E. Keys: Provide two of each different key.

**2.4 TERMINAL BLOCKS**

- A. Manufacturers:
  - 1. Allen-Bradley/Rockwell Automation: [www.ab.com](http://www.ab.com).
  - 2. Cooper Bussmann: [www.bussmann.com](http://www.bussmann.com).
  - 3. WECO Electrical Connectors Inc: [www.weco.ca](http://www.weco.ca).
  - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Terminal Blocks: NEMA ICS 4.



- C. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.
- D. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts.
- E. Provide ground bus terminal block, with each connector bonded to enclosure.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Install securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner under the provisions of Section 260529.
- C. Install cabinet fronts plumb.

**3.2 CLEANING**

- A. Clean electrical parts to remove conductive and harmful materials.
- B. Remove dirt and debris from enclosure.
- C. Clean finishes and touch up damage.

END OF SECTION 26 27 16

**SECTION 26 27 17 - EQUIPMENT WIRING**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Electrical connections to equipment.

**1.2 RELATED REQUIREMENTS**

- A. Section 260534 - Conduit.
- B. Section 260519 - Low-Voltage Electrical Power Conductors and Cables (600 V and Less).
- C. Section 260537 - Boxes.
- D. Section 262726 - Wiring Devices.

**1.3 REFERENCE STANDARDS**

- A. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association.
- B. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association.
- C. 2016 California Electrical Code.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
  - 2. Determine connection locations and requirements.
- B. Sequencing:
  - 1. Install rough-in of electrical connections before installation of equipment is required.
  - 2. Make electrical connections before required start-up of equipment.

**1.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

1.6 QUALITY ASSURANCE

- A. Conform to requirements of 2016 CEC.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
  - 1. Colors: Conform to NEMA WD 1.
  - 2. Cord Construction: CEC, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
  - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
- B. Disconnect Switches: As described and in individual equipment sections.
- C. Wiring Devices: As specified in Section 262726.
- D. Flexible Conduit: As specified in Section 260534.
- E. Wire and Cable: As specified in Section 260519.
- F. Boxes: As specified in Section 260537.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.
- J. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

END OF SECTION 26 27 17

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Fan speed controllers.
- D. Receptacles.
- E. Wall plates.
- F. Floor box service fittings.
- G. Poke-through assemblies.

1.2 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260537 - Boxes.
- C. Section 260553 - Identification for Electrical Systems: Labels for wiring devices.
- D. Section 262717 - Equipment Wiring: Cords and plugs for equipment.
- F. Section 271500 - Structured Telecommunications Cabling: Voice and data jacks.

1.3 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Federal Specification; Revision G.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F.
- C. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- D. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association.

- E. NEMA WD 6 - Wiring Device -- Dimensional Requirements; National Electrical Manufacturers Association.
- F. 2016 California Electrical Code.
- G. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- H. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- I. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- J. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- K. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.
- L. UL 1917 - Solid-State Fan Speed Controls; Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
  - 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
  - 4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
  - 5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
  - 6. Notify the Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.
- B. Sequencing:
  - 1. Do not install wiring devices until final surface finishes and painting are complete.

#### 1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
  - 1. Wall Dimmers: Include derating information for ganged multiple devices.

#### 1.6 QUALITY ASSURANCE

- A. Conform to requirements of 2016 CEC.

- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Pass & Seymore
- B. Cooper Wiring Devices: [www.cooperwiringdevices.com](http://www.cooperwiringdevices.com).
- C. Leviton Manufacturing, Inc: [www.leviton.com](http://www.leviton.com).
- D. Or equal.

2.2 APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFI receptacles with specified weatherproof covers for all receptacles installed outdoors or in damp or wet locations.
- D. Provide GFI receptacles for all receptacles installed within 6 feet of sinks.
- E. Provide GFI receptacles for all receptacles installed in kitchens.
- F. Provide GFI receptacles for all receptacles serving electric drinking fountains.
- G. Provide isolated ground receptacles for all receptacles serving computers and electronic cash registers.
- H. Unless noted otherwise, do not use combination switch/receptacle devices.
- I. For flush floor service fittings, use tile rings for installations in tile floors.
- J. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

**2.3 ALL WIRING DEVICES**

- A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- B. Finishes:
  - 1. All Wiring Devices: White with white nylon wall plate unless otherwise indicated.
  - 2. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate unless otherwise indicated.
  - 3. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate unless otherwise indicated.
  - 4. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover unless otherwise indicated.
  - 5. Isolated Ground Convenience Receptacles: Orange with isolated ground triangle mark on device face.
  - 6. Surge Protection Receptacles: Blue.
  - 7. Clock Hanger Receptacles: White with nylon wall plate.
  - 8. Above-Floor Service Fittings: wiring devices with housing.
  - 9. Flush Floor Box Service Fittings: wiring devices with cover and ring/flange.
  - 10. Flush Poke-Through Service Fittings: wiring devices with cover and aluminum flange.

**2.4 WALL SWITCHES**

- A. All Wall Switches: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- B. Pilot Light Wall Switches: Industrial specification grade, 20 A, 120/277 V with red illuminated standard toggle type switch actuator and maintained contacts; illuminated with load on; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
- C. Locking Wall Switches: Industrial specification grade, 20 A, 120/277 V with lever type keyed switch actuator and maintained contacts; all switches keyed alike; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
- D. Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with toggle type three position switch actuator and momentary contacts; single pole double throw, off with switch actuator in center position.
- E. Locking Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with lever type keyed three position switch actuator and momentary contacts; all switches keyed alike; single pole double throw, off with switch actuator in center position.
- F. Wall Switches: Heavy Duty, AC only general-use snap switch, complying with NEMA WD 6 and WD 1.
  - 1. Body and Handle: white plastic with toggle handle.
  - 2. Indicator Light: Lighted handle type switch; red handle.
  - 3. Locator Light: Lighted handle type switch; red color handle.
  - 4. Ratings:
    - a. Voltage: 120 and 277 volts, AC.



b. Current: 20 amperes.

G. Switch Types: Single pole, double pole, and 3-way.

## 2.5 WALL DIMMERS

- A. All Wall Dimmers: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.
- B. Electronic Low-Voltage Wall Dimmers: 120 V AC, slide control type with separate on/off switch; single pole or three way as indicated on the drawings.
  - 1. Power Rating: 400 VA unless otherwise indicated or required to control the load indicated on the drawings.
- C. Fluorescent Wall Dimmers: 120 V AC, slide control type with separate on/off switch, compatible with dimming ballast controlled; single pole or three way as indicated on the drawings.
  - 1. Power Rating: 600 VA unless otherwise indicated or required to control the load indicated on the drawings.
- D. Wall Dimmers: Semiconductor dimmer for incandescent lamps, Type as indicated on drawings, complying with NEMA WD 6 and WD 1.
  - 1. Body and Handle: white plastic with rotary knob.
  - 2. Voltage: 120 and 277 volts.
  - 3. Power Rating: 600 watts.
- E. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

## 2.6 FAN SPEED CONTROLLERS

- A. Description: 120 V AC, solid-state, full-range variable speed, slide control type with separate on/off switch, with integral radio frequency interference filtering, fan hum elimination circuitry, field-adjustable trim, power failure preset memory, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1917.
  - 1. Current Rating: 1.5 A unless otherwise indicated or required to control the load indicated on the drawings.

## 2.7 RECEPTACLES

- A. All Receptacles: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
  - 2. NEMA configurations specified are according to NEMA WD 6.
- B. Convenience Receptacles:

1. Standard Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
  2. Isolated Ground Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, with ground contacts isolated from mounting strap; single or duplex as indicated on the drawings.
  3. Weather Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R,, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
  4. Tamper Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R,, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
  5. Tamper Resistant and Weather Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R,, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
- C. GFI Receptacles:
1. All GFI Receptacles: Provide with feed-through protection, light to indicate ground fault tripped condition and loss of protection, and list as complying with UL 943, class A.
  2. Standard GFI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
  3. Weather Resistant GFI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
  4. Tamper Resistant GFI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
  5. Tamper Resistant and Weather Resistant GFI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
- D. Receptacles: Heavy duty, complying with NEMA WD 6 and WD 1.
1. Device Body: white plastic.
  2. Configuration: NEMA WD 6, type as specified and indicated.
- E. Convenience Receptacles: Type 5 to 15.
- F. Single Convenience Receptacles.
- G. Duplex Convenience Receptacles.
- H. GFCI Receptacles: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.
- 2.8 TELEPHONE AND DATA JACKS
- 2.9 WALL PLATES
- A. All Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
  2. Size: Standard; .
  3. Screws: Metal with slotted heads finished to match wall plate finish.
- B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- D. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.
- E. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.
- F. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected.
- G. Decorative Cover Plates: white, nylon.
- H. Jumbo Cover Plates: Ivory, nylon.
- I. Weatherproof Cover Plates: Gasketed cast metal with hinged.
- 2.10 FLOOR BOX SERVICE FITTINGS
- A. Description: Service fittings compatible with floor boxes provided under Section 260537 with all components, adapters, and trims required for complete installation.
- B. Above-Floor Service Fittings:
- C. Flush Floor Service Fittings:
1. Single Service Flush Convenience Receptacles:
    - a. Cover: Rectangular.
    - b. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
  2. Single Service Flush Communications Outlets:
    - a. Cover: Rectangular.
    - b. Configuration: .
  3. Single Service Flush Furniture Feed:
    - a. Cover: Rectangular.
    - b. Configuration: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
  4. Dual Service Flush Combination Outlets:
    - a. Cover: Rectangular.
    - b. Configuration:
      - 1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).
      - 2) Communications: .
  5. Dual Service Flush Furniture Feed:
    - a. Cover: Rectangular.
    - b. Configuration:

