

SPECIFICATIONS  
Project No. 2018045

**MARGARET SCOTTEN ES  
MODERNIZATION 2019**

GRASS VALLEY SCHOOL DISTRICT  
Nevada County, California

**PROJECT MANUAL**

AEDIS ARCHITECTS  
808 R Street, Suite 201  
Sacramento, California 95811  
(916) 970-0230

SPECIFICATIONS  
Project No. 2018045

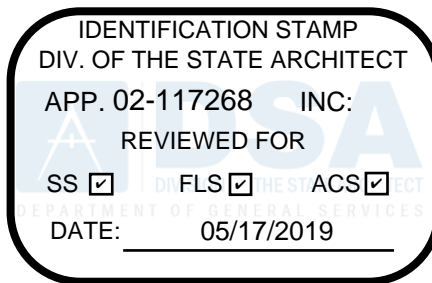
DSA File No. 29-11  
DSA Application No. 02-117268

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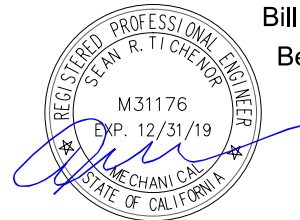
GRASS VALLEY SCHOOL DISTRICT  
Nevada County, California

Division of the State Architect  
Office of Regulation Services

Aedis Architects  
808 R Street, Suite 201  
Sacramento, California 95811  
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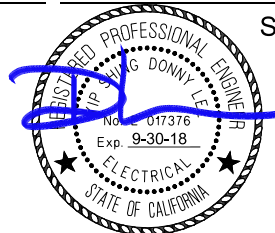


John Diffenderfer, Architect  
Aedis Architects



Bill Bevier, Structural Engineer  
Bevier Structural Engineering

Anthony Tassano, Civil Engineer  
Warren Consulting Engineers



Sean Tichenor, Mechanical Engineering  
Peters Engineering

Sean Tichenor, Plumbing Engineering  
Peters Engineering

Donny Lee, Electrical Engineer  
EDGE Electric Consulting

**SECTION 00 0110  
TABLE OF CONTENTS**

**PROCUREMENT AND CONTRACTING REQUIREMENTS**

**1.01 DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS**

- A. 00 0101 - Project Title Page
- B. 00 0107 - Seals Page
- C. 00 0110 - Table of Contents

**SPECIFICATIONS**

**2.01 DIVISION 01 -- GENERAL REQUIREMENTS**

- A. 01 1000 - Summary
- B. 01 2000 - Price and Payment Procedures
- C. 01 2100 - Allowances
- D. 01 2200 – Unit Prices
- E. 01 2300 - Alternates
- F. 01 3000 - Administrative Requirements
- G. 01 3114 - Project Coordination
- H. 01 4000 - Quality Requirements
- I. 01 4219 - Reference Standards
- J. 01 5000 - Temporary Facilities and Controls
- K. 01 6000 – Products and Substitutions
- L. 01 7000 - Execution and Closeout Requirements
- M. 01 7419 - Construction Waste Management and Disposal
- N. 01 7800 - Closeout Submittals

**2.02 DIVISION 02 -- EXISTING CONDITIONS**

- A. For Site Preparation and Earthwork, see Division 31
- B. For Pavements and Site Improvements, see Division 32
- C. For Site Utilities, see Division 33
- D. 02 4100 – Site Demolition
- E. 02 4113 – Selective Structure Demolition

**2.03 DIVISION 03 -- CONCRETE**

- A. 03 0500 – Concrete Sealer
- B. 03 0516 - Underslab Vapor Barrier
- C. 03 1000 - Concrete Forming and Accessories
- D. 03 2000 - Concrete Reinforcing
- E. 03 3000 - Cast-in-Place Concrete

**2.04 DIVISION 04 -- MASONRY**

**2.05 DIVISION 05 -- METALS**

- A. 05 5000 - Metal Fabrications
- B. 05 5150 – Aluminum Access Ladders
- C. 05 5213 - Pipe and Tube Railings

**2.06 DIVISION 06 -- WOOD, PLASTICS, AND COMPOSITES**

- A. 06 1000 - Rough Carpentry
- B. 06 1733 - Wood I-Joists
- C. 06 1800 - Glued-Laminated Construction

**2.07 DIVISION 07 -- THERMAL AND MOISTURE PROTECTION**

- A. 07 2100 - Thermal Insulation
- B. 07 2500 - Weather Barriers
- C. 07 2600 – Slab on Grade Vapor Retarders
- D. 07 5419 - Roofing
- E. 07 7200 - Roof Accessories
- F. 07 9005 - Joint Sealers

**2.08 DIVISION 08 -- OPENINGS**

- A. 08 1113 - Hollow Metal Doors and Frames
- B. 08 7100 - Door Hardware
- C. 08 8000 - Glazing

**2.09 DIVISION 09 -- FINISHES**

- A. 09 0561 - Common Work Results for Flooring Preparation
- B. 09 2116 - Gypsum Board Assemblies
- C. 09 2236 – Metal Lath
- D. 09 2400 - Cement Plastering
- E. 09 5100 - Acoustical Ceilings
- F. 09 6500 - Resilient Flooring
- G. 09 9000 - Painting and Coating

**2.10 DIVISION 10 -- SPECIALTIES**

- A. 10 1400 - Signage
- B. 10 2113 - Plastic Toilet Compartments
- C. 10 2213 - Movable Fire Wall
- D. 10 2800 - Toilet, Bath, and Laundry Accessories

**2.11 DIVISION 11 -- EQUIPMENT**

- A. 11 5213 - Projection Screens
- B. 11 6143 - Stage Curtains

**2.12 DIVISION 12 -- FURNISHINGS**

- A. 12 3200 - Manufactured Wood Casework

**2.13 DIVISION 13 -- SPECIAL CONSTRUCTION**

**2.14 DIVISION 14 -- CONVEYING EQUIPMENT**

**2.15 DIVISION 15 -- RESERVED (NOT USED) (FOR MECHANICAL, SEE DIVISIONS 21, 22, AND 23)**

**2.16 DIVISION 16 -- RESERVED (NOT USED) (FOR ELECTRICAL, SEE DIVISIONS 25, 26, 27, 28, AND 29)**

**2.17 DIVISION 17 -- RESERVED (NOT USED)**

**2.18 DIVISION 18 -- RESERVED (NOT USED)**

**2.19 DIVISION 19 -- RESERVED (NOT USED)**

**2.20 DIVISION 20 -- RESERVED (NOT USED)**

**2.21 DIVISION 21 -- FIRE SUPPRESSION**

## **2.22 DIVISION 22 -- PLUMBING**

- A. 22 0100 – Operations and Maintenance of Plumbing
- B. 22 0500 – Common work Results of plumbing
- C. 22 0523 - General-Duty Valves for Plumbing Piping
- D. 22 0529 - Hangers and Supports for Plumbing Piping and Equipment
- E. 22 0548 - Vibration and Seismic Controls for Plumbing Piping and Equipment
- F. 22 0700 – Plumbing Insulation General Requirements
- G. 22 0719 - Plumbing Piping Insulation
- H. 22 1116 – Domestic Water Piping
- I. 22 1119 – Domestic Water Piping Specialties
- J. 22 1316 – Sanitary Waste and Vent
- K. 22 13 19 – Sanitary Waste Piping Specialties
- L. 22 1416 – Rain Water Leaders
- M. 22 4000 - Plumbing Fixtures

## **2.23 DIVISION 23 -- HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)**

- A. 23 0100 – operation and Maintenance of HVAC Systems
- B. 23 0500 – Common Work Results for HVAC
- C. 23 0513 - Common Motor Requirements for HVAC Equipment
- D. 23 0529 - Hangers and Supports for HVAC Piping and Equipment
- E. 23 0530 – Hangers and support for HVAC Ductwork
- F. 23 0548 - Vibration and Seismic Controls for HVAC
- G. 23 0553 - Identification for HVAC Piping and Equipment
- H. 23 0593 - Testing, Adjusting, and Balancing for HVAC
- I. 23 0700 – HVAC Insulation
- J. 23 0713 - Duct Insulation
- K. 23 1123 – Facility Natural Gas Piping
- L. 23 3113 – Metal Ducts
- M. 23 3116 – Not Metal Ducts
- N. 23 3313 – Dampers
- O. 23 3343 – Flexible Connectors
- P. 23 7433 - Packaged Rooftop Air-conditioning Units

## **2.24 DIVISION 24 -- RESERVED (NOT USED)**

## **2.25 DIVISION 25 -- INTEGRATED AUTOMATION**

## **2.26 DIVISION 26 -- ELECTRICAL**

- A. 26 0000 – Electrical Work
- B. 26 0505 – Selective Demolition for Electrical
- C. 26 0519 – Low-Voltage Electrical Power Conductors and Cables
- D. 26 0526 – Grounding and Bonding for Electrical Systems
- E. 26 0529 - Hangers and Supports for Electrical Systems
- F. 26 0533 – Raceway and boxes for Electrical Systems
- G. 26 0553 – Identification for Electrical Systems
- H. 26 2413 - Switchboards

- I. 26 2416 – Panel Boards
- J. 26 2726 – Wiring Devices
- K. 26 2816.16 – Enclosed Switches
- L. 26 5561 – Stage Lighting
- M. 26 5600 – Exterior Lighting
- N. 27 4116 – Sound System for MP Room
- O. 28 4600 – Fire Alarm System
- 2.27 DIVISION 27 -- COMMUNICATIONS**
- 2.28 DIVISION 28 -- ELECTRONIC SAFETY AND SECURITY**
- 2.29 DIVISION 29 -- RESERVED (NOT USED)**
- 2.30 DIVISION 30 -- RESERVED (NOT USED)**
- 2.31 DIVISION 31 -- EARTHWORK**
  - A. 31 0000 - Earthwork
  - B. 31 2333 – Trenching and Backfilling
- 2.32 DIVISION 32 -- EXTERIOR IMPROVEMENTS**
  - A. 32 1200 - Asphalt Paving
  - B. 32 1600 – Site Concrete
- 2.33 DIVISION 33 -- UTILITIES**
  - A. 33 0000 – Site utilities
  - B. 33 4000 – Site Drainage
- 2.34 DIVISION 34 -- TRANSPORTATION**
- 2.35 DIVISION 35 -- WATERWAY AND MARINE CONSTRUCTION**
- 2.36 DIVISION 36 -- RESERVED (NOT USED)**
- 2.37 DIVISION 37 -- RESERVED (NOT USED)**
- 2.38 DIVISION 38 -- RESERVED (NOT USED)**
- 2.39 DIVISION 39 -- RESERVED (NOT USED)**
- 2.40 DIVISION 40 -- PROCESS INTEGRATION**
- 2.41 DIVISION 41 -- MATERIAL PROCESSING AND HANDLING EQUIPMENT**
- 2.42 DIVISION 42 -- PROCESS HEATING, COOLING, AND DRYING EQUIPMENT**
- 2.43 DIVISION 43 -- PROCESS GAS AND LIQUID HANDLING, PURIFICATION AND STORAGE EQUIPMENT**
- 2.44 DIVISION 44 -- POLLUTION CONTROL EQUIPMENT**
- 2.45 DIVISION 45 -- INDUSTRY-SPECIFIC MANUFACTURING EQUIPMENT**
- 2.46 DIVISION 46 -- WATER AND WASTEWATER EQUIPMENT**
- 2.47 DIVISION 47 -- RESERVED (NOT USED)**
- 2.48 DIVISION 48 -- ELECTRICAL POWER GENERATION**
- 2.49 DIVISION 49 -- RESERVED (NOT USED)**

**END OF SECTION 00 0110**

**SECTION 01 1000**  
**SUMMARY**

**PART 1 GENERAL**

**1.01 PROJECT**

- A. Project Name: Margaret Scotten ES Modernization 2019.
- B. Owner's Name: Grass Valley School District.
- C. Architect's Name: Aedis Architects.
- D. The Project consists of the Modernization of the entire campus, Replacement of HVAC equipment, and the addition of a stage to the existing multipurpose building.