- 1) Power: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
  - 2) Communications: One 2-1/8 inch by 1 inch combination threaded opening(s).
6. Accessories:
- a. Tile Rings: Finish to match covers; configuration as required to accommodate specified covers.
  - b. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.
- D. Flush Cover Convenience Receptacles:
1. Material: Brass.
- E. Flush Cover Communication Outlets:
- F. Flush Cover Combination Fittings:
1. Material: Brass.
- G. Protective Ring: Brass finish.
- H. Split Nozzles: Brass finish.
- I. Carpet Rings: Brass.
- 2.11 POKE-THROUGH ASSEMBLIES
- A. Description: Assembly comprising floor service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination; fire rating listed to match fire rating of floor and suitable for floor thickness where installed.
- B. Above-Floor Service Fittings:
- C. Flush Floor Service Fittings:
1. Single Service Flush Convenience Receptacles:
    - a. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
  2. Single Service Flush Communications Outlets:
    - a. Configuration:
    - b. Voice and Data Jacks: As specified in Section 271005.
  3. Single Service Flush Furniture Feed:
    - a. Configuration: One 2 inch by 1-1/4 inch combination threaded opening(s).
  4. Dual Service Flush Combination Outlets:
    - a. Cover: Hinged door(s).
    - b. Configuration:
      - 1) Power: One standard convenience duplex receptacle(s).
      - 2) Communications: \_\_\_\_\_.
      - 3) Voice and Data Jacks: As specified in Section 271005.
  5. Dual Service Flush Furniture Feed:
    - a. Configuration:
      - 1) Power: One 3/4 inch threaded opening(s).
      - 2) Communications: Two 1/2 inch threaded opening(s).
  6. Accessories:

- a. Closure Plugs: Size and fire rating as required to seal unused core hole and maintain fire rating of floor.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with 2016 CEC.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that floor boxes are adjusted properly.
- F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- G. Verify that core drilled holes for poke-through assemblies are in proper locations.
- H. Verify that conditions are satisfactory for installation prior to starting work.

#### 3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

#### 3.3 INSTALLATION

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1, including mounting heights specified in that standard unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 260537 as required for installation of wiring devices provided under this section.
  - 1. Mounting Heights, measured to top of the box: Unless otherwise indicated, as follows:
    - a. Wall Switches: 48 inches max. above finished floor.
    - b. Wall Dimmers: 48 inches max. above finished floor.
    - c. Fan Speed Controllers: 48 inches max. above finished floor.
    - d. Receptacles: Min. 15 inch measured to bottom of the box. Over obstructions refer to reach ranges in CBC 11B-308:
      - 1) For parallel approach, over 34" max. obstruction with 24" max. depth: 46" max. measured to top of the box.
      - 2) For forward approach, over 34" max. obstruction with 25" max. depth: 44" max. measured to top of the box.

- 3) Same height range is applicable to telephones, measured to highest operable part.
  2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
  3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
  4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify LP Consulting Engineers to obtain direction prior to proceeding with work.
  5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect grounding terminal to outlet box or normal branch circuit equipment grounding conductor.
- I. Install securely, in a neat and workmanlike manner, as specified in NECA 1.
- J. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- K. Install wall switches with OFF position down.
- L. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- M. Do not share neutral conductor on branch circuits utilizing wall dimmers.
- N. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- O. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- P. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

- Q. Install identification label for wall switches and wall dimmers in accordance with Section 260526 indicating load served when controlling loads that are not visible from the control location or multiple wall switches or wall dimmers are installed at one location.
- R. Install identification label for all receptacles in accordance with Section 260526 indicating serving branch circuit.
- S. Install poke-through closure plugs in all unused core holes to maintain fire rating of floor.
- T. Install receptacles with grounding pole on top.
- U. Connect wiring device grounding terminal to outlet box with bonding jumper.
- V. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
- W. Connect wiring devices by wrapping conductor around screw terminal.
- X. Use jumbo size plates for outlets installed in masonry walls.
- Y. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- Z. Install protective rings on active flush cover service fittings.

#### 3.4 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate locations of outlet boxes provided under Section 260537 to obtain mounting heights specified.
- B. Install wall switch 48 inches above finished floor, measured to top of the box.
- C. Install convenience receptacle min. 15" inches above finished floor, measured to bottom of the box.
- D. convenience receptacle; see paragraph 3.3 for installation heights.
- E. Install dimmer 48 inches max. above finished floor, measured to top of the box.
- F. Install telephone jack; see paragraph 3.3 for installation heights.
- G. Coordinate installation of access floor boxes with access floor system provided under Section 096900.

#### 3.5 FIELD QUALITY CONTROL

- A. Perform field inspection, testing, and adjusting in accordance with Section 014000.
- B. Inspect each wiring device for damage and defects.

- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Operate each wall switch with circuit energized and verify proper operation.
- E. Verify that each receptacle device is energized.
- F. Test each receptacle to verify operation and proper polarity.
- G. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- H. Correct wiring deficiencies and replace damaged or defective wiring devices.
- I. Verify that each telephone jack is properly connected and circuit is operational.

**3.6 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.

**3.7 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

**END OF SECTION**



SECTION 26 28 13 - FUSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fuses.
- B. Spare fuse cabinet.

1.2 REFERENCE STANDARDS

- A. NEMA FU 1 - Low Voltage Cartridge Fuses; National Electrical Manufacturers Association.
- B. California amendments CEC 2016.

1.3 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data sheets showing electrical characteristics, including time-current curves.
- C. Maintenance Materials: Furnish the following for District's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Extra Fuses: Three of each type and size.

1.4 QUALITY ASSURANCE

- A. Conform to requirements of 2016 CEC.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.
- C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Cooper Bussmann
- B. Ferraz Shawmut, Inc

- C. Littelfuse
- D. Or Equal

## 2.2 FUSES - GENERAL

- A. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.
- B. Voltage: Rating suitable for circuit phase-to-phase voltage.
- C. Main Service Switches Larger than 600 amperes: Class L (time delay).
- D. Main Service Switches: Class RK1 (time delay).
- E. Power Load Feeder Switches: Class RK1 (time delay).
- F. Motor Load Feeder Switches: Class RK1 (time delay).
- G. Lighting Load Feeder Switches: Class RK1 (time delay).
- H. Other Feeder Switches: Class RK1 (time delay).
- I. General Purpose Branch Circuits: Class RK1 (time delay).
- J. Motor Branch Circuits: Class L time delay.

## 2.3 SPARE FUSE CABINET

- A. Description: Wall-mounted sheet metal cabinet with shelves, suitably sized to store spare fuses and fuse pullers specified.
- B. Doors: Hinged, with hasp for the District's padlock.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install fuses with label oriented such that manufacturer, type, and size are easily read.
- B. Install spare fuse cabinet where indicated.

END OF SECTION 26 28 13

SECTION 26 29 23 – MOTOR STARTERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The requirements of this section are in addition to the requirements of Division 1, General Conditions and Supplementary Conditions.

1.2 SUMMARY

- A. Scope: Furnish all labor, materials, equipment and incidentals required, and install, complete ready for operation, and field test starters as shown on the Drawings and as described in the Specifications.
- B. Related Work Specified Elsewhere:
  - 1. Section 260110, GENERAL REQUIREMENTS, ELECTRICAL
  - 2. Section 260519, LOW VOLTAGE POWER CONDUCTORS & CALBES
  - 3. Section 260526, GROUNDING AND BONDING
  - 4. Section 260534, RACEWAYS

1.3 QUALITY ASSURANCE

- A. All starters shall comply with applicable standards of the Underwriter's Laboratories and be NEMA rated.

1.4 REQUIREMENTS

- A. Motor starters (controllers) are to be provided for all motors that will perform the required functions as indicated on the Drawings. Starters are to be provided and/or installed under this Division of these Specifications where not otherwise provided by other Divisions. Motor size and type as indicated on the Drawings are to be used for reference only - verify data for motors actually provided.
- B. Note that motor starting equipment furnished under this Division is to be sized according to nameplate data of the motors actually provided. Due to substitutions or other types of equipment modifications, it is not particularly unusual to have motors or equipment provided that have electrical characteristics slightly different than those anticipated during design. Whenever this occurs, make such modifications to the circuit wiring, conduit sizing, disconnecting and starting equipment, and feeder circuit wiring, short circuit and over current protection as required. No additional compensation will be allowed for work or equipment associated with these types of modifications.

**PART 2 - PRODUCTS**

**2.1 MOTOR STARTERS**

- A. Size per applicable Electrical Codes. Where a combination starter is required, use a type with circuit breaker disconnecting device.
- B. Running Overload Protection: An overload relay shall be installed in each ungrounded motor circuit leg. They shall be sensitive to motor current only, have inverse time characteristics, and be of the manual reset type with a reset button operable from the outside of the starter enclosure. They shall be temperature compensated type. Select the overload relay heaters as required by the applicable Electrical Code only after the actual nameplate data for the motor has been determined.
- C. Provide and install all control devices not otherwise provided. This includes specifically: control transformers, pilot devices, push buttons and selector switches, auxiliary contacts, etc., which are required to be mounted on or within the starter enclosure. Each starter contactor shall be provided with at least one extra N.O. auxiliary contact.
- D. All motor starters shall be installed in enclosures suitable to the conditions (NEMA 3R where installed outdoors) and provided with a nameplate identifying the equipment controlled.
- E. Provide phase failure relays for motor loads over 25 horsepower.
- F. MANUFACTURERS: Starters shall be manufactured by Allen-Bradley (Bulletin 505 through 523 depending on the specific application and as described on the Drawings), Cutler-Hammer or equal.

**2.2 MANUAL MOTOR STARTING SWITCHES**

- A. Allen-Bradley Bulletin 600 or 609. Starters with under voltage protection, Bulletin 609U shall be provided where noted on the Drawings.
- B. Push button or toggle lever type switches shall be provided as noted. Where not otherwise indicated, provide toggle type.
- C. Running overload protection shall be provided by thermal overload devices operating on the melting solder-ratchet principle. Provide heater elements and size starting switches in accordance with nameplate data of motors actually supplied. Provide pilot and control devices as indicated on the Drawings. Enclosures shall be suitable for the conditions (NEMA 3R where installed outdoors or in wet locations) and a nameplate shall be provided indicating the controlled equipment.
- D. Where shown at a motor location on the Drawings, a local motor rated safety switch and motor circuit running current overload protection are required. These may be provided entirely or in part by the equipment manufacturer (internally protected motor with circuit connector, etc.); but if not, it is to be provided under this section of the Specifications.

**2.3 ACCESSORIES**

- A. Control stations shall be standard size, heavy-duty oil tight. Control Stations shall be manufactured by Allen-Bradley, or equal.
- B. All pilot devices (pushbuttons, selector switches, pilot lights, etc.) shall be the same manufacturer as the motor starters.
- C. Control Relays and Time Delay Relays shall be plug-in type with indicator light. Relays shall be manufactured by Idec, or equal.
- D. Phase failure relay shall detect phase loss, phase reversal, low voltage and phase unbalance. Phase failure relays shall be manufactured by Timemark series 258 or equal with base.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Motor starters are to be installed plumb and rigidly secured to structure or equipment with wood screws, bolts and expansion anchors, or machine bolts and locknuts as applicable.
- B. Nameplates shall be installed as indicated in Section 260110, Basic Electrical Requirements.

END OF SECTION 26 29 23

SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Interior luminaires.
- B. Exit signs.
- C. Ballasts.
- D. Fluorescent dimming ballasts and controls.
- E. Fluorescent emergency power supply units.
- F. Lamps.
- G. Luminaire accessories.

1.2 RELATED REQUIREMENTS

- A. Section 092116 - Gypsum Board Assemblies: Additional requirements for support of ceiling mounted fixtures.
- B. Section 095100 - Acoustical Ceilings: Additional requirements for support of ceiling mounted fixtures.
- C. Section 260537 - Boxes.
- D. Section 260923 - Lighting Control Devices: Automatic controls for lighting including occupancy sensors, outdoor motion sensors, time switches, outdoor photo controls, and daylighting controls.
- E. Section 262726 - Wiring Devices: Manual wall switches and wall dimmers.

1.3 REFERENCE STANDARDS

- A. ANSI C78.379 - American National Standard for Electric Lamps -- Reflector Lamps -- Classification of Beam Patterns; 2006.
- B. ANSI C82.1 - American National Standard for Lamp Ballast - Line Frequency Fluorescent Lamp Ballast; 2004.
- C. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low Pressure Sodium Lamps (Multiple-Supply Type).

- D. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; Consolidated.
  - E. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits.
  - F. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information.
  - G. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
  - H. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association.
  - I. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; National Electrical Contractors Association.
  - J. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Fluorescent Ballasts; National Electrical Manufacturers Association.
  - K. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; National Electrical Manufacturers Association.
  - L. California Electrical Code (CEC) 2016.
  - M. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association.
  - N. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
  - O. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.
  - P. UL 1029 - High-Intensity-Discharge Lamp Ballasts; Current Edition, Including All Revisions.
  - Q. UL 1598 - Luminaires; Current Edition, Including All Revisions.
  - R. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.
- 1.4 ADMINISTRATIVE REQUIREMENTS
- A. Coordination:
    - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
    - 2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
    - 3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.

4. Notify the Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

**1.5 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
  1. Provide photometric calculations where luminaires are proposed for substitution upon request.
- C. Shop Drawings: Indicate dimensions and components for each fixture that is not a standard product of the manufacturer.
- D. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
  1. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IESNA LM-63 standard format upon request.
- E. Certificates for Dimming Ballasts: Manufacturer's documentation of compatibility with dimming controls to be installed.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- H. Maintenance Materials: Furnish the following for District's use in maintenance of project.
  1. See Section 016000 - Product Requirements, for additional provisions.

**1.6 QUALITY ASSURANCE**

- A. Conform to requirements of 2016 CEC.
- B. Conform to requirements of 2016 CEC and NFPA 101.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

**1.7 DELIVERY, STORAGE, AND PROTECTION**

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.



- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Furnish products as indicated in Lighting Fixture Schedule included on the Drawings
- B. Substitutions: See Section 016000 - Product Requirements.

2.2 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule on the drawings.
- B. Or equal in performance and quality acceptable by the Architect and/or the District Representative.

2.3 LUMINAIRES

- A. Provide products that comply with requirements of 2016 CEC.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products that comply with requirements of 2016 CEC and NFPA 101.
- D. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

- F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- H. Recessed Luminaires:
  - 1. Ceiling Compatibility: Comply with NEMA LE 4.
  - 2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
  - 3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
- I. Fluorescent Luminaires:
  - 1. Provide ballast disconnecting means complying with 2016 CEC where required.
  - 2. Fluorescent Luminaires Controlled by Occupancy Sensors: Provide programmed start ballasts.
  - 3. Fluorescent Luminaires Controlled by Dual-Level Switching: Provide with two ballasts.
    - a. Luminaires with Two Lamps: Each ballast controls one lamp.
    - b. Luminaires with Three Lamps: One ballast controls two outer lamps and one ballast controls inner lamp.
    - c. Luminaires with Four Lamps: One ballast controls two outer lamps and one ballast controls two inner lamps.
- J. HID Luminaires:
  - 1. HID High Bay Luminaires: Provide safety chain or power hook unless otherwise indicated.
  - 2. HID Luminaires with Quartz Restrike Systems: Factory-installed supplementary quartz lamp automatically switches on when power interruption causes primary HID lamp to drop out or during cold startup.
- K. LED Luminaires: Listed and labeled as complying with UL 8750.
- L. Track Lighting Systems: Provide track compatible with specified track heads, with all connectors, power feed fittings, dead ends, hangers and canopies as necessary to complete installation.
- M. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

## 2.4 LUMINAIRES

- A. Furnish products as indicated in Lighting Fixture Schedule included on the Drawings.
- B. Substitutions: See Section 016000 - Product Requirements.

## 2.5 EXIT SIGNS

- A. All Exit Signs: Internally illuminated with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

1. Number of Faces: Single or double as indicated or as required for the installed location.
  2. Directional Arrows: As indicated or as required for the installed location.
- B. Self-Powered Exit Signs:
1. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
  2. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
  3. Provide low-voltage disconnect to prevent battery damage from deep discharge.
  4. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.
- C. Self-Luminous Exit Signs: Internally illuminated by tritium gas sealed inside phosphor lined gas tubes, requiring no electrical power to operate, with a service life of 20 years unless otherwise indicated.
- D. Accessories:
1. Provide compatible accessory high impact polycarbonate vandal shields where indicated.
  2. Provide compatible accessory wire guards where indicated.
- E. Manufacturers: Furnish products as indicated in Lighting Fixture Schedule included on the Drawings
- F. Exit Signs: Exit sign fixture suitable for use as emergency lighting unit.
1. Provide fixtures complying with NFPA 101.
  2. Lamps: Compact fluorescent.
  3. Directional Arrows: Universal type for field adjustment.
  4. Mounting: As indicated.
  5. Battery: 6 or 12 volt, nickel-cadmium type, with 1.5 hour capacity.
  6. Battery Charger: Dual-rate type, with sufficient capacity to recharge discharged battery to full charge within twelve hours.
  7. Lamps: Manufacturer's standard.
- 2.6 BALLASTS
- A. Manufacturers:
1. General Electric Company/GE Lighting; : [www.gelighting.com](http://www.gelighting.com).
  2. Osram Sylvania; : [www.sylvania.com](http://www.sylvania.com).
  3. Philips Lighting Electronics/Advance; : [www.advance.philips.com](http://www.advance.philips.com).
  4. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.
  5. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.
- B. All Ballasts:
1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
  2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
- C. Fluorescent Ballasts:

1. All Fluorescent Ballasts: Unless otherwise indicated, provide high frequency electronic ballasts complying with ANSI C82.11 and listed and labeled as complying with UL 935.
  - a. Input Voltage: Suitable for operation at voltage of connected source, with variation tolerance of plus or minus 10 percent.
  - b. Total Harmonic Distortion: Not greater than 20 percent.
  - c. Power Factor: Not less than 0.95.
  - d. Ballast Factor: Normal ballast factor between 0.85 and 1.15, unless otherwise indicated.
  - e. Thermal Protection: Listed and labeled as UL Class P, with automatic reset for integral thermal protectors.
  - f. Sound Rating: Class A, suitable for average ambient noise level of 20 to 24 decibels.
  - g. Lamp Compatibility: Specifically designed for use with the specified lamp, with no visible flicker.
  - h. Lamp Operating Frequency: Greater than 20 kHz, except as specified below.
  - i. Lamp Current Crest Factor: Not greater than 1.7.
  - j. Lamp Wiring Method:
    - 1) Instant Start Ballasts: Parallel wired.
    - 2) Rapid Start Ballasts: Series wired.
    - 3) Programmed Start Ballasts: Provide parallel or series/parallel wired where available; otherwise series wired is acceptable.
  - k. Provide automatic restart capability to restart replaced lamp(s) without requiring resetting of power.
  - l. Provide end of lamp life automatic shut down circuitry for T5 and smaller diameter lamp ballasts.
  - m. Surge Tolerance: Capable of withstanding characteristic surges according to IEEE C62.41.2, location category A.
  - n. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 18, for Class A, non-consumer application.
  - o. Ballast Marking: Include wiring diagrams with lamp connections.
2. Non-Dimming Fluorescent Ballasts:
  - a. Lamp Starting Method:
    - 1) T8 Lamp Ballasts: Instant start unless otherwise indicated.
    - 2) T5 Lamp Ballasts: Programmed start unless otherwise indicated.
    - 3) Compact Fluorescent Lamp Ballasts: Programmed start unless otherwise indicated.
3. Dimming Fluorescent Ballasts:
  - a. Dimming Range: Continuous dimming from 100 percent to five percent relative light output, without flicker and with even tracking across multiple lamps.
  - b. Control Compatibility: Fully compatible with the dimming controls to be installed.
    - 1) Wall Dimmers: See Section 262726.
    - 2) Daylighting Controls: See Section 260923.
  - c. Lamp Starting Method: Programmed start unless otherwise indicated.
  - d. Dimmed Lamp Starting: Capable of starting lamp(s) at any dimmed preset without transitioning first to full light output.
4. Bi-Level Stepped Dimming Linear Fluorescent Ballasts:
  - a. Bi-Level Operation: Capable of being switched between full light output on all lamps, 50 percent of full light output on all lamps, and all lamps off.
  - b. Control Compatibility: Capable of being controlled by standard manual light switches or occupancy sensors unless otherwise indicated.
  - c. Lamp Starting Method: Programmed start unless otherwise indicated.