**1.02 CONTRACT DESCRIPTION**

**1.03 DESCRIPTION OF WORK**

- A. Scope of demolition and removal work is indicated on drawings and specified in Section 02 4100.
- B. Scope of alterations work is indicated on drawings.
- C. Renovate the as shown in the plans
- D. Plumbing: Alter existing system and add new construction, keeping existing in operation.
- E. HVAC: Alter existing system and add new construction, keeping existing in operation.
- F. Electrical Power and Lighting: Alter existing system and add new construction, keeping existing in operation.
- G. Fire Alarm: Alter existing system and add new construction, keeping existing in operation.
- H. Telephone: Alter existing system and add new construction, keeping existing in operation.

**1.04 WORK BY OWNER**

- A. None

**1.05 OWNER OCCUPANCY**

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

**1.06 CONTRACTOR USE OF SITE AND PREMISES**

- A. Provide access to and from site as required by law and by Owner. Keep public areas such as hallways, stairs, elevator lobbies and toilet rooms free from accumulation of waste materials, rubbish or construction debris.
  - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
  - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.
- B. Existing building spaces may not be used for storage.
- C. Time Restrictions:
- D. Utility Outages and Shutdown:
  - 1. Limit disruption of utility services to hours the building is unoccupied.
  - 2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
  - 3. Prevent accidental disruption of utility services to other facilities.

**1.07 WORK SEQUENCE**

- A. Coordinate construction schedule and operations with Owner.

**PART 2 PRODUCTS - NOT USED**  
**PART 3 EXECUTION - NOT USED**

**END OF SECTION 01 1000**



**SECTION 01 2000  
PRICE AND PAYMENT PROCEDURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Change procedures.

**1.02 RELATED REQUIREMENTS**

- A. Section 00 5200 - Agreement Form: Contract Sum, retainages, payment period, monetary values of unit prices.
- B. Section 01 2100 - Allowances: Payment procedures relating to allowances.
- C. Section 01 2200 - Unit Prices: Monetary values of unit prices; Payment and modification procedures relating to unit prices.

**1.03 SCHEDULE OF VALUES**

- A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- B. Forms filled out by hand will not be accepted.
- C. Submit Schedule of Values in duplicate no later than 7 days before initial payment request is to be submitted.
- D. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.
- E. Revise schedule to list approved Change Orders, with each Application For Payment.

**1.04 APPLICATIONS FOR PROGRESS PAYMENTS**

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use Form \_\_\_\_\_.
  - 1. At contractor's option, continuation or back-up may be contractor's own form, if consistent with requirements.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- E. For each item, provide a column for listing each of the following:
  - 1. Item Number.
  - 2. Description of work.
  - 3. Scheduled Values.
  - 4. Previous Applications.
  - 5. Work in Place and Stored Materials under this Application.
  - 6. Authorized Change Orders.
  - 7. Total Completed and Stored to Date of Application.
  - 8. Percentage of Completion.
  - 9. Balance to Finish.
  - 10. Retainage.
- F. Execute certification by signature of authorized officer.
- G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

- I. Submit three copies of each Application for Payment with "original" contractor's and inspector's signatures on all copies which are required.
- J. Include the following with the application:
  - 1. Transmittal letter as specified for submittals in Section 01 3000.
  - 2. Construction progress schedule, revised and current as specified in Section 01 3000.
  - 3. Waivers of liens from major Subcontractors and vendors - For each payment application, submit waivers of lien from every entity (including Contractor) who could lawfully and possibly file a lien in excess of \$100 arising out of Contract and related to work covered by payment. Submit partial waivers for amount requested (prior to deduction or retainage) on each item; and when application shows completion of item, submit final or full waivers. Owner reserves right to designate which entities involved in the work must submit waivers.
  - 4. Waiver Delays - Each progress payment must be submitted with Contractor's waiver for period of construction covered by application; but may, at Contractor's option, be submitted with waivers from subcontractors, sub-contractors and suppliers for previous period of construction covered by previous application; except final payment application must be submitted with (or preceded by) final or full waivers from every entity involved with performance of the work.
  - 5. Waiver Forms - Submit waivers on forms, and executed in a manner, acceptable to Owner.
- K. After the application is signed by the Architect, the School District shall be allowed up to thirty (30) days to make payment to the contractor.

**1.05 MODIFICATION PROCEDURES**

- A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
- B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
  - 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
  - 2. Promptly execute the change.
- C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within \_\_\_\_ days.
- D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 6000.
- E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
  - 1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
  - 2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
  - 3. For pre-determined unit prices and quantities, the amount will based on the fixed unit prices.
  - 4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.
- F. Substantiation of Costs: Provide full information required for evaluation.
  - 1. On request, provide the following data:
    - a. Quantities of products, labor, and equipment.

- b. Taxes, insurance, and bonds.
- c. Overhead and profit.
- d. Justification for any change in Contract Time.
- e. Credit for deletions from Contract, similarly documented.
- 2. Support each claim for additional costs with additional information:
  - a. Origin and date of claim.
  - b. Dates and times work was performed, and by whom.
  - c. Time records and wage rates paid.
  - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
- 3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- H. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- I. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- J. Promptly enter changes in Project Record Documents.
- K. Construction Change Documents (CCD's) altering the record documents are to be reviewed and approved by DSA

#### **1.06 APPLICATION AT TIME OF SUBSTANTIAL COMPLETION**

- A. Following issuance of Architect's or Engineer's final "certificate of substantial completion", and also in part as applicable to prior certificates on portions of completed work as designated, a "special" payment application may be prepared and submitted by Contractor. The principal administrative actions and submittals which must proceed or coincide with such special applications can be summarized as follows, but not necessarily by way of limitation:
  - 1. Warranties, (guarantees), maintenance agreements and similar provisions of contract documents.
  - 2. Test/adjust/balance records, maintenance instructions, meter readings, start-up performance reports, and similar change-over information germane to Owner's occupancy, use, operation and maintenance of completed work.
  - 3. Final cleaning of the work
  - 4. Application for reduction (if any) of retainage, and consent of surety.
  - 5. Advice to Owner on coordination of shifting insurance coverages, including proof of extended coverages as required.
  - 6. Listing of Contractor's incomplete work, recognized as exceptions to Architect's/Engineer's certificate of substantial completion

#### **1.07 APPLICATION FOR FINAL PAYMENT**

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
  - 1. All closeout procedures specified in Section 01 7000.
  - 2. Completion of items specified for completion beyond time of substantial completion (regardless of whether special payment application was previously made)..
  - 3. Assurance, satisfactory to Owner, that unsettled claims will be settled and that work not actually completed and accepted will be completed without undue delay..
  - 4. Transmittal of required project construction records to Owner..
  - 5. Removal of temporary facilities, services, surplus materials, rubbish and similar elements..

6. Change over of door locks and other Contractor's access provisions to Owner's property.
- C. Application Transmittal: Submit executed copies of each payment application, one copy which is completed with waivers of lien and similar attachments. Transmit each copy with a transmittal form listing those attachments, and recording appropriate information related to application in a manner acceptable to Architect/Engineer. Transmit to Architect/Engineer by means of ensuring receipt within 24 hours.

**PART 3 EXECUTION - NOT USED**

**END OF SECTION 01 2000**

**SECTION 01 2100  
ALLOWANCES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Allowances.
- B. Payment and modification procedures relating to allowances.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

**1.03 METAL ROOFING REPAIR ALLOWANCE**

- A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Metal Roofing Repair Allowance.
- B. Funds will be drawn from the Metal Roofing Repair Allowance only by Change Order.
- C. At closeout of Contract, funds remaining in Metal Roofing Repair Allowance will be credited to Owner by Change Order.

**1.04 DRYROT REPAIR ALLOWANCE**

- A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Dryrot Repair Allowance.
- B. Funds will be drawn from the Dryrot Repair Allowance only by Change Order.
- C. At closeout of Contract, funds remaining in Dryrot Repair Allowance will be credited to Owner by Change Order.

**1.05 ALLOWANCES SCHEDULE**

- A. Metal Roofing Repair Allowance: Include the stipulated sum/price of \$25,000 for use upon Owner's instructions.
- B. Dryrot Repair Allowance: Include the stipulated sum/price of \$25,000 for use upon Owner's instructions for roofing and dryrot repairs.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION 01 2100**

## **SECTION 01 2200**

### **UNIT PRICES**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. List of unit prices, for the Districts use in determining the number of units (if any) may be removed from the project.

##### **1.02 RELATED REQUIREMENTS**

- A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for Unit Prices.
- B. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

##### **1.03 COSTS INCLUDED**

- A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals, erection, application or installation of an item of the Work including overhead and profit.

##### **1.04 UNIT QUANTITIES SPECIFIED**

- A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities to be installed will be determined by the owner and credits will be requested for any units not installed.

##### **1.05 PAYMENT**

- A. Credit for any Work not installed that is governed by unit prices will be made on the basis of the actual quantities of Work that the Architect has removed at the direction of the District, multiplied by the unit price.