- D. High Intensity Discharge (HID) Ballasts: Complying with ANSI C82.4 and listed and labeled as complying with UL 1029.
1. Electronic Metal Halide Ballasts:
    - a. All Electronic Metal Halide Ballasts:
      - 1) Input Voltage: Suitable for operation at voltage of connected source, with variation tolerance of plus or minus 10 percent.
      - 2) Total Harmonic Distortion: Not greater than 15 percent.
      - 3) Power Factor: Not less than 0.90.
      - 4) Provide thermal protection with automatic reset.
      - 5) Sound Rating: Class A, suitable for average ambient noise level of 20 to 24 decibels.
      - 6) Lamp Operating Frequency: Less than 200 Hz or as required to avoid acoustic resonance in lamp arc tube.
      - 7) Lamp Current Crest Factor: Not greater than 1.5.
      - 8) Provide end of lamp life automatic shut down circuitry.
      - 9) Surge Tolerance: Capable of withstanding characteristic surges according to IEEE C62.41.2, location category A.
      - 10) Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 18, for Class A, non-consumer application.

## 2.7 FLUORESCENT EMERGENCY POWER SUPPLY UNITS

- A. Manufacturers:
1. Iota Engineering, LLC; : [www.iotaengineering.com](http://www.iotaengineering.com).
  2. Lithonia Lighting; : [www.lithonia.com](http://www.lithonia.com).
  3. Philips Emergency Lighting/Bodine; : [www.bodine.com](http://www.bodine.com).
- B. Description: Self-contained fluorescent emergency power supply units suitable for use with indicated luminaires, complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- C. Compatibility:
1. Ballasts: Compatible with electronic, standard magnetic, energy saving, and dimming AC ballasts, including those with end of lamp life shutdown circuits.
  2. Lamps: Compatible with low-mercury lamps.
- D. Operation: Upon interruption of normal power source, solid-state control automatically switches connected lamp(s) to the fluorescent emergency power supply for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- E. Battery: Sealed maintenance-free high-temperature nickel cadmium unless otherwise indicated.
- F. Diagnostics: Provide accessible and visible multi-chromatic combination test switch/indicator light to display charge, test, and diagnostic status and to manually activate emergency operation.
- G. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status and field selectable audible alert.

- H. Fluorescent Ballasts: ANSI C82.1, high power factor type electromagnetic ballast, suitable for lamps specified.
  - 1. Certify fluorescent ballast design and construction by Certified Ballast Manufacturers, Inc.
  - 2. Substitutions: See Section 016000 - Product Requirements.
- I. High Intensity Discharge (HID) Ballasts: ANSI C82.4, metal halide lamp ballast, suitable for lamp specified.
  - 1. Substitutions: See Section 016000 - Product Requirements.
  - 2. Lamps: Suitable for lamp type and quantity specified for luminaire.
  - 3. Product:

## 2.8 LAMPS

- A. Manufacturers: Oram-Sylvania, Philip or General Electric. Supply lamps by one manufacturer only.
  - 1. Substitutions: See Section 016000 - Product Requirements.
- B. All Lamps:
  - 1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
  - 2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
  - 3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
  - 4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the LP Consulting Engineers to be inconsistent in perceived color temperature.
- C. Compact Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.
  - 1. Low Mercury Content: Provide lamps that pass the EPA Toxicity Characteristic Leaching Procedure (TCLP) test for characteristic hazardous waste.
  - 2. Correlated Color Temperature (CCT): 3,500 K unless otherwise indicated.
  - 3. Color Rendering Index (CRI): Not less than 80.
  - 4. Average Rated Life: Not less than 10,000 hours for an operating cycle of three hours per start.
- D. Linear Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.
  - 1. Low Mercury Content: Provide lamps that pass the EPA Toxicity Characteristic Leaching Procedure (TCLP) test for characteristic hazardous waste.
  - 2. T8 Linear Fluorescent Lamps:
- E. Lamp Types: As specified for each fixture.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Coordinate locations of outlet boxes provided under Section 260537 as required for installation of luminaires provided under this section.
- B. Install products according to manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship), NECA 500 (commercial lighting), and NECA 502 (industrial lighting).
- D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- E. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting).
- F. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- G. Support luminaires larger than 2 x 4 foot size independent of ceiling framing.
- H. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.
- I. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- J. Exposed Grid Ceilings: Support surface mounted luminaires in grid ceiling directly from building structure.
- K. Install recessed luminaires to permit removal from below.
- L. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- M. Install clips to secure recessed grid-supported luminaires in place.
- N. Install wall mounted luminaires and exit signs at height as indicated on Drawings.
- O. Install accessories furnished with each luminaire.
- P. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture; use flexible conduit.
- Q. Connect luminaires and exit signs to branch circuit outlets provided under Section 260537 using flexible conduit.
- R. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- S. Bond products and metal accessories to branch circuit equipment grounding conductor.

- T. Install specified lamps in each exit sign and luminaire.
- U. Fluorescent Luminaires Controlled by Dual-Level Switching: Connect such that each switch controls the same corresponding lamps in each luminaire.
- V. Exit Signs:
- W. Fluorescent Emergency Power Supply Units:
- X. Install lamps in each luminaire.
- Y. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

### 3.2 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Perform field inspection in accordance with Section 014000.
- D. Operate each luminaire after installation and connection to verify proper operation.
- E. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
- F. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by LP Consulting Engineers.

### 3.3 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by LP Consulting Engineers. Secure locking fittings in place.
- B. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by LP Consulting Engineers or authority having jurisdiction.
- C. Aim and adjust fixtures as indicated.
- D. Position exit sign directional arrows as indicated.

### 3.4 CLEANING

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.
- B. Clean electrical parts to remove conductive and deleterious materials.



- C. Remove dirt and debris from enclosures.
- D. Clean finishes and touch up damage.

3.5 PROTECTION

- A. Relamp luminaires that have failed lamps at Substantial Completion.

3.6 SCHEDULE - SEE DRAWINGS

END OF SECTION 26 15 00

SECTION 26 56 00 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Exterior luminaires.
- B. Ballasts.
- C. Lamps.
- D. Poles and accessories.
- E. Luminaire accessories.

1.2 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260537 - Boxes.
- D. Section 260923 - Lighting Control Devices: Automatic controls for lighting including outdoor motion sensors, time switches, and outdoor photo controls.

1.3 REFERENCE STANDARDS

- A. ANSI C78.379 - American National Standard for Electric Lamps -- Reflector Lamps -- Classification of Beam Patterns
- B. ANSI C82.1 - American National Standard for Lamp Ballast - Line Frequency Fluorescent Lamp Ballast
- C. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low Pressure Sodium Lamps (Multiple-Supply Type)
- D. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; Consolidated
- E. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing
- F. IEEE C2 - National Electrical Safety Code

- G. IESNA LM-5 - Photometric Measurements of Area and Sports Lighting Installations
- H. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information
- I. IESNA LM-64 - Photometric Measurements of Parking Areas
- J. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association
- K. NECA/IESNA 501 - Recommended Practice for Installing Exterior Lighting Systems
- L. California amendments, CEC 2016.
- M. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.
- N. UL 1029 - High-Intensity-Discharge Lamp Ballasts; Current Edition, Including All Revisions.
- O. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- P. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
  - 2. Notify the Architect and/or the District Representative of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.
- B. Coordination: Furnish bolt templates and pole mounting accessories to installer of pole foundations.

#### 1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
  - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
  - 2. Provide photometric calculations where luminaires are proposed for substitution upon request.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IESNA LM-63 standard format upon request.
  2. Lamps: Include rated life and initial and mean lumen output.
  3. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.
- D. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.
- E. Field Quality Control Reports.
1. Include test report indicating measured illumination levels.
- F. Test Reports: Indicate measured illumination levels.
- G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- H. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- I. Maintenance Materials: Furnish the following for District's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.
- J. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.
- 1.6 QUALITY ASSURANCE
- A. Conform to requirements of 2016 CEC.
  - B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
  - C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
  - D. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
  - B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

**PART 2 - PRODUCTS**

**2.1 LUMINAIRE TYPES**

- A. Furnish products as indicated in luminaire schedule included on the Drawings.

**2.2 LUMINAIRES**

- A. Provide products that comply with requirements of 2016 CEC.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.
- H. HID Luminaires:
  - 1. HID Luminaires with Quartz Restrike Systems: Factory-installed supplementary quartz lamp automatically switches on when power interruption causes primary HID lamp to drop out or during cold startup.
- I. LED Luminaires: Listed and labeled as complying with UL 8750.

**2.3 BALLASTS**

- A. Manufacturers:
  - 1. General Electric Company/GE Lighting; [www.gelighting.com](http://www.gelighting.com).
  - 2. Osram Sylvania; [www.sylvania.com](http://www.sylvania.com).
  - 3. Philips Lighting Electronics/Advance; [www.advance.philips.com](http://www.advance.philips.com).
  - 4. Or equal.
  - 5. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.
  - 6. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.
- B. All Ballasts:
  - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).

2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
- C. High Intensity Discharge (HID) Ballasts: Unless otherwise indicated, provide electromagnetic ballasts complying with ANSI C82.4 and listed and labeled as complying with UL 1029.
  1. Input Voltage: Suitable for operation at voltage of connected source, with variation tolerance of plus or minus 5 percent.
  2. Power Factor: Not less than 0.90 unless otherwise indicated.
- D. Fluorescent Ballasts: ANSI C82.1, high power factor type electromagnetic ballast, suitable for lamps specified.
  1. Provide low-temperature ballast suitable for lamps specified.
  2. Certify fluorescent ballast design and construction by Certified Ballast Manufacturers, Inc.
- E. High Intensity Discharge (HID) Ballasts: ANSI C82.4, metal halide lamp ballast, suitable for lamp specified.

#### 2.4 LAMPS

- A. Manufacturers:
  1. General Electric Company/GE Lighting; [www.gelighting.com](http://www.gelighting.com).
  2. Osram Sylvania; [www.sylvania.com](http://www.sylvania.com).
  3. Philips Lighting Company; [www.lighting.philips.com](http://www.lighting.philips.com).
  4. Manufacturer Limitations: Where possible, provide lamps produced by a single manufacturer.
  5. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.
- B. All Lamps:
  1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
  2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
  3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
  4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the LP Consulting Engineers to be inconsistent in perceived color temperature.
- C. Compact Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.
  1. Low Mercury Content: Provide lamps that pass the EPA Toxicity Characteristic Leaching Procedure (TCLP) test for characteristic hazardous waste.
  2. Correlated Color Temperature (CCT): 3,500 K unless otherwise indicated.
  3. Color Rendering Index (CRI): Not less than 80.
  4. Average Rated Life: Not less than 10,000 hours for an operating cycle of three hours per start.
- D. Linear Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.
  1. Low Mercury Content: Provide lamps that pass the EPA Toxicity Characteristic Leaching Procedure (TCLP) test for characteristic hazardous waste.
  2. T8 Linear Fluorescent Lamps:

- a. Correlated Color Temperature (CCT): 4,100 K unless otherwise indicated.
  - b. Color Rendering Index (CRI): Not less than 80.
  - c. Average Rated Life: Not less than 20,000 hours for an operating cycle of three hours per start.
3. T5 Linear Fluorescent Lamps:
- a. Correlated Color Temperature (CCT): 4,100 K unless otherwise indicated.
  - b. Color Rendering Index (CRI): Not less than 80.
  - c. Average Rated Life: Not less than 20,000 hours for an operating cycle of three hours per start.
- E. High Intensity Discharge (HID) Lamps: Wattage as indicated, with bulb type, burning position, and base type as required for luminaire.
1. Metal Halide Lamps:
- a. Non-Reflector Type Metal Halide Lamps: Clear lamp finish unless otherwise indicated.
  - b. Provide ANSI type O-rated protected metal halide lamps where required for open luminaires provided with compatible exclusionary sockets.
  - c. Ceramic Metal Halide Lamps:
    - 1) Correlated Color Temperature (CCT): 4,000 K unless otherwise indicated.
    - 2) Color Rendering Index (CRI): Not less than 80.
- F. Lamp Types: As specified for each luminaire.

## 2.5 POLES

- A. All Poles:
- 1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
  - 2. Material: Steel, unless otherwise indicated.
  - 3. Shape: Square straight, unless otherwise indicated.
  - 4. Finish: Match luminaire finish, unless otherwise indicated.
  - 5. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
  - 6. Unless otherwise indicated, provide with the following features/accessories:
    - a. Top cap.
    - b. Handhole.
    - c. Anchor bolts with leveling nuts or leveling shims.
    - d. Anchor base cover.
    - e. Provision for pole-mounted weatherproof GFI receptacle where indicated.
- B. Metal Poles: Provide ground lug, accessible from handhole or transformer base.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with 2016 CEC.

- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 260537 as required for installation of luminaires provided under this section.
- B. Install products according to manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship) and NECA/IESNA 501 (exterior lighting).
- D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- E. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- F. Pole-Mounted Luminaires:
  - 1. Maintain the following minimum clearances:
    - a. Comply with IEEE C2.
    - b. Comply with utility company requirements.
  - 2. Foundation-Mounted Poles:
    - a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 033000.
      - 1) Install anchor bolts plumb per template furnished by pole manufacturer.
      - 2) Position conduits to enter pole shaft.
    - b. Install foundations plumb.
    - c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
    - d. Tighten anchor bolt nuts to manufacturer's recommended torque.
    - e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
    - f. Install anchor base covers or anchor bolt covers as indicated.
  - 3. Embedded Poles: Install poles plumb as indicated.
  - 4. Grounding:
    - a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
  - 5. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.
- G. Install accessories furnished with each luminaire.
- H. Bond products and metal accessories to branch circuit equipment grounding conductor.
- I. Provide concrete bases for lighting poles at locations indicated, in accordance with detail on drawing and Section 033000.
- J. Install poles plumb.



1. Provide shims to adjust plumb.
2. Grout around each base.

K. Install lamps in each luminaire.

L. Bond luminaires, metal accessories, and metal poles to branch circuit equipment grounding conductor. Provide supplementary grounding electrode at each pole.

### 3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Perform field inspection, testing, and adjusting in accordance with Section 014000.

D. Operate each luminaire after installation and connection to verify proper operation.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by LP Consulting Engineers.

F. Measure illumination levels at night with calibrated meters to verify conformance with performance requirements. Record test results in written report to be included with submittals.

1. Test according to IESNA LM-64 (parking areas).

G. Measure illumination levels to verify conformance with performance requirements. Take measurements during night sky, without moon or with heavy overcast clouds effectively obscuring moon.

### 3.4 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by LP Consulting Engineers. Secure locking fittings in place.

B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by LP Consulting Engineers.

### 3.5 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosure.

D. Clean finishes and touch up damage.

3.6 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals, for closeout submittals.
- B. See Section 017900 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of luminaires to the Architect and/or District Representative, and correct deficiencies or make adjustments as directed.
- D. Just prior to Substantial Completion, replace all lamps that have failed.

3.7 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

3.8 SCHEDULE - SEE DRAWINGS

END OF SECTION 26 56 00

SECTION 28 31 00 - FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The requirements of this section are in addition to the requirements of Division 1, General Conditions and Supplementary Conditions.
- B. Related work specified elsewhere
  1. Section 260110, GENERAL REQUIREMENTS, ELECTRICAL
  2. Section 260534, RACEWAYS
  3. Section 260519, LOW VOLTAGE POWER CONDUCTORS AND CALBES
  4. Section 260537, BOXES
  5. Section 260526, GROUNDING AND BONDING

1.2 DESCRIPTION:

- A. This section of the specification includes the furnishing, installation, and connection of a microprocessor controlled, analog addressable, intelligent fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panels, auxiliary control devices, annunciators, power supplies, and wiring as shown on the drawings and specified herein.
- B. The fire alarm system shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.
- C. The system shall be an active/interrogative type system where each transponder and/or addressable device is repetitively scanned, causing a signal to be transmitted to the main fire alarm control panel (FACP) indicating that the device and its associated circuit wiring is functional. Loss of this signal at the main FACP shall result in a trouble indication as specified hereinafter for the particular input.
- D. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001
- E. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).
- F. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.
- G. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the systems integrity.

1.3 SUMMARY

- A. Scope: Provide all new system equipment, material and labor required for the installation of an addressable fire alarm system, complete and fully operational, as described in this Specification and as shown on the Drawings. Provide and install all components required for proper system operation whether specifically specified or not and all items of equipment, support structure, devices, etc., incidental to the installation.
- B. Provide and install all required zone cards, power supplies and audio and visual alarm appliance control cards as required for the alarm signaling appliances indicated on the Drawings.
- C. Coordinate all work on the fire alarm system with school personnel to minimize impact on concurrent school operations.
- D. Work included:
  - 1. The system shall include, but not be limited to, all control equipment, power supply, initiating devices, audible and visual notification appliances as appropriate, raceway, wiring, fittings, and all other accessories necessary to provide a complete and operable addressable system.
  - 2. All equipment shall be labeled with the manufacturer's name and logotype to assure the integrity of the complete system. "Hybridized" systems (containing equipment from several different manufacturers) shall not be considered acceptable.
- E. Requirements:
  - 1. Review the Drawings and Specifications for work and material provided by others that will affect work specified under this Section. Carefully coordinate with other trades, equipment suppliers, contractors, etc. as required to provide a high quality reliable installation with a minimum of construction delays. All work required to be re-accomplished due to lack of coordination shall be done at the Contractor's expense.
  - 2. Work and materials shall meet or exceed the requirements of the latest published rules and regulations of the State of California, local authority, NFPA, CAL-OSHA, CSFM, and NECA- Standard of Installation".
  - 3. Listings
- F. All fire alarm system equipment shall be listed for its intended purpose and be compatibility listed to assure the integrity of the complete system.
- G. Standards:
  - 1. The fire alarm equipment and installation shall comply with the current provisions of the following standards and shall be listed for its intended purpose and be compatibility listed to insure integrity of the complete system.
    - a. National Electric Code, Article 760
    - b. National Fire Protection Association Standards:
      - 1) California amendment 2016.
      - 2) NFPA 72 National Fire Alarm Code
      - 3) NFPA 90A Air Conditioning Systems
      - 4) NFPA 92A Smoke-Control Systems
      - 5) NFPA 92B Smoke Management Systems in Malls, Atria, and Large Areas
      - 6) NFPA 101 Life Safety Code
      - 7) Local and State Building Codes
- H. BOCA, National Building Code, Mechanical Code, Fire Prevention Code