##### **1.06 SCHEDULE OF UNIT PRICES**

- A. Item: WALL MOUNT HEAT PUMP REPLACEMENT UNIT C48HA10VP4; Sheet M0.00.
- B. Item: WALL MOUNT HEAT PUMP REPLACEMENT UNIT T60SA10SP4XXE; Sheet M0.00.

#### **PART 2 PRODUCTS - NOT USED**

#### **PART 3 EXECUTION - NOT USED**

**END OF SECTION 01 2200**

**SECTION 01 2300  
ALTERNATES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Description of Alternates.
- B. Procedures for pricing Alternates.

**1.02 RELATED REQUIREMENTS**

- A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for Alternates.
- B. Document 00 4323 - Alternates Form: List of Alternates as supplement to Bid Form.
- C. Document 00 5200 - Agreement Form: Incorporating monetary value of accepted Alternates.

**1.03 ACCEPTANCE OF ALTERNATES**

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

**1.04 SCHEDULE OF ALTERNATES**

**GENERAL: INCLUDE AS PART OF EACH ALTERNATE, MISCELLANEOUS DEVICES, APPURTENANCES AND SIMILAR ITEMS INCIDENTAL TO OR REQUIRE FOR A COMPLETE INSTALLATION AND FULLY OPERATIONAL SYSTEM, WHETHER OR NOT MENTIONED AS PART OF THE ALTERNATE.**

**2.01 ALTERNATE NO. \_\_\_\_\_ - \_\_\_\_\_:**

- A. Base Bid Item: Section \_\_\_\_\_ and Drawing number \_\_\_\_ including \_\_\_\_\_.
- B. Alternate Item: Section \_\_\_\_\_ and Drawing number \_\_\_\_ including \_\_\_\_\_.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION 01 2300**

**SECTION 01 3000**  
**ADMINISTRATIVE REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Electronic document submittal service.
- B. Preconstruction meeting.
- C. Site mobilization meeting.
- D. Progress meetings.
- E. Construction progress schedule.
- F. Coordination drawings.
- G. Submittals for review, information, and project closeout.
- H. Number of copies of submittals.
- I. Submittal procedures.

**1.02 RELATED REQUIREMENTS**

- A. Section 00 7200 - General Conditions: Dates for applications for payment.
- B. Section 00 7300 - Supplementary Conditions: Duties of the Construction Manager.
- C. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
- D. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

**1.03 PROJECT COORDINATOR**

- A. Project Coordinator:
- B. Description of Work:
  - 1. Coordination and Meetings:
    - a. General: Prepare a written memorandum on required coordination activities. Include such items as required notices, reports and attendance at meetings. Distribute this memorandum to each entity performing work at the project site. Prepare similar memorandum for separate contractors where interfacing of their work is required.
    - b. Prepare coordination drawings where work by separate entities requires fabrication off-site of products and materials which must accurately interface. Coordination drawings shall indicate how work shown by separate shop drawings will interface, and shall indicate sequence for installation. Comply with all requirements of the "Submittals" section.
    - c. Monthly Coordination Meetings: Hold monthly general project coordination meetings at regularly scheduled times convenient for all parties involved. These meetings are in addition to specific meetings held for other purposes, such as regular project meetings and special preinstallation meetings. Request representation at each meeting by every party currently involved in coordination or planning for the work of the entire project. Conduct meetings in a manner which will resolve coordination problems. Record results of the meeting and distribute copies to everyone in attendance and to other affected by decisions or actions resulting from each meeting.
    - d. At Contractor's option, monthly coordination meetings can be held integrally with monthly progress meetings as specified in section "Price and Payments."
  - 2. Administrative and supervisory personnel
    - a. General: In addition to a General Superintendent and other administrative and supervisory personnel required of the work, provide specific coordinating personnel as specified herein.



- b. Project Coordinator: Provide a full-time Project Coordinator experienced in administration and supervision of building construction including mechanical and electrical work. This Project Coordinator is hereby authorized to act as general coordinator of interfaces between units of work. For the purpose of this provision, "interface" is defined to include scheduling and sequencing of work, sharing of access to work spaces, installations, protection of each other's work, cutting and patching, tolerances, cleaning, selections for compatibility, preparation of coordination drawings, inspections, tests, and temporary facilities and services.
    - c. The School District shall have the right to approve or reject the project superintendent and/or the project coordinator at any time before or during construction. Should the District provide written disapproval of the superintendent or project coordinator, he/she shall be removed and replaced from the construction site within 10 working days.
- 3. Limitations for use of site
  - a. General: Limitations on site usage as well as specific requirements that impact site utilization are indicated on the Drawings and by other Contract Documents. In addition to these limitations and requirements administer allocation of available space equitably among entities needing both access and space so as to produce the best overall efficiency in performance of the total work of the project. Schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on site.
  - b. Burial of Waste Materials: Do not dispose of organic and hazardous materials on site, either by burial or by burning.
- 4. Special reports
  - a. General: Submit special reports directly to the Owner within one day of an occurrence. Submit a copy of the report to the Architect/Engineer and other entities that are affected by the occurrence.
  - b. Reporting Accidents: Prepare and submit reports of significant accidents, at site and anywhere else work is in progress. Record and document data and actions. For this purpose, a significant accident is defined to include events where personal injury is sustained, or property loss of substance is sustained, or where the event posed a significant threat of loss or personal injury.
  - c. **Absence of Asbestos Containing Material: Contractor shall provide a statement to the Architect at the completion of construction that to the best of his or her knowledge no ACBM was used as a building material in the project.**
- C. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.
- D. During construction, coordinate use of site and facilities through the Project Coordinator.
- E. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- F. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 1000 - Summary.
- G. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- H. Make the following types of submittals to Architect through the Project Coordinator:
  - 1. Requests for Interpretation.
  - 2. Requests for substitution.
  - 3. Shop drawings, product data, and samples.
  - 4. Test and inspection reports.
  - 5. Design data.
  - 6. Manufacturer's instructions and field reports.
  - 7. Applications for payment and change order requests.

8. Progress schedules.
  9. Coordination drawings.
  10. Closeout submittals.
- I. General Installation Provisions:
1. Hold a pre-installation meeting at the project site well before installation of each unit of work which requires coordination with other work. Installer and representatives of the manufacturers and fabricators who are involved in or affected by that unit of work, and with its coordination or integration with other work that has preceded or will follow shall attend this meeting. Advise the Architect/ Engineer of schedule meeting dates.
  2. At each meeting review progress of other work and preparations for the particular work under consideration. Record significant discussions of each conference, and record agreements and disagreements, along with the final plan of action. Distribute the record of meeting promptly to everyone concerned, including the Owner and Architect/Engineer.
  3. Do not proceed with the work if the pre-installation conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the work and reconvene pre-installation conference at the earliest feasible date.
  4. Installer's Inspection of Conditions: Require the Installer of each major unit of work to inspect the substrate to receive work and conditions under which the work is to be performed. The Installer shall report all unsatisfactory conditions in writing to the Contractor. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
  5. Manufacturer's Instructions: Where installations include manufactured products, comply with manufacturer's applicable instructions and recommendations for installation, to the extent that these instructions and recommendations are more explicit or more stringent than requirements indicated in the contract documents. Inspect each item of materials or equipment immediately prior to installation. Reject damaged and defective items.
  6. Provide attachment, connection devices, tools and methods for securing work. Secure work true to line and level, and within recognized industry tolerances. Allow expansion and building movement. Provide uniform joint width in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable visual-effect choices to the Architect/Engineer for final decision. Recheck measurements and dimensions of the work, as an integral step of starting each installation. Install each unit-of-work during weather conditions and project status which will ensure the best possible results in coordination with the entire work. Isolate each unit of work from incompatible work as necessary to prevent deterioration. Coordinate enclosure of the work with required inspections and tests, so as to minimize the necessity of uncovering work for that purpose.
  7. Mounting Heights: Where mounting heights are not indicated, mount individual units of work at industry recognized standard mounting heights for the particular application indicated. Refer questionable mounting height choices to the Architect/Engineer for final decision.
- J. Cleaning and Protection:
1. General: During handling and installation of work at the project site, clean and protect work in progress and adjoining work on the basis of continuous maintenance. Apply protective covering on installed work where it is required to ensure freedom from damage or deterioration at time of substantial completion. The site shall remain clean and clear of litter and debris at all times during and after construction to the satisfaction of the District.
  2. Clean and perform maintenance on installed work as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects. Keep surrounding grounds clean and clear of all debris and garbage. Remove plant "weeds" to maintain a neat and orderly construction site at all times.
  3. Limiting Exposures of Work: To the extent possible through reasonable control and protection methods, supervise performance of the work in such a manner and by such means which will ensure that none of the work, whether completed or in progress, will be

subjected to harmful, dangerous, damaging or otherwise deleterious exposure during the construction period. Such exposures include, where applicable, but not by way of limitation the following: excessive static or dynamic loading, excessive internal or external pressures, excessively high or low temperatures, thermal shock, excessively high or low humidity, air contamination or pollution, water or ice, solvents, chemicals, light, radiation, puncture, abrasion, heavy traffic, soiling, bacteria, insect infestation, combustion, electrical current, high speed operation, improper lubrication, unusual wear or other misuse, incompatible interface, destructive testing, misalignment, excessive weathering, unprotected storage, improper shipping or handling, theft, vandalism

K. Conservation and Salvage

1. General: It is a requirement for supervision and administration of the work that construction operations be carried out with the maximum possible consideration given to conservation of energy, water and materials. In addition, maximum consideration shall be given to salvaging materials and equipment involved in performance of the work but not incorporated therein. Refer to other sections for required disposition of salvage materials which are the Owner's property.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE**

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format, with the exception of color selections, samples, and Deferred Approvals.
  1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
  2. It is Contractor's responsibility to submit documents in allowable format.
  3. Subcontractors, suppliers, and Architect's consultants will be permitted to use the service at no extra charge.
  4. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, [www.adobe.com](http://www.adobe.com), or Bluebeam PDF Revu, [www.bluebeam.com](http://www.bluebeam.com)), unless such software capability is provided by the service provider.
  5. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
  6. All other specified submittal and document transmission procedures apply, except that electronic document requirements to not apply to samples, color selection charts, or Deferred Approvals.
- B. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

**3.02 PRECONSTRUCTION MEETING**

- A. Project Coordinator will schedule a meeting after Notice of Award.
- B. Architect will schedule a meeting not more than 5 days after date of Notice to Proceed.
- C. Attendance Required:
  1. Owner.
  2. Architect.
  3. Contractor.
- D. Agenda:
  1. Execution of Owner-Contractor Agreement.

2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
5. Designation of personnel representing the parties to Contract and Architect.
6. Procedures and processing of field decisions, submittals, substitutions, RFIs, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
7. Scheduling.

### **3.03 PROGRESS MEETINGS**

- A. Project Coordinator will make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.
- B. Attendance Required:
  1. Contractor.
  2. Owner.
  3. Architect.
  4. Contractor's superintendent.
  5. Major subcontractors.
- C. Agenda:
  1. Review minutes of previous meetings.
  2. Review of work progress.
  3. Field observations, problems, and decisions.
  4. Identification of problems that impede, or will impede, planned progress.
  5. Review of submittals schedule and status of submittals.
  6. Review of off-site fabrication and delivery schedules.
  7. Maintenance of progress schedule.
  8. Corrective measures to regain projected schedules.
  9. Planned progress during succeeding work period.
  10. Maintenance of quality and work standards.
  11. Effect of proposed changes on progress schedule and coordination.
  12. Other business relating to work.
- D. Record minutes and distribute copies within three days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

### **3.04 CONSTRUCTION PROGRESS SCHEDULE**

- A. Not more than 7 days after date established for commencement of the work, submit preliminary schedule defining planned operations for the first 90 days of Work, with a general outline for remainder of Work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
  1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

### **3.05 COORDINATION DRAWINGS**

- A. Provide information required by Project Coordinator for preparation of coordination drawings.
- B. Provide coordination drawings where required for the integration of the work, including work first shown in detail on shop drawings or product data. Show sequencing and relationship of separate units of work which must interface in a restricted manner to fit in the space provided, or function as indicated. Coordination drawings are considered shop drawings and must be definitive in nature.

- C. Review drawings prior to submission to Architect.
- D. Preparation: Submit newly prepared information, drawn to accurate scale on sheets not less than 8-1/2" x 11"; except for actual pattern or template type drawings, the maximum sheet size shall not exceed 30" x 42". Indicate the name of the firm that prepared each shop drawing and provide appropriate project identification in the title block. Provide a space not less than 20 sq. in. beside the title block for marking the record of the review process and the Architect/Engineer's "Action" marking. Do not reproduce contract documents or copy standard printed information as the basis of shop drawings. Telephonic or facsimile submittals are not considered acceptable documents for review.

### 3.06 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
  - 1. Product data.
    - a. General information required specifically as product data includes manufacturer's standard printed recommendations for application and use, compliance with recognized standards of trade associations and testing agencies, and the application of their labels and seals (if any), special notation of dimensions which have been verified by way of field measurement, and special coordination requirements for interfacing the material, product or system with other work.
    - b. Preparation: Collect required product data into a single submittal for each unit of work system. Mark submittal to show which choices and options are applicable to the Project. Where product data has been printed to include information on several similar products; some of which are not required for use on the project, or are not included in this submittal, mark to show clearly that such information is not applicable. Where product data must be specially prepared for required products, materials or systems, because standard printed data is not suitable for use, submit data as "shop drawings" and not as "product data".
    - c. Final Distribution: The contractor shall receive an electronic copy of the submittal and shall furnish copies of product data to subcontractors, suppliers, fabricators, manufacturers, installers, governing authorities and others as required for proper performance of the work.
    - d. Installation Copy: Do not proceed with installation of materials, products and systems until a copy of product data applicable to the installation is in the possession of the installer. Do not permit the use of unmarked copies of product data in connection with the performance of the work.
  - 2. Shop drawings.
    - a. Information required on shop drawings includes dimensions, identification of specific products and materials which are included in the work, compliance with specified standards and notations of coordination requirements with other work. **Provide special notation of dimensions that have been established by field measurement. Highlight, encircle or otherwise indicate deviations from the contract documents on the shop drawings. Architect will not be responsible for "finding" changes or deviations to the original contract (bid) documents.**
  - 3. Samples for selection.
  - 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

### 3.07 DEFERRED APPROVAL SUBMITTALS

- A. Manufacturer's drawings, details and specifications for deferred approval items shall be submitted to the Architect for review and his submission to governing authorities in compliance

with governing codes, rules and regulations, and stamped approval obtained thereon as prescribed by Codes.

- B. Engineered drawings and structural calculations shall be prepared by a Structural Engineer registered by the State of California, or as otherwise required by governing State Authorities and submitted to the Architect and Structural Engineer for review and approval prior to submission to D.S.A. for review and approval.
- C. Additional drawings and instructions deemed necessary to carry out the work included in Contract shall be supplied to, or by, the manufacturer and so prepared as to be consistent with the Contract Documents.
- D. **Deferred Approval Submittals shall have one reproducible copy of the documents affixed with the wet stamp and wet signature of the design engineering professional responsible for the preparation of the submittal. Additionally, provide (1) full size copy reproducing the stamp and signature. The reproducible documents with wet stamp and signature shall be returned to the contractor for onsite holding. An electronic copy of the DSA approved drawings will be held by the Architect.**

### 3.08 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
  - 1. Design data.
  - 2. Certificates.
  - 3. Test reports.
    - a. Classify each test report as being either "shop drawings" or product data" depending on whether the report is specially prepared for the project, or a standard publication of workmanship control testing at the point of production. Process inspection and test reports accordingly.
  - 4. Inspection reports.
    - a. Classify each inspection report as being either "shop drawings" or product data" depending on whether the report is specially prepared for the project, or a standard publication of workmanship control testing at the point of production. Process inspection and test reports accordingly.
  - 5. Manufacturer's instructions.
  - 6. Manufacturer's field reports.
  - 7. Survey data.
  - 8. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

### 3.09 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
  - 1. Project record documents.
  - 2. Operation and maintenance data.
  - 3. Warranties.
    - a. Refer to section "Products and Substitutions" for specific general requirements on warranties, product bonds, workmanship bonds and maintenance agreements. In addition to copies desired for the Contractor's use, furnish 2 executed copies of such warranties, bonds or agreements. Provide 2 additional copies where required for maintenance manuals. *(Project Close-out Item)*
  - 4. Bonds.
  - 5. Survey copies.
    - a. Furnish one reproducible copy and one black-line print of general survey data. Provide one reproducible copy and one black-line print copies of the final property survey. *(Project Close-out Item)*

6. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

### 3.10 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Extra Copies at Project Closeout: See Section 01 7800.
- C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
  1. Submit samples for the Architect/Engineer's visual review of general generic kind, color, pattern, and texture, and for a final check of the coordination of these characteristics with other related elements of the work. Samples are also submitted for quality control comparison of these characteristics between the final sample submittal and the actual work as it is delivered and installed.
  2. Refer to individual work sections of these specifications for additional sample requirements, which may be intended for examination or testing of additional characteristics. Compliance with other required characteristics is the exclusive responsibility of the Contractor; such compliance is not considered in the Architect/Engineer's review and "Action" indication on sample submittals.
  3. Documentation required specifically for sample submittals includes a generic description of the sample, the sample source or the product name or manufacturer, compliance with governing regulations and recognized standards. In addition, indicate limitations in terms of availability, sizes, delivery time, and similar limiting characteristics.
  4. Mock-Ups and similar samples specified in individual work sections are special types of samples. Comply with sample submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.
  5. Retained samples will not be returned to Contractor unless specifically so stated.

### 3.11 SUBMITTAL PROCEDURES

- A. General Requirements:
- B. Transmit each submittal with the approved form included at the end of this section. Form shall be fully completed and attached to the electronic file of submittal being submitted by contractor. Submittals received by Architect without form attached or incomplete information, will be returned to the sender "without action." Multiple submittals (submittals covering more than one specification section) grouped together electronically, will be returned "without action" to the contractor for separation prior to reviewing. *An electronic copy, MS Word document, of the submittal form is available at no charge to the contractor for their use. This file may be slightly modified by the contractor for job specific use, upon review and approval of the Architect.*
- C. Identify project name and project number, name and address of Contractor, name and address of Subcontractor or supplier, name of Owner, pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents. **Submittals without a Contractor's stamp of approval will be returned by the Architect with no action taken. Apply Contractor's stamp,**
- E. For each submittal for review, allow 2 weeks of receipt from the Contractor.
- F. Coordination: Coordinate the preparation and processing of submittals with the performance of the work. Coordinate each separate submittal with other submittals and related activities such as testing, purchasing, fabrication, delivery and similar activities that require sequential activity. Coordinate the submittal of different units of interrelated work so that one submittal will not be delayed by the Architect/Engineer's need to review a related submittal. The Architect/Engineer

reserves the right to withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.

- G. Scheduling: In each appropriate administrative submittal, such as the progress schedule, show the principal work-related submittals and time requirements for coordination of submittal activity with related work.
- H. Listing: Prepare a separate listing showing principal work - related submittals and their initial submittal dates as required for coordination of the work. Organize the listing by the related specification number sequence. Submit the listing within 10 days after the issuance of "Notice to Proceed" and submit all work-related submittals, i.e. shop drawings, within thirty-five (35) days after the "Notice to Proceed."
- I. Submittals for Color Selections: Submit a separate listing of all materials and products requiring color selection within 10 days after the issuance of "Notice to Proceed" and all color samples, brochures, brush-outs, etc., identified on the above list within 35 days after the issuance of "Notice to Proceed." Each sample, brochure, brush-out, etc., shall bear stickers showing project name, project number and type of product (toilet partitions, window blinds, casework, sealant, etc.)
- J. Coordination of Submittal Times: Prepare and transmit each submittal to the Architect/Engineer sufficiently in advance of the scheduled performance of related work and other applicable activities. Transmit different kinds of submittals for the same unit of work so that processing will not be delayed by the Architect/Engineer's need to review submittals concurrently for coordination.
- K. Review Time: Allow sufficient time so that the installation will not be delayed as a result of the time required to properly process submittals, including time for resubmittal, if necessary. Advise the Architect/Engineer on each submittal, as to whether processing time is critical to the progress of the work, and if the work would be expedited if processing time could be shortened.