- I. Local Authorities Having Jurisdiction
- J. Underwriters Laboratories Inc.
- K. All equipment shall be approved by Underwriters Laboratories, Inc. for its intended purpose, listed as power limited by Underwriters Laboratories, Inc., for the following standards as applicable:
  - 1. UL 864 UOJZ Control units for Fire Protective Signaling Systems
  - 2. Local Signaling Unit
  - 3. Central Station Signaling Protected Premises Unit
  - 4. Remote Signaling Protected Premises Unit.
  - 5. Water Deluge Releasing Unit
  - 6. UL 268 Smoke Detectors for Fire Protective Signaling systems.
  - 7. UL 268A Smoke Detectors for duct applications
  - 8. UL 217 Smoke Detectors for Single Stations
  - 9. UL 521 Heat Detectors for Fire Protective Signaling systems.
  - 10. UL 228 Door Holders for Fire Protective Signaling systems.
  - 11. UL 464 Audible Signaling appliances
  - 12. UL 1638 Visual Signaling appliances
  - 13. UL 38 Manually Activated Signaling Boxes
  - 14. UL 346 Waterflow indicators for Fire Protective Signaling systems.
  - 15. UL 1481 Power Supplies for Fire Protective Signaling systems.
  - 16. Americans with Disabilities Act (ADA).
- L. All visual Notification appliances and manual pull stations shall comply with the requirements of the Americans with Disabilities Act.

#### 1.4 QUALITY ASSURANCE

- A. The fire alarm system shall conform to Section 809 of the California Building Code, Article 760 of the California Electrical Code, and Article 14 of the California Fire Code.
- B. Work and materials shall meet or exceed the requirements of the rules and regulations of the State of California, NFPA, CAL-OSHA, CSFM, AND NECA - "Standard of Installation".

#### 1.5 FIRE ALARM SYSTEM CONTRACTOR REQUIREMENTS

- A. The Contractor shall hold a valid California State Contractor's license (C7, C10).
- B. The Contractor must be the factory authorized sales and service representative for all equipment being submitted.
- C. The Contractor shall provide documentations to show the fire alarm contractor have been in the electronics contracting business for a minimum of six years under the same name. He must maintain a full-time sales and service staff at an established business location having the appropriate parts and service facilities. An individual operating out of residential facilities or without the required facilities, staff, or tenure will not be considered as an acceptable contractor for this project.
- D. Contractor shall use NICET Level II Fire Alarm Certified Technicians for field installation.

**1.6 SUBMITTALS FOR EQUIPMENT AS SPECIFIED**

- A. Submittals are required for all items. The list of material prefacing the submittal data sheets shall include the State Fire Marshal listing number for each item. Prepare submittal and arrange material as described in Specification Section 16010 and as noted within this section. Incomplete submittals without the State Fire Marshall listing numbers sheets will not be considered.
- B. The fire alarm Contractor shall prepare all material required for the "Construction Submittal", to be submitted to the Architect for acceptance. The submittal package shall include but not limited to product sheets, CSFM listing sheets with the current expiration date, drawings with site and floor plans showing all components and/or devices locations to be installed, riser diagrams, battery and wire voltage drop calculations.

**1.7 SUBMITTALS FOR SUBSTITUTE EQUIPMENT AND INSTALLATION**

- A. Complete submittal packages are to be prepared for all material as described above to be submitted to the Architect for acceptance. In additions, the list of material prefacing the submittal data sheets must clearly indicate which items are being proposed for substitution.
- B. Where the system installation is proposed to differ from that shown on the Drawings, the submittal information for proposed substitute equipment must be sufficient to demonstrate that the requirements of this Specification will be met.
  - 1. The Fire Alarm Contractor shall prepare all material required for the "Submittal" to the California Division of State Architect / Office of Regulation Services (This agency shall hereafter be referred to as "DSA/ORS"). Obtain a "check list" from the DSA/ORS to aid in preparation of this submittal material.
  - 2. Prepare catalog cuts of all equipment proposed for use including California State Fire Marshal listing numbers listing sheet with the current expiration date for all components. Arrange submittal material as described in Specification Section 16010, General Requirements.
  - 3. Prepare detailed AutoCAD (version 2000 or higher) drawing(s) showing all work to be accomplished and all items to be furnished. The AutoCAD drawing(s) shall be produced on sheets of the same size and in the same scale as the project Drawings. The submittal drawings shall augment and clarify the Contract Drawings. Coordinate all additional requirements with others as required. Floor plans on electronic media may be purchased from the Architect.
  - 4. Where the substitute equipment will have power requirements that are different in any way from the specified equipment, new calculations for wire Voltage Drop and Battery Capacity must be prepared by the Contractor and submitted with the Material Submittal Data Sheets or on the Submittal drawings as applicable.
- C. Upon satisfactory review by the Architect, the entire submittal (Drawings and Catalog Data) will be submitted to the DSA/ORS for final approval.
- D. Reproducible prints of the approved submittal Drawings are to be provided upon completion of this project for inclusion in the AS-BUILT set as required in Specification Section 260110, Basic Electrical Requirements.

1.8 GUARANTEE

- A. The equipment supplier/installer shall assume all responsibility for the proper operation of the entire system installed under this Section, and the entire system shall be guaranteed free from defects in material or workmanship for a period of one year after filing of the "Notice of Completion". Provide on-site service for this system for the duration of the guarantee period at no additional cost to the District. Where system trouble is caused by misuse, abuse, or accident current labor rates shall be chargeable for the service call - otherwise, the service shall be free. Service shall normally be available from a factory authorized service center during normal working hours and within 24 hours of receiving a call.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All material and equipment shall be first quality, new, free from defects and rated for used in public institutions by the manufacturer. Except as specified herein, all system equipment and components shall be products compatible to the fire alarm control panel. System equipment shall be all the product of the same manufacturer and listed by the California State Fire Marshal.
- B. The fire alarm system components and wires are listed in the drawing respective Fire Alarm System Component Schedule and Fire Alarm Wiring Schedule and as described in this specification

2.2 SYSTEM DESCRIPTION AND OPERATION

- A. All new initiating devices shall be addressable, unless noted otherwise.
- B. The alarm initiating circuits and signal circuits shall be 24 Volt DC, two wires, supervised, Class "B" systems with end of line devices located as shown on the Drawings and as required for proper system operation.
- C. Actuation of any alarm-initiating device shall cause all system audio and visual signaling devices to operate. Alarm audible shall sound in California standard "march time" and alarm strobes shall flash at the required rate until the alarm is acknowledged at the control panel or the system is reset. All audio and visual signaling devices shall be synchronized.
- D. The alarm system shall be silenced by authorized personnel only, by opening the locked control cabinet and operating the proper switch. Operation of this switch shall be indicated by a trouble light and audible signal at the control panel. The zone in alarm shall continue to provide visual LED indication of alarm condition until that zone is restored to normal operation
- E. System Software:
  - 1. The system shall be capable of self-programming upon initialization.
  - 2. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation.
  - 3. All software operations shall be stored in a nonvolatile programmable memory within the FACP.
  - 4. Loss of primary and secondary power shall not erase the instructions stored in memory.

5. System programming shall be password protected and shall include full upload and download capability.
  6. The system shall feature full flexibility for selective input/output control functions.
  7. Resident software shall allow for full configuration of initiating circuits. The system shall require no additional hardware to change from sensing normally open contact devices to sensing normally closed contacted devices or vice versa. Nor shall the system require additional hardware to change from sensing normally open contact devices to sensing-and distinguishing between-a combination of current limited and non-current limited devices on the same circuit. Nor shall the system require additional hardware for changing from a non-verification circuit to a verification circuit or vice-versa.
  8. There shall be no limit, other than maximum system capacity, to the number of intelligent/analog devices, which may be in alarm simultaneously.
  9. The system shall have the capability of recalling alarm and trouble conditions in chronological order for the purpose of recreating an event history.
- F. Alarm Operation:
1. The actuation of any approved alarm initiating device shall automatically initiate the following operations where furnished as part of the system:
    - a. All audible alarm indicating appliances within corresponding building shall sound a fire alarm signal until the System Acknowledge key or the Signal Silence key is depressed.
    - b. All visible alarm indicating appliances shall flash continuously until the System Acknowledge key or the Signal Silence key is depressed.
    - c. The off-site central monitoring station shall be notified automatically until the System Acknowledge key or the Signal Silence key is depressed.
    - d. Shutdown of the corresponding HVAC system equipment shall occur until the System Acknowledge key or the Signal Silence key is depressed, if applicable.
    - e. Recall of elevator(s) system equipment within corresponding building shall occur until the System Acknowledge key or the Signal Silence key is depressed, if applicable.
    - f. Activation of all programmed outputs assigned to the initiating device shall occur until the System Acknowledge key or the Signal Silence key is depressed.
    - g. Any subsequent zone alarm shall reactivate the alarm indicating appliances.
- G. Alarm Verification:
1. The activation of any system smoke detector, heat detector or sensor shall initiate an alarm verification operation whereby the panel will reset the activated detector and wait for a second alarm activation.
  2. If, within one (1) minute after resetting, a second alarm is reported from the same or any other smoke detector, heat detector or sensor, the system shall process the alarm as described previously. If no second alarm occurs within one minute the system shall resume normal operation.
  3. The alarm verification shall operate only on smoke detector, heat detector or sensor alarms. Other activated initiating devices shall be processed immediately.
  4. The alarm verification operation shall be selectable by zone.
- H. Alarm Indication:
1. The alarm shall be displayed on the local Fire Alarm Control Panel, and where applicable, the remote annunciator. At the minimum, it shall display the point label and the device type identifier.
  2. The system alarm LED shall flash on the control panel and the remote annunciator until the alarm has been acknowledged. Once acknowledged, this same LED shall latch on.