### **3.12 ARCHITECT/ENGINEER'S ACTION:**

- A. Action Stamp: The Architect/Engineer will stamp each submittal to be returned with a uniform, self-explanatory action stamp, appropriately marked and executed to indicate whether the submittal returned is for unrestricted use, final-but-restricted use (as marked), must be revised and resubmitted (use not permitted) or without action (as explained on the transmittal form).
- B. Final Unrestricted Release: Where the submittals are marked as follows, the work covered by the submittal may proceed provided it complies with the requirements of the contract documents; acceptance of the work will depend upon that compliance.
  - 1. Marking: "REVIEWED"
- C. Final-But-Restricted Release: When the submittals are marked as follows, the work covered by the submittal may proceed provided it complies with both the Architect's/Engineer's notations or corrections on the submittal and with the requirements of the contract documents; acceptance of the work will depend on that compliance.
  - 1. Marking: "FURNISH AS CORRECTED"
- D. Returned for Resubmittal: When the submittal is marked as follows, do not proceed with the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise the submittal or prepare a new submittal in accordance with the Architect's/Engineer's notations stating the reasons for returning the submittal; resubmit the submittal without delay. Repeat if necessary to obtain a different action marking. Do not permit submittals with the following marking to be used at the project site, or elsewhere work is in progress.
  - 1. Marking: "REJECTED" OR "REVISE AND RESUBMIT"
- E. Other Action: Where the submittal is returned, marked with the Architect/Engineer's explanation, for special processing or other Contractor activity, or is primarily for information or record purposes, the marking will be self-explanatory.

### **"SUBMITTAL FORM" IN SECTION 01 30 00.01**



**END OF SECTION 01 3000**

**SECTION 01 3114  
PROJECT COORDINATION**

**PART 1 GENERAL**

**1.01 MECHANICAL AND ELECTRICAL COORDINATOR**

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 COORDINATION REQUIRED**

**3.02 OBSERVATION OF WORK**

**3.03 EQUIPMENT START-UP**

**END OF SECTION 01 3114**

**SECTION 01 4000**  
**QUALITY REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Testing and inspection agencies and services.
- E. Control of installation.
- F. Tolerances.
- G. Defect Assessment.

**1.02 RELATED REQUIREMENTS**

- A. Document 00 3100 - Available Project Information: Soil investigation data.
- B. Document 00 7200 - General Conditions: Inspections and approvals required by public authorities.
- C. Section 01 2100 - Allowances: Allowance for payment of testing services.
- D. Section 01 3000 - Administrative Requirements: Submittal procedures.
- E. Section 01 4216 - Definitions.
- F. Section 01 4219 - Reference Standards.
- G. Section 01 6000 - PRODUCTS AND SUBSTITUTIONS: Requirements for material and product quality.

**1.03 REFERENCE STANDARDS**

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).
- B. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2014.
- C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2013.
- D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.
- E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2014a.
- F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2013.
- G. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2010.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents, or for Owner's information.
- C. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
  - 1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of inspector.

- d. Date and time of sampling or inspection.
  - e. Identification of product and specifications section.
  - f. Location in the Project.
  - g. Type of test/inspection.
  - h. Date of test/inspection.
  - i. Results of test/inspection.
  - j. Compliance with Contract Documents.
  - k. When requested by Architect, provide interpretation of results.
2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents, or for Owner's information.
- D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
- 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
  - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
- 1. Submit report in duplicate within 30 days of observation to Architect for information.
  - 2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents.

### **1.05 QUALITY ASSURANCE**

- A. Testing Agency Qualifications:
- 1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
  - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
  - 3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

### **1.06 REFERENCES AND STANDARDS**

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

## **1.07 TESTING AND INSPECTION AGENCIES AND SERVICES**

- A. Owner will employ services of an independent testing agency to perform certain specified testing; payment for cost of services will be derived from allowance specified in Section 01 2100; see Section 01 2100 and applicable sections for description of services included in allowance.
- B. Owner will employ and pay for services of an independent testing agency to perform other specified testing.
- C. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
- D. As indicated in individual specification sections, Owner or Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
- E. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- F. Contractor Employed Agency:
  - 1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.
  - 2. Inspection agency: Comply with requirements of ASTM D3740, and ASTM E329.
  - 3. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
  - 4. Laboratory: Authorized to operate in the State in which the Project is located.
  - 5. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.

## **PART 2 PRODUCTS - NOT USED**

## **PART 3 EXECUTION**

### **3.01 CONTROL OF INSTALLATION**

- 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 Architect 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.

### **3.02 TOLERANCES**

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

### **3.03 TESTING AND INSPECTION**

- A. See individual specification sections for testing required.
- B. Testing Agency Duties:
  - 1. Test samples of mixes submitted by Contractor.
  - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.

3. Perform specified sampling and testing of products in accordance with specified standards.
  4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
  6. Perform additional tests and inspections required by Architect.
  7. Attend preconstruction meetings and progress meetings.
  8. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  2. Agency may not approve or accept any portion of the Work.
  3. Agency may not assume any duties of Contractor.
  4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
  2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
  3. Provide incidental labor and facilities:
    - a. To provide access to Work to be tested/inspected.
    - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
    - c. To facilitate tests/inspections.
    - d. To provide storage and curing of test samples.
  4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
  5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
  6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

### **3.04 DEFECT ASSESSMENT**

- A. Replace Work or portions of the Work not complying with specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.
- C. If, in the opinion of Owner, it is not practical to remove and replace the work, Owner will direct an appropriate remedy or adjust payment.

**END OF SECTION 01 4000**

**SECTION 01 4219  
REFERENCE STANDARDS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Requirements relating to referenced standards.
- B. Reference standards full title and edition date.

**1.02 RELATED REQUIREMENTS**

- A. Document 00 7200 - General Conditions: Reference standards.

**1.03 QUALITY ASSURANCE**

- A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
- C. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

**PART 2 CONSTRUCTION INDUSTRY ORGANIZATION DOCUMENTS**

**2.01 AA -- ALUMINUM ASSOCIATION, INC.**

- A.

**2.02 AABC -- ASSOCIATED AIR BALANCE COUNCIL**

**2.03 AAMA -- AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION**

**2.04 ACI -- AMERICAN CONCRETE INSTITUTE INTERNATIONAL**

**2.05 ACPA -- AMERICAN CONCRETE PIPE ASSOCIATION**

**2.06 ACS -- ACOUSTICAL SOCIETY OF AMERICA**

**2.07 AFPA -- AMERICAN FOREST AND PAPER ASSOCIATION**

**2.08 AGA -- AMERICAN GALVANIZERS ASSOCIATION, INC.**

**2.09 AHA -- AMERICAN HARDBOARD ASSOCIATION**

**2.10 AI -- THE ASPHALT INSTITUTE**

**2.11 AIA -- THE AMERICAN INSTITUTE OF ARCHITECTS**

**2.12 AIHA -- AMERICAN INDUSTRIAL HYGIENE ASSOCIATION**

**2.13 AISC -- AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.**

**2.14 AISI -- AMERICAN IRON AND STEEL INSTITUTE**

**2.15 AITC -- AMERICAN INSTITUTE OF TIMBER CONSTRUCTION**

**2.16 ALSC -- AMERICAN LUMBER STANDARDS COMMITTEE**

**2.17 AMCA -- AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.**

**2.18 ANSI -- AMERICAN NATIONAL STANDARDS INSTITUTE**

- A. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.

- 2.19 APA -- APA - THE ENGINEERED WOOD ASSOCIATION**
- 2.20 ARI -- AIR-CONDITIONING AND REFRIGERATION INSTITUTE (SEE AHRI)**
- 2.21 ARMA -- ASPHALT ROOFING MANUFACTURERS ASSOCIATION**
- 2.22 ASC -- ADHESIVE AND SEALANT COUNCIL**
- 2.23 ASHRAE -- AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC.**
- 2.24 ASME -- THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS**
- 2.25 ASPE -- AMERICAN SOCIETY OF PLUMBING ENGINEERS**
- 2.26 ASSE -- AMERICAN SOCIETY OF SANITARY ENGINEERING**
- 2.27 ASTM A SERIES -- ASTM INTERNATIONAL**
- 2.28 ASTM B SERIES -- ASTM INTERNATIONAL**
- 2.29 ASTM C SERIES -- ASTM INTERNATIONAL**
  - A. ASTM C91/C91M - Standard Specification for Masonry Cement; 2012.
  - B. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.
  - C. ASTM C206 - Standard Specification for Finishing Hydrated Lime; 2014.
  - D. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
  - E. ASTM C897 - Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters; 2015.
  - F. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
  - G. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster; 2015b.
  - H. ASTM C932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering; 2006 (Reapproved 2013).
  - I. ASTM C1328/C1328M - Standard Specification for Plastic (Stucco) Cement; 2012.
- 2.30 ASTM D SERIES -- ASTM INTERNATIONAL**
- 2.31 ASTM E SERIES -- ASTM INTERNATIONAL**
  - A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
  - B. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.
  - C. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011.
  - D. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.



- 2.32 ASTM F SERIES -- ASTM INTERNATIONAL**
- 2.33 ASTM G SERIES -- ASTM INTERNATIONAL**
- 2.34 AWI -- ARCHITECTURAL WOODWORK INSTITUTE**
- 2.35 AWPA -- AMERICAN WOOD-PRESERVERS' ASSOCIATION**
- 2.36 AWS -- AMERICAN WELDING SOCIETY**
- 2.37 BHMA -- BUILDERS HARDWARE MANUFACTURERS ASSOCIATION**
- 2.38 CBC -- CALIFORNIA BUILDING CODE**
- 2.39 CISCA -- CEILINGS & INTERIOR SYSTEMS CONSTRUCTION ASSOCIATION**
- 2.40 CISPI -- CAST IRON SOIL PIPE INSTITUTE**
- 2.41 CRI -- CARPET AND RUG INSTITUTE**
- 2.42 CTI -- CERAMIC TILE INSTITUTE**
- 2.43 DHI -- DOOR AND HARDWARE INSTITUTE**
- 2.44 DSA - DIVISION OF STATE ARCHITECT**
- 2.45 GA -- GYPSUM ASSOCIATION**
- 2.46 IES/IESNA -- ILLUMINATING ENGINEERING SOCIETY**
- 2.47 MBMA -- METAL BUILDING MANUFACTURERS ASSOCIATION**
- 2.48 MFMA -- MAPLE FLOORING MANUFACTURERS ASSOCIATION**
- 2.49 MFMA -- METAL FRAMING MANUFACTURERS ASSOCIATION**
- 2.50 ML/SFA -- METAL LATH/STEEL FRAMING ASSOCIATION - SEE NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS**
- 2.51 NAAMM -- THE NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS**
- 2.52 NCMA -- NATIONAL CONCRETE MASONRY ASSOCIATION**
- 2.53 NECA -- NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION**
- 2.54 NEII -- NATIONAL ELEVATOR INDUSTRY, INC.**
- 2.55 NEMA -- NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION**
  - A. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- 2.56 NFPA -- NATIONAL FIRE PROTECTION ASSOCIATION**
- 2.57 NPCA -- NATIONAL PAINT AND COATINGS ASSOCIATION**
- 2.58 NRCA -- NATIONAL ROOFING CONTRACTORS ASSOCIATION**
- 2.59 NSF -- NSF INTERNATIONAL (THE PUBLIC HEALTH AND SAFETY ORGANIZATION)**
- 2.60 PCA -- PORTLAND CEMENT ASSOCIATION**
- 2.61 PCI -- PRECAST/PRESTRESSED CONCRETE INSTITUTE**
- 2.62 RFCI -- RESILIENT FLOOR COVERING INSTITUTE**
- 2.63 SDI -- STEEL DOOR INSTITUTE**
- 2.64 SDI -- STEEL DECK INSTITUTE, INC.**
- 2.65 SMACNA -- SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION, INC.**
- 2.66 SSPC -- SOCIETY FOR PROTECTIVE COATINGS**
- 2.67 SWI -- STEEL WINDOW INSTITUTE**
- 2.68 UL -- UNDERWRITERS LABORATORIES INC.**
  - A. UL (DIR) - Online Certifications Directory; current listings at [database.ul.com](http://database.ul.com).
  - B. UL (FRD) - Fire Resistance Directory; current edition.

**2.69 WCLIB -- WEST COAST LUMBER INSPECTION BUREAU**

**2.70 WI -- WOODWORK INSTITUTE**

- A. WI (CCP) - Certified Compliance Program (CCP); current edition at [www.woodworkinstitute.com/certification](http://www.woodworkinstitute.com/certification).
- B. WI (CSIP) - Certified Seismic Installation Program (CSIP); current edition at [www.woodworkinstitute.com](http://www.woodworkinstitute.com).
- C. WI (MCP) - Monitored Compliance Program (MCP); current edition at [www.woodworkinstitute.com/certification](http://www.woodworkinstitute.com/certification).

**2.71 WWPA -- WESTERN WOOD PRODUCTS ASSOCIATION**

**END OF SECTION 01 4219**

**SECTION 01 5000**  
**TEMPORARY FACILITIES AND CONTROLS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Vehicular access and parking.
- F. Waste removal facilities and services.
- G. Project identification sign.
- H. Field offices.
- I. Fire Hydrants and Fire Service Utilities

**1.02 RELATED REQUIREMENTS**

- A. Section 01 5100 - Temporary Utilities.
- B. Section 01 5213 - Field Offices and Sheds.
- C. Section 01 5500 - Vehicular Access and Parking.

**1.03 TEMPORARY UTILITIES - SEE SECTION 01 5100**

- A. Provide adequate utility capacity at each stage of construction. Prior to availability of temporary utilities at the site, provide trucked-in services for start-up of construction operations.
- B. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes. No cost or usage charges for temporary services or facilities are chargeable to the Owner or Architect/Engineer. Cost or use charges for temporary services or facilities will not be accepted as a basis of claims for a change-order extra.
- C. Obtain and pay for temporary easements required to bring temporary utilities to the project site, where the Owner's permanent easement cannot be utilized for that purpose.
- D. Existing facilities may not be used.
- E. New permanent facilities may not be used.

**1.04 TELECOMMUNICATIONS SERVICES**

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
  - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
  - 2. Telephone Land Lines: One line, minimum; one handset per line.
  - 3. Internet Connections: Minimum of one; DSL modem or faster.
  - 4. *Wireless access: Provide wireless internet access at the field office. Provide internet access password to entire project team for use of laptops/tablets at the project site.*
  - 5. Email: Account/address reserved for project use.

**1.05 TEMPORARY SANITARY FACILITIES**

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Use of existing facilities located is not permitted.
- C. Maintain daily in clean and sanitary condition.
- D. Provide separate facilities for male and female personnel when both sexes are working (in any capacity) at project site. Provide piped (wet) wash facilities with water;

## **1.06 BARRIERS**

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

## **1.07 FENCING**

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

## **1.08 EXTERIOR ENCLOSURES**

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

## **1.09 INTERIOR ENCLOSURES**

- A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.
- B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:

## **1.10 FIRE PROTECTION**

- A. Fire Extinguishers: Provide types, sizes, numbers and locations as would be reasonably effective in extinguishing fires during early stages, by personnel at project site. The contractor shall provide portable fire extinguishers in compliance with 2007 CFC sec. 1415. Provide Type A extinguishers at locations of low-potential for either electrical or grease-oil-flammable liquids fires; provide Type ABC dry chemical extinguishers at other locations; comply with recommendations of NFPA No. 10. Post warning and quick- instructions at each extinguisher location, and instruct personnel at project site, at time of their first arrival, on proper use of extinguishers and other available facilities at project site. Post local fire department call number on each telephone instrument at project site.
- B.

## **1.11 VEHICULAR ACCESS AND PARKING - SEE SECTION 01 5500**

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

## **1.12 WASTE REMOVAL**

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

- B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- C. Provide containers with lids. Remove trash from site periodically.
- D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

**1.13 PROJECT IDENTIFICATION**

- A. Provide project identification sign of design and construction indicated on drawings.
- B. Engage an experienced sign painter to paint graphics or experienced print shop to laser-cut vinyl lettering and graphics on sign as indicated.
- C. Verify all names and graphics prior to finalizing work. Construct sign of treated wood posts and 3/4" plywood panels of exterior type Grade B-C, sanded 2 sides.
- D. Erect on site at location indicated. If not shown on plan, as located by Architect.
- E. No other signs are allowed without Owner permission except those required by law.

**1.15 FIELD OFFICES - SEE SECTION 01 5213**

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate a minimum of 6 persons.
- C. Inspectors Field Office: Provide office space suitably finished, furnished, equipped, locked, heated, naturally ventilated, lighted and wired with electrical power; not less than 150 sq. ft. floor area. Equip office with 1 telephone line with cordless, 900 MHZ phone with minimum range of 1500 ft., one plain paper facsimile machine with a dedicated telephone line, and not less than 5 duplex convenience power outlets. In addition to 1 desk and 1 chair, furnish office with one 36" x 96" plan table, and plan rack to hold 2 complete sets of working drawings and shop drawings.
- D. Provide separate private office similarly equipped and furnished, for use of Owner/Inspector.
- E. Locate offices a minimum distance of 30 feet from existing and new structures.
- F. Drinking Water: Provide dispenser-type, electrical-power-cooled drinking water units; either piped with potable water or supplied with bottled water; adequate in number and locations for personnel at project site. Furnish paper cups and waste receptacles.

**1.16 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS**

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing facilities used during construction to original condition.
- D. Restore new permanent facilities used during construction to specified condition.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION 01 5000**

**SECTION 01 6000**  
**PRODUCTS AND SUBSTITUTIONS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General product requirements.
- B. Sustainable design-related product requirements.
- C. Re-use of existing products.
- D. Transportation, handling, storage and protection.
- E. Product option requirements.
- F. Substitution limitations.
- G. Procedures for Owner-supplied products.
- H. Maintenance materials, including extra materials, spare parts, tools, and software.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 1000 - Summary: Lists of products to be removed from existing building.
- B. Section 01 1000 - Summary: Identification of Owner-supplied products.
- C. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- D. Section 01 4000 - Quality Requirements: Product quality monitoring.
- E. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- F. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

**1.03 REFERENCE STANDARDS**

- A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content; Current Edition.
- B. CAN/CSA Z809 - National Standard for Sustainable Forest Management; CSA International Inc; 2008.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.04 SUBMITTALS**

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
  - 1. Submit no later than fifteen (15) calendar days prior to the bid date.
  - 2. For products specified only by reference standards, list applicable reference standards.
- 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. Provide a detailed, side-by-side comparison of the significant qualities of the proposed substitution with those of the work originally specified. Significant qualities include elements such as size, weight, durability, performance and visual effect where applicable.
- D. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

#### **1.05 SUBSTITUTIONS**

- A. Such requests must be submitted for review and approval within fifteen (15) days prior to bid opening. Submittals for substitution received after the (15) days will be rejected.

### **PART 2 PRODUCTS**

#### **2.01 EXISTING PRODUCTS**

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

#### **2.02 NEW PRODUCTS**

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
  1. Made outside the United States, its territories, Canada, or Mexico.
- C. Where other criteria are met, Contractor shall give preference to products that:
  1. If used on interior, have lower emissions, as defined in Section 01 6116.
  2. If wet-applied, have lower VOC content, as defined in Section 01 6116.

#### **2.03 GENERAL PRODUCT REQUIREMENTS:**

- A. Provide products that comply with the requirements of the Contract Documents and that are undamaged and, unless otherwise indicated, unused at the time of installation. Provide products that are complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
- B. Standard Products: Where they are available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
- C. Continued Availability: Where, because of the nature of its application, the Owner is likely to need replacement parts or additional amounts of a product at a later date, either for maintenance and repair or replacement, provide standard, domestically produced products for which the manufacturer has published assurances that the products and its parts are likely to be available to the Owner at a later date.
- D. Nameplates: Except as otherwise indicated for required labels and operating data, do not permanently attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view either in occupied spaces or on the exterior of the completed project.
- E. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface which, in occupied spaces, is not conspicuous.
- F. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate the nameplate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data.
  1. Name of manufacturer
  2. Name of product
  3. Model number
  4. Serial number
  5. Capacity

- 6. Speed
- 7. Ratings

## **2.04 PRODUCT OPTIONS**

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

## **2.05 MAINTENANCE MATERIALS**

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

## **PART 3 EXECUTION**

### **3.01 SUBSTITUTION LIMITATIONS**

- A. See Section 01 2500 - Substitution Procedures.
- B. Architect will consider requests for substitutions only within fifteen (15) days prior to bid opening. Submittals for substitution received after the fifteen (15) days will be rejected.

### **3.02 OWNER-SUPPLIED PRODUCTS**

- A. See Section 01 1000 - Summary for identification of Owner-supplied products.
- B. Owner's Responsibilities:
  - 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
  - 2. Arrange and pay for product delivery to site.
  - 3. On delivery, inspect products jointly with Contractor.
  - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
  - 5. Arrange for manufacturers' warranties, inspections, and service.
- C. Contractor's Responsibilities:
  - 1. Review Owner reviewed shop drawings, product data, and samples.
  - 2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
  - 3. Handle, store, install and finish products.
  - 4. Repair or replace items damaged after receipt.

### **3.03 TRANSPORTATION AND HANDLING**

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.



- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

#### **3.04 STORAGE AND PROTECTION**

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturer's warranty conditions, if any.
- H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- I. Prevent contact with material that may cause corrosion, discoloration, or staining.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

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**SAMPLE WARRANTY- GUARANTEE**

**SEPARATE GUARANTEES FURNISHED FOR PARTICULAR TYPES OF WORK AS SPECIFIED UNDER THE PERTINENT SECTIONS OF THESE SPECIFICATIONS SHALL BE SUBMITTED ON THE CONTRACTOR'S LETTERHEAD IN THE FOLLOWING FORM:**

**GUARANTEE - WARRANTY FOR \_\_\_\_\_**

**WE HEREBY WARRANT AND THE MANUFACTURER GUARANTEES THAT THE \_\_\_\_\_**

**\_\_\_\_\_**  
**WHICH WE HAVE INSTALLED IN THE \_\_\_\_\_**

**HAS BEEN DONE IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS AND THAT THE WORK AS INSTALLED WILL FULFILL THE REQUIREMENTS OF THE GUARANTEE- WARRANTY INCLUDED IN THE SPECIFICATIONS.**

**WE AGREE TO REPAIR OR REPLACE ANY OR ALL OF OUR WORK TOGETHER WITH ANY OTHER ADJACENT WORK WHICH MAY BE DISPLACED BY SO DOING, THAT MAY PROVE TO BE DEFECTIVE IN ITS WORKMANSHIP OR MATERIAL WITHIN A PERIOD OF \_\_\_\_\_ YEARS FROM THE DATE OF ACCEPTANCE OF THE ABOVE-NAMED STRUCTURE BY THE OWNER, WITHOUT ANY EXPENSE WHATSOEVER TO THE OWNER, ORDINARY WEAR AND TEAR AND UNUSUAL ABUSE OR NEGLIGENCE EXCEPTED.**

**IN THE EVENT OF OUR FAILURE TO COMPLY WITH THE ABOVE MENTIONED CONDITIONS WITHIN THIRTY (30) DAYS AFTER BEING NOTIFIED IN WRITING BY THE OWNER, WE COLLECTIVELY OR SEPARATELY DO HEREBY AUTHORIZE THE OWNER TO PROCEED TO HAVE SUCH DEFECTS REPAIRED AND MADE GOOD AT OUR EXPENSE, AND WE WILL HONOR AND PAY THE COSTS AND CHARGES THEREFOR UPON DEMAND.**

**SIGNED \_\_\_\_\_**

**SUBCONTRACTOR**

**COUNTERSIGNED \_\_\_\_\_**

**MANUFACTURER (IF APPLICABLE)**

**SUBSTITUTION REQUEST FORM: PART 1**

TO: \_\_\_\_\_, OWNER

( ) -

PROJECT:	CONTRACTOR:
OWNER PROJECT NO:	

SUBSTITUTION REQUEST BY:	FIRM:
--------------------------	-------

TRANSMITTAL RECORD	ATTN:	FIRM:	DATE SENT:	DATE REC'D:	DATE DUE:
CONTRACTOR TO OWNER					
CONTRACTOR TO ARCHITECT					
OWNER / ARCHITECT TO CONSULTANT					
ARCHITECT TO OWNER REPRESENTATIVE					
OWNER REPRESENTATIVE TO CONTRACTOR					

**WE HEREBY SUBMIT FOR YOUR CONSIDERATION THE FOLLOWING PRODUCT INSTEAD OF THE SPECIFIED ITEM FOR THE PROJECT:**

SECTION / DRAWING	ARTICLE	SPECIFIED ITEM
<b>PROPOSED SUBSTITUTION:</b>		

**WE HAVE (A) ATTACHED MANUFACTURER'S LITERATURE, INCLUDING COMPLETE TECHNICAL DATA AND LABORATORY TEST RESULTS, IF APPLICABLE, (B) ATTACHED AN EXPLANATION**

OF WHY PROPOSED SUBSTITUTION IS A TRUE EQUIVALENT TO SPECIFIED ITEM, (C) INCLUDED COMPLETE INFORMATION ON CHANGES TO CONTRACT DOCUMENTS THAT THE PROPOSED SUBSTITUTION WILL REQUIRE FOR ITS PROPER INSTALLATION, AND (D) FILLED IN THE BLANKS BELOW.

CONTRACTOR TO COMPLETE QUESTIONS THAT FOLLOW AND CERTIFIES TO THE ACCURACY OF ALL ANSWERS:

<p><b>A. DOES THE SUBSTITUTION AFFECT DIMENSIONS SHOWN ON DRAWINGS? YES ___ / NO ___.</b> <b>IF NO, PLEASE EXPLAIN PROPOSED MITIGATION AND WHY SUBSTITUTION IS EQUIVALENT TO ORIGINALLY SPECIFIED ITEM:</b></p>
<p><b>B. WILL THE UNDERSIGNED PAY FOR CHANGES TO THE BUILDING DESIGN, INCLUDING ENGINEERING AND DETAILING COSTS CAUSED BY THE REQUESTED SUBSTITUTION? YES ___ / NO ___.</b> <b>IF NO, PLEASE STATE REASONS AND EXPLAIN WHY SUBSTITUTION IS EQUIVALENT TO ORIGINALLY SPECIFIED ITEM:</b></p>
<p><b>C. WHAT EFFECT DOES THE SUBSTITUTION HAVE ON OTHER TRADES? NO EFFECT: ___ / SOME EFFECT ___.</b> <b>IF SUBSTITUTION WILL AFFECT OTHER TRADES, PLEASE EXPLAIN THE EFFECT AND WHY SUBSTITUTION IS EQUIVALENT TO ORIGINALLY SPECIFIED ITEM:</b></p>
<p><b>D. WILL SUBSTITUTION CAUSE CHANGE TO PROJECT SCHEDULE, OR TO CRITICAL DELIVERY DATES? ADD? SHORTEN? IF THE SUBSTITUTION WILL ADD TO SCHEDULE DATES OR AFFECT CRITICAL ACTIVITIES, PLEASE EXPLAIN WHY SUBSTITUTION IS EQUIVALENT TO ORIGINALLY SPECIFIED ITEM:</b></p>
<p><b>E. PLEASE DESCRIBE DIFFERENCES BETWEEN PROPOSED SUBSTITUTION AND SPECIFIED ITEM? PLEASE EXPLAIN AND IDENTIFY ANY AND ALL DIFFERENCES, AND PLEASE EXPLAIN WHY SUBSTITUTION IS EQUIVALENT TO ORIGINALLY SPECIFIED ITEM:</b></p>

**F. WHAT IS THE COST DIFFERENTIAL TO CONTRACTOR IN ORIGINAL SPECIFIED ITEM AND PROPOSED SUBSTITUTION INCLUDING ALL MARK-UPS? [IF SUBSTITUTION REQUESTED DURING BID PERIOD, SKIP THIS QUESTION.]**

**G. ARE MANUFACTURER'S GUARANTEES FOR THE PROPOSED ITEM THE SAME AS FOR ITEM SPECIFIED? YES \_\_\_ / NO \_\_\_. IF NO, PLEASE EXPLAIN WHY SUBSTITUTION IS EQUIVALENT TO ORIGINALLY SPECIFIED ITEM:**

**H. CONTRACTOR ACCEPTS FULL RESPONSIBILITY FOR DELAYS CAUSED BY REDESIGN OF OTHER ITEMS OF THE WORK NECESSITATED BY SUBSTITUTION? YES \_\_\_ / NO \_\_\_. IF NO, PLEASE STATE REASONS AND EXPLAIN WHY SUBSTITUTION IS EQUIVALENT TO ORIGINALLY SPECIFIED ITEM:**

**I. CONTRACTOR STATES THAT THE FUNCTION, APPEARANCE AND QUALITY ARE EQUIVALENT OR SUPERIOR TO THE SPECIFIED ITEM? YES \_\_\_ / NO \_\_\_. IF NO, PLEASE EXPLAIN WHY SUBSTITUTION IS EQUIVALENT TO ORIGINALLY SPECIFIED ITEM:**

**WE CERTIFY THAT THE FUNCTION, APPEARANCE, AND QUALITY OF THE PROPOSED SUBSTITUTION ARE EQUIVALENT OR SUPERIOR TO THOSE OF THE SPECIFIED ITEM, EXCEPT AS WE MAY SPECIFICALLY STATE OTHERWISE IN THIS REQUEST.**

**SUBMITTED BY:** \_\_\_\_\_ **SIGNATURE:**

\_\_\_\_\_  
**FIRM:** \_\_\_\_\_ **DATE:**

\_\_\_\_\_  
**ADDRESS:** \_\_\_\_\_ **PHONE / FAX:**

**REMARKS:**  
\_\_\_\_\_

**CONSULTANT RESPONSE:**  
**RESPONSE:**

**ACCEPTED**

**NOT ACCEPTED**

**ACCEPTED AS NOTED**

**RECEIVED TOO LATE**

**REMARKS:** \_\_\_\_\_

\_\_\_\_\_  
**BY:** \_\_\_\_\_

**OWNER REPRESENTATIVE**

**ACCEPTED**

**NOT ACCEPTED**

**ACCEPTED AS NOTED**

**RECEIVED TOO LATE**

**REMARKS:** \_\_\_\_\_

\_\_\_\_\_  
**BY:** \_\_\_\_\_

**SUBSTITUTION REQUEST FORM: PART 2**

**ATTACHED DATA INCLUDES PRODUCT DESCRIPTION, SIDE-BY-SIDE COMPARISON, SPECIFICATIONS, DRAWINGS, PHOTOGRAPHS, PERFORMANCE AND TEST DATA ADEQUATE FOR EVALUATION OF THE REQUESTS, APPLICABLE PORTIONS OF THE DATA ARE CLEARLY IDENTIFIED.**

**ATTACHED DATA ALSO INCLUDES DESCRIPTION OF CHANGES TO CONTRACT DOCUMENTS WHICH PROPOSED SUBSTITUTION WILL REQUIRE FOR PROPER INSTALLATION.**

**THE UNDERSIGNED STATES THAT THE FOLLOWING PARAGRAPHS, UNLESS MODIFIED ON ATTACHMENTS, ARE CORRECT:**

**1. THE PROPOSED SUBSTITUTION DOES NOT AFFECT DIMENSIONS SHOWN ON DRAWINGS. IF, IN FACT, IT DOES AFFECT DIMENSIONS, CONTRACTOR SHALL PROVIDE DRAWINGS SHOWING CHANGES TO DOCUMENTS.**

**2. THE UNDERSIGNED WILL PAY FOR CHANGES TO THE PROJECT, INCLUDING ENGINEERING, DESIGN, DETAILING, CONSTRUCTION COSTS, AND STATE APPROVAL COSTS (IF ANY) CAUSED BY THE REQUESTED SUBSTITUTION.**

**3. THE PROPOSED SUBSTITUTION WILL HAVE NO ADVERSE AFFECT ON OTHER TRADES, THE CONSTRUCTION SCHEDULE, OR SPECIFIED WARRANTY REQUIREMENTS.**

**4. MAINTENANCE AND SERVICE PARTS WILL BE LOCALLY AVAILABLE FOR THE PROPOSED SUBSTITUTION.**

**THE UNDERSIGNED FURTHER STATES THAT THE FUNCTIONS, APPEARANCE, AND QUALITY OF THE PROPOSED SUBSTITUTION ARE EQUIVALENT OR SUPERIOR TO THE SPECIFIED ITEMS.**

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**CONTRACTOR**



**END OF SECTION 01 6000**

**SECTION 01 7000**  
**EXECUTION AND CLOSEOUT REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Cutting and patching.
- C. Cleaning and protection.
- D. Starting of systems and equipment.
- E. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- F. General requirements for maintenance service.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.
- D. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.
- E. Section 01 5000 - Temporary Facilities and Controls: Temporary interior partitions.
- F. Section 01 5100 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.
- G. Section 01 7419 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- H. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- I. Section 02 4100 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.
- J. Section 07 8400 - Firestopping.