3. A subsequent alarm received from another zone shall flash the system alarm LED on the control panel and remote annunciator. The LCD display shall indicate the new alarm information.
  4. A pulsing alarm tone shall occur within the local building control panel, and where applicable, the remote annunciator until the event has been acknowledged.
  5. A manual evacuation (drill) switch shall be provided to operate the alarm indicating appliances without causing other control circuits to be activated. However, should a true alarm occur, all alarm functions would occur as described previously.
  6. The system shall have a single key that will allow the operator to display all alarms, troubles, and supervisory service conditions including the time of each occurrence.
  7. Any momentary opening of an initiating or indicating appliance circuit wiring shall cause an audible signal to sound at the Fire Alarm Control Panel, and where applicable, the remote annunciator for four seconds indicating a trouble condition.
- I. Alarm Walk Test:
1. The actuation of the “enable walk test” program at the Fire Alarm Control Panel shall activate the “Walk Test” mode of the system, which shall initiate the following events:
  2. The off-site central monitoring station connection shall be bypassed.
  3. Control relay functions shall be bypassed.
  4. Walk test shall be selectable by circuit.
  5. Alarms received on normal circuits shall cause the control panel to go into alarm and override the walk test mode.
  6. The control panel shall show a trouble condition.
  7. The alarm activation of any initiation device shall cause the audible signals to activate for two seconds.
  8. The panel shall automatically reset itself after signaling is complete.
  9. The control panel shall automatically return to normal condition if there is no activity on a walk test circuit for a period of 30 minutes.
- J. Supervision:
1. The system shall contain Class “A” or “B” (Style “B, C, D, or E”) independently supervised initiating device circuits. The alarm activation of any initiation circuit shall not prevent the subsequent alarm operation of any other initiation circuit.
  2. Each independently supervised circuit shall include a discrete LED readout to indicate disarrangement conditions per circuit.
  3. The incoming power to the system shall be supervised so that any power failure must be audible and visually indicated at the Fire Alarm Control Panel and where applicable, the remote annunciator. A green “power on” LED shall be displayed continuously while incoming power is present.
  4. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be audibly and visually indicated at the Fire Alarm Control Panel and where applicable, the remote annunciator.
  5. The system shall have provisions for disabling and enabling all circuits individually for maintenance or testing purposes.
- K. Power Requirements:
1. Each Fire Alarm Control Panel and remote power supply extender, fire alarm terminal cabinet or console shall be provided with a dedicated 120 VAC power circuit and connected to 20A/1P circuit breaker in the nearest panelboard within the building or as noted on the plans). The circuit breaker shall be painted color “Red”.
  2. The fire alarm system shall operate from the line side of commercial service (120 VAC) rectified to 24 VOLT DC. A means of system disconnect and overcurrent protection shall be provided

- a. Lead Calcium standby batteries shall be provided with sufficient capacity to power alarm signaling devices for not less than 5 minutes following a primary power interruption of at least 24 hours duration. The control panel shall contain battery charging and control equipment to maintain the batteries in "ready" condition at all times

**2.3 COMPONENTS (SEE DRAWINGS FOR THE FIRE ALARM SYSTEMS COMPONENT SCHEDULE)**

**A. Equipment and part numbers are specified on the Drawings FIRE ALARM SYSTEM COMPONENT SCHEDULE as a standard of quality.**

1. All material and equipment shall be rated for use in public institutions by the manufacturer, new, and free from defects. Except as specified herein, all system equipment and components shall be products compatible to the fire alarm control panel. Components not listed by the California State Fire Marshal and/or not having a CSFM listing number will not be accepted for installation.
2. All initiating equipment will shall be compatible with fire alarm control panel.
3. The following optional system equipment shall be provided:
4. Manual stations shall be addressable non-coded devices of cast metal construction, double action. A spare glass rod shall be provided stored in each station and 12 additional spare rods shall be provided to the District upon project completion. Reset keys for the new devices shall all be identical.
5. Photoelectric type smoke detectors shall be addressable with two-wire base.
6. Room heat detectors shall be 135° F rate of rise addressable heat detector.
7. Attic Heat Detectors shall be <addressable> combination fixed temperature and rate-of-rise. Operation of the fixed temperature element shall be 200° F or as indicated at the device on the Drawing. Provide with standard outlet box adaptor.
8. Xenon strobe units shall be ADA compliant, candela (cd) as indicated, 24 VOLT DC, wall mounted @ +80" and as indicated on the Drawings. Visible only or Audible/Visible Appliances shall be appropriate as indicated on the Drawings. Wire guards shall be provided for visual alarm appliances in the multi-use room, in exit corridors, and as shown on the Drawings. Strobes in same room to be synchronize.

**2.4 WIRING (SEE DRAWING FOR FIRE ALARM CABLE SCHEDULE):**

- A. Wire and cable shall be U.L. Listed for fire alarm use and shall be a minimum of 16 AWG or as required by local codes and Authority Having Jurisdiction.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. The installation shall be accomplished by and under the direction of skilled craftsmen, factory trained by the equipment manufacturer, and experienced in the installation of fire alarm systems of this type in the State of California. Workmanship shall be of the highest quality.
- B. The fire alarm system installation contractor must be the accepted system manufacturer's authorized dealer, with factory trained installation personnel and a normally maintained inventory of spare parts.

- C. Installation showing evidence of poor workmanship or not in accordance with these Specifications and the Drawings shall be re-accomplished or repaired to the satisfaction of the Architect at the Contractor's expense.
- D. Avoid splicing of conductors wherever possible; but where splices must be made, use Scotchlok or Wirenut type connectors in interior DRY locations only. Connections in wet locations and below grade will not be allowed. NO EXCEPTION!
- E. The conductors of the fire alarm system are required to be installed in RACEWAY. Raceway and conductors shall be installed under Sections 16110 and 16120 as required for proper system operation. Raceways containing conductors identified as "Fire Protective Control Panel" conductors shall not contain any other conductors. No AC current carrying conductors shall be allowed in the same raceway with the DC fire alarm detection and signaling conductors. A minimum of 18" of free wire shall be left at each outlet for device connection under this Division. Wire installed within terminal and equipment cabinets and at outlets must be neat and orderly. LABEL ALL WIRES at each accessible raceway opening with Brady "Omni-Grip" devices or the equivalent.
- F. Wire installed within terminal and equipment cabinets and at outlets must be neat and orderly. LABEL ALL WIRES at each accessible raceway opening with Brady "Omni-Grip" devices or the equivalent.
- G. Identify by "red" color paint, all fire alarm outlet boxes and raceways. Raceways may be painted color "red" every 10'-0" increments.

### 3.2 CONNECTIONS AND CIRCUIT

- A. The fire alarm system connections to the panelboard shall be on a dedicated branch circuit in accordance with California Electrical Cod (CEC). The circuit and connections shall be mechanically protected. The circuit disconnecting means (circuit breaker) shall be "RED" in color and accessible only to authorized personnel and shall be clearly marked "FIRE ALARM".

### 3.3 CENTRAL STATION MONITORING

- A. The fire alarm system shall be connected via leased telephone lines to a central station or remote station as selected by the District (owner).
- B. The fire alarm system shall transmit both alarm and trouble signals with the alarm having priority over the trouble signal.
- C. The contractor shall be responsible for all installation charges, while the District shall be responsible for the line lease charges.
- D. TESTS, INSTRUCTION, AND DOCUMENTATION
- E. The entire system shall be tested, programmed, and adjusted under the supervision of a factory trained representative of the manufacturer. Coordinate all operational options with the District prior to setup. The system shall be tested to demonstrate that:
  - 1. All alarm initiating and signal systems and all supervisory equipment is performing properly.
  - 2. The entire system is free from grounded or open circuits.

3. The alarm control equipment will indicate when a ground or open circuit that would affect operation occurs.
  4. All features of the remote annunciator are fully operational.
  5. Operate every building fire alarm device to ensure proper operation and correct annunciation at the fire alarm control panel and remote annunciator (where applicable).
  6. The signaling line circuits and notification appliance circuits shall be opened in at least two (2) locations to check for the presence of supervision.
  7. At least one half of all tests shall be performed on battery standby power.
  8. Where application of heat would destroy any detector, it may be manually activated.
- F. Any defects noted shall be corrected at once and the test re-conducted to demonstrate proper operation.
- G. Prior to final test, the fire department must be notified in accordance with the local requirements.
- H. Upon completion of system testing described above, a satisfactory final test of the entire system shall be made in the presence of the enforcing fire agency, the District and the manufacturer representative. Provide sufficient support staff to demonstrate the system completed as required by the enforcing agency. A notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to the District, the local Fire Department, the Architect and the Engineer.
- I. The equipment supplier/installer shall instruct the District or his designated representative(s) in the proper operation, programming, and maintenance of the system. Allow a minimum of eight (8) hours on-site for this "hands-on" instruction and program training. Approximately 30 days after final acceptance of the system, or as requested by the Owner, a follow up training session shall be scheduled at the site. Any special operating problems shall be resolved and the system shall be fully checked out and "fine-tuned" as required. Allow a minimum of four (4) hours on site for the instruction portion of this requirement.
- J. Three bound manuals shall be provided to the District containing at least a service directory, a description of system operation, all system operation and maintenance instructions, complete data sheets, and approved system Drawings folded and placed in plastic pouches in the back. The manuals shall be composed of original material (not photocopies) and each section shall be clearly identified. Registered copies of the system maintenance program shall be provided to the District as described elsewhere in this Specification.
- K. The Contractor shall leave the fire alarm system in proper working order, and without additional expense to the District, shall replace any defective materials or equipment provided under this contract within one year (365 days) from the date of final acceptance by the District.

END OF SECTION 28 31 00

**SECTION 32 31 13 – CHAIN LINK FENCING AND GATES:**

1. GENERAL:

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of chain link fences and gates is indicated on drawings.

1.3 QUALITY ASSURANCE:

Provide chain link fences and gates as complete units controlled by a single source including necessary erection accessories, fittings, and fastenings.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data, and installation instructions for metal fencing, fabric, gates and accessories.

B. Shop Drawings: Submit shop drawings indicating extent, type gate locations and post footing details.

2. PRODUCTS:

2.1 GENERAL: Dimensions indicated for pipe, roll-formed, and H-sections are outside dimensions, exclusive of coatings.

2.2 AVAILABLE MANUFACTURER'S: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work included, but are not limited to, the following:

2.3 MANUFACTURER: Subject to compliance with requirement, provide products of one of the following:

A. Galvanized Steel Fencing and Fabric: Equal to:

1. United States Steel Corp.
2. Anchor Fence, Inc.
3. Master-Holco Co.

2.4 STEEL FABRIC:

A. Fabric: No 9 gauge (0.148" + or – 0.005") size steel wires, 2" mesh, with top salvages knuckled for fabric 60" high and under, and both top and bottom salvages twisted and barbed for fabric over 60" high.

B. Furnish one piece fabric widths for fencing up to 12' high.

- C. Fabric Finish: Galvanized, ASTM A 392, Class I, with not less than 1.2 oz. Zinc per sq. ft of surface.

**FRAMING AND ACCESSORIES:**

- A. Steel Framework General: Galvanized steel, ASTM A 120 or A 123, with not less than 1.8 oz. Zinc per sq. ft. of surface.
- B. Fittings and Accessories: Galvanized, ASTM A 153, with zinc weights per Table 1.
- C. Line Posts: Space 10' o.c. maximum, unless otherwise indicated of following minimum sizes and weights.
  - 1. 6' to 8' fabric height 2.375" OD steel pipe, 3.65 lbs. per lin. ft.

- 2.5 GATE POSTS: Furnish posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:

LEAF WIDTH	GATE POST	LBS./LIN. FT.
Up to 6'	2.875: OD pipe	5.79

- 2.6 TOP RAIL: Manufacturer's longest lengths, with expansion type couplings, approximately 6" long, for each joint. Provide means for attaching top rail securely to each gate corner, pull and end.

- A. 1.66" OD pipe, 2.27 lbs. per ft.
- B. Post Brace Assembly: Manufacturer's standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use same material as top rail for brace, and truss to line posts with 0.375" diameter rod and adjustable tightener.

- 2.7 POST TOPS: Provide weathertight closure cap with loop to receive tension wire or toprail; one cap for each post.

- 2.8 STRETCHER BARS: One piece lengths equal to full height of fabric, with minimum cross-section of 3/16" x 3.4". Provide one stretcher bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into post.

- 2.9 STRETCHER BAR BANDS: Space not over 15" o.c., to secure stretcher bars to end, corner, pull, and gate posts.

- 2.10 **MAINTENANCE GATES:**

- A. Fabrication: Fabricate perimeter frames of gates from metal and finish to match fence framework. Assemble gate frames by welding or with special fittings and

rivets for rigid connections, providing security against removal or breakage connections. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories. Space frame members maximum of 8' apart unless otherwise indicated.

Provide same fabric as for fence, unless otherwise indicated. Install fabric with stretcher bars at vertical edges and at top and bottom edges. Attach stretcher bars to gate ramp at not more than 15" o.c. Install diagonal cross bracing consisting of 3/8" diameter adjustable length truss rods on gates to ensure frame rigidity without sag or twist.

- B. Swing Gates: Fabricate perimeter frames of minimum 1.90" OD pipe.
- C. Gate Hardware: Provide hardware and accessories for each gate, galvanized per ASTM A 153, and in accordance with the following:
  - 1. Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180 degree gate opening. Provide 1 1/2" pair of hinges for each leaf over 6' nominal height.
  - 2. Latch: Forked type or plunger bar type to permit operation from either side of gate, with padlock eye as integral part of latch.
- D Keeper: Provide keeper for vehicle gates, which automatically engages gate leaf and holds it in open position until manually released.

2.13 CONCRETE:

Provide concrete consisting of portland cement, ASTM C 150, aggregate ASTM C 33, and clean water. Mix materials to obtain concrete with a minimum 28 day compressive strength of 2500 psi using at least 4 sacks of cement per cu. yd., 1" maximum size aggregate, maximum 3" slump, and 2% to 4% entrained air.

3. EXECUTION:

3.1 INSTALLATION:

- A. Do not begin installation and erection before final grading is completed, unless otherwise permitted.

3.2 EXCAVATION: Drill or hand excavate (using post hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.

3.3 SETTING POSTS: Center and align posts in holes 3" above bottom of excavation.

- A. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.

Unless otherwise indicated, extend concrete footings 2" above grade and trowel to a crown to shed water.

- 3.4 TOP RAILS: Run rail continuously through post caps, bending to radius for curved runs. Provide expansion couplings as recommended by fencing manufacturer.
- 3.5 BRACE ASSEMBLIES: Install braces so posts are plumb when diagonal rod is under proper tension.
- 3.6 FABRIC: Leave approximately 2" between finish grade and bottom salvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.
- 3.7 STRETCHER BARS: Thread through or clamp to fabric 4" o.c., and secure to posts with metal bands spaced 15" o.c.
- 3.8 GATES: Install gates plumb, level, and secure to full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.
- 3.9 TIE WIRES: Use U-shaped wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least two full turns. Bend ends of wire to minimize hazard to persons or clothing.
- Tie fabric to line posts, with wire ties spaced 12" o.c. Tie fabric to rails and braces, with wire ties spaced 24" o.c. Tie fabric to tension wires, with hog rings spaced 24" o.c.
- 3.10 Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

**END OF SECTION 32 31 13**



**SECTION 32 31 20 – DECORATIVE METAL FENCING:**

**1. GENERAL:**

A. SUMMARY: Provide Decorative Metal Fence, as shown and specified per Contract Documents.

B. REFERENCES:

1. American Society of Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
2. American Welding Society (AWS): D1.1 Structural Welding Code – Steel.

C. SUBMITTALS:

1. General: Submit product data, shop drawings and samples.
2. Closeout: Submit maintenance data and guarantee in required form for a period of (1) year from date of final acceptance by Owner. Provide manufacture's standard 20-year warranty.

D. QUALITY ASSURANCE: Welding performed by certified welders per AWS.

**2. PRODUCTS:**

A. MATERIALS:

1. Ornamental Metal Fence:

- a. General: Design based on Montage Plus Steel Ornamental Fence System, Majestic Style, 3 Rail, Flush-bottom, manufactured by Ameristar Fence Products.
- b. Steel Material: ASTM A653, with a minimum yield strength of 45,000 psi and minimum zinc (hot-dip galvanized) coating weight of 0.60 ounces per square foot, Coating Designation G-60.
- c. Pickets and Rails: As recommended by the manufacturer and as shown.
- d. Fence Posts: 2 ½ inch square; 12 gage.

2. Fastenings:

- a. General: Furnish bolts, nuts, screws, washers, and other various fastenings necessary for proper erection of work.
- b. Exposed in Finished Surfaces: Countersunk Phillips flat head screws, unless otherwise shown; finish to match adjacent surfaces.
- c. Expansion Bolts: FS FF-S-325, Group III expansion shield, Type 1 or 2, unless otherwise show.

3. Finish: Manufacturer's standard epoxy and acrylic E-coat; color to be selected by the Architect

B. FABRICATION:

1. General: Shop assembles work in largest practicable sections to minimize field connections. File or grind smooth parts exposed to finish view; remove weld marks and leave free of noticeable fabrication marks. Bends, twists, open joints in finished members, or projecting edges or corners at connections will not be permitted. Provide bolts and fastenings necessary to complete fabrication.

2. Assembly:
  - a. General: Provide as shown.
  - b. Reinforcement: Provide proper reinforcement for hardware and where required on metal work.
3. Finish: Manufacturer's standard.
4. Concrete: ASTM C94 Portland Cement; 28 day compressive strength of 2,500 psi; 1-1/2 inch maximum coarse aggregate.

**3. EXECUTION**

**A. PREPARATION:**

1. Examination: Examine condition of work in place before beginning work; report defects.
2. Measurements: Take field measurements; report variance between plan and field dimensions.

**B. INSTALLATION:**

1. General: Install in conformance with referenced standards, manufacture's written directions, as shown, and as specified.
2. Ornamental Metal Fence and Gates:
  - a. General: Set in concrete as shown.
    1. Fence Posts: Footing size 12 inches wide x 3'-0' deep footing.
  - b. Workmanship: Set work plumb and true; properly assemble and erect in a rigid and workmanlike manner. Replace, or repair parts damaged or injured during erection in an acceptable manner.
  - c. Hardware: As shown; per manufacturer's instructions.
  - d. Field Torch-up: Torch-up damaged surfaces as recommended by the manufacturer.

**END OF SECTION 32 31 20**