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Cutting and Patching: Submit written request in advance of cutting or alteration that 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 Owner or separate Contractor.

**1.04 COORDINATION**

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and

conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

## **PART 2 PRODUCTS**

### **2.01 PATCHING MATERIALS**

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

### **3.02 PREPARATION**

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

### **3.03 GENERAL INSTALLATION REQUIREMENTS**

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

### **3.04 CUTTING AND PATCHING**

- A. Whenever possible, execute the work by methods that avoid cutting or patching.

- B. Perform whatever cutting and patching is necessary to:
  1. Complete the work.
  2. Fit products together to integrate with other work.
  3. Provide openings for penetration of mechanical, electrical, and other services.
  4. Match work that has been cut to adjacent work.
  5. Repair areas adjacent to cuts to required condition.
  6. Repair new work damaged by subsequent work.
  7. Remove samples of installed work for testing when requested.
  8. Remove and replace defective and non-complying work.
- C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- F. Restore work with new products in accordance with requirements of Contract Documents.
- G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.
- I. Patching:
  1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
  2. Match color, texture, and appearance.
  3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

### **3.05 PROGRESS CLEANING**

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

### **3.06 PROTECTION OF INSTALLED WORK**

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

- G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

### **3.07 SYSTEM STARTUP**

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.
- E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

### **3.08 ADJUSTING**

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

### **3.09 FINAL CLEANING**

- A. Cleaning: Provide final cleaning of the Work at the time indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of work to the condition expected from a normal, commercial building cleaning and maintenance program. Comply with the manufacturer's instructions for operations.
- B. Owner will provide comprehensive cleaning after final acceptance.
- C. Execute final cleaning prior to final project assessment.
  - 1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
  - 2. Provide final cleaning including additional dusting, vacuuming, and mopping just prior to Owner move-in.
- D. Use cleaning materials that are nonhazardous.
- E. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- F. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- G. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- H. Clean filters of operating equipment.
- I. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems, and where else required.
- J. Clean site; sweep paved areas, rake clean landscaped surfaces.
- K. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.
- L. Clean Owner-occupied areas of work.

### **3.10 CLOSEOUT PROCEDURES**

- A. Make submittals that are required by governing or other authorities.
  - 1. Provide copies to Architect.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

- D. Prerequisites to Substantial Completion:
1. In the progress payment request that coincides with, or is the first request following, the date substantial completion is claimed, show either 100% completion for the portion of the Work claimed as "substantially complete", or list incomplete items, the value of incomplete work, and reasons for the Work being incomplete.
  2. Include supporting documentation for completion as indicated in these contract documents.
  3. Advise Owner of pending insurance change-over requirements.
  4. Deliver tools, spare parts, extra stock of material and similar physical items to the Owner, obtaining written verification from owner of delivery. Scan document in to PDF format and include with close out package.
  5. Make the final change-over of locks and transmit the keys to the Owner. Advise the Owner's personnel of the change-over in security provisions.
  6. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities and services from the project site, along with construction tools and facilities, mock-ups and similar elements.
  7. Complete final cleaning up requirements, including touch-up painting of marred surfaces.
  8. Inspection Procedure: Upon receipt of the Contractor's request for pre-final inspection, the Architect/Engineer will either proceed with inspection or advise the contractor of unfilled prerequisites.
    - a. Following the pre-final inspection, the Architect/Engineer will advise the Contractor of work which must be performed before the Certificate of Substantial Completion will be issued. The Architect/Engineer will repeat the inspection when requested and when assured in writing, that the Work has been substantially completed.
    - b. Results of the completed inspection will form the initial "punch-list for final acceptance.
- E. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- F. Owner will occupy all of the building as specified in Section 01 1000.
- G. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- H. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- I. Accompany Project Coordinator on Contractor's preliminary final inspection.
- J. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- K. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.
- L. Prerequisites to Final Acceptance: Complete the following before requesting the School District Inspector's (Project Inspector) final inspection for certification of final acceptance, and final payment as required by the General Conditions. List known exceptions, if any, in the request.
  1. Submit the final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required. (Hard copies required)
  2. Submit a certified copy of the Architect/Engineer's final punch-list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance and has been endorsed and dated by the Architect/Engineer.
  3. Submit Consent of Surety. (Hard copies required)

4. Submit a final liquidated damages settlement statement, acceptable to the Owner. (Hard copies required)
5. Submit evidence of final, continuing insurance coverage complying with insurance requirements. (Hard copies required)
6. Submit a signed statement to Architect, in PDF format, that to the best of his or her knowledge no ACBM was used as a building material in the building(s).
7. Re-inspection Procedure: The School District's Inspector (Project Inspector) will re-inspect the Work upon receipt of the Contractor's notice that the work, including punch-list items resulting from earlier inspections, has been completed, except for these items whose completion has been delayed because of circumstances that are acceptable to the School District's Inspector (Project Inspector).
  - a. Upon completion of re-inspection, the School District Inspector's (Project Inspector) will either prepare a certificate of final acceptance, or will advise the Contractor of work that is incomplete or of obligations that have not been fulfilled, but are required for final acceptance.
  - b. If necessary, the re-inspection procedure will be repeated and the Contractor will be back-charged by the Owner for the cost.

### **3.11 MAINTENANCE**

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

**END OF SECTION 01 7000**

## SECTION 01 7419

### CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

#### PART 1 GENERAL

##### 1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
  - 1. Aluminum and plastic beverage containers.
  - 2. Corrugated cardboard.
  - 3. Wood pallets.
  - 4. Clean dimensional wood.
  - 5. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 1000 - Site Clearing for use options.
  - 6. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill.
  - 7. Bricks: May be used on project if whole, or crushed and used as landscape cover, sub-base material, or fill.
  - 8. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
  - 9. Glass.
  - 10. Gypsum drywall and plaster.
  - 11. Plastic buckets.
  - 12. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (<http://flooring.dupont.com>) and Interface ([www.interfaceinc.com](http://www.interfaceinc.com)) conduct reclamation programs.
  - 13. Asphalt roofing shingles.
  - 14. Plastic sheeting.
  - 15. Rigid foam insulation.
  - 16. Windows, doors, and door hardware.
  - 17. Plumbing fixtures.
  - 18. Mechanical and electrical equipment.
  - 19. Fluorescent lamps (light bulbs).
  - 20. Acoustical ceiling tile and panels.
- E. The following recycling incentive programs are mandatory for this project; Contractor is responsible for implementation:
  - 1. \_\_\_\_\_: Revenue or savings shall accrue to Contractor.
- F. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
- G. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.
- H. The following sources may be useful in developing the Waste Management Plan:
  - 1. State Recycling Department, at \_\_\_\_\_.
- I. Methods of trash/waste disposal that are not acceptable are:
  - 1. Burning on the project site.
  - 2. Burying on the project site.



3. Dumping or burying on other property, public or private.
  4. Other illegal dumping or burying.
  5. Incineration, either on- or off-site.
- J. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

## **1.02 RELATED REQUIREMENTS**

- A. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. Section 01 5000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- C. Section 01 6000 - PRODUCTS AND SUBSTITUTIONS: Waste prevention requirements related to delivery, storage, and handling.
- D. Section 01 7000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.
- E. Section 31 1000 - Site Clearing: Handling and disposal of land clearing debris.

## **1.03 DEFINITIONS**

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

#### 1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Submit Waste Management Plan within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner; submit projection of all trash and waste that will require disposal and alternatives to landfilling.
- C. Waste Management Plan: Include the following information:
  - 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
  - 2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
  - 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
  - 4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
  - 5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
  - 6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
  - 7. Recycling Incentives: Describe procedures required to obtain credits, rebates, or similar incentives.
- D. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
  - 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
  - 2. Submit Report on a form acceptable to Owner.
  - 3. Landfill Disposal: Include the following information:
    - a. Identification of material.
    - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
    - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
    - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
  - 4. Recycled and Salvaged Materials: Include the following information for each:
    - a. Identification of material, including those retrieved by installer for use on other projects.
    - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
    - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
    - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
    - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
  - 5. Material Reused on Project: Include the following information for each:
    - a. Identification of material and how it was used in the project.
    - b. Amount, in tons or cubic yards.
    - c. Include weight tickets as evidence of quantity.

6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.
- E. Recycling Incentive Programs:
  1. Where revenue accrues to Contractor, submit copies of documentation required to qualify for incentive.
  2. Where revenue accrues to Owner, submit any additional documentation required by Owner in addition to information provided in periodic Waste Disposal Report.

## **PART 2 PRODUCTS**

### **2.01 PRODUCT SUBSTITUTIONS**

- A. See Section 01 6000 - Product Requirements for substitution submission procedures.
- B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 6000:
  1. Relative amount of waste produced, compared to specified product.
  2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Price.
  3. Proposed disposal method for waste product.
  4. Markets for recycled waste product.

## **PART 3 EXECUTION**

### **3.01 WASTE MANAGEMENT PROCEDURES**

- A. See Section 01 1000 for list of items to be salvaged from the existing building for relocation in project or for Owner.
- B. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- C. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.
- D. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.
- E. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

### **3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION**

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
  1. Prebid meeting.
  2. Preconstruction meeting.
  3. Regular job-site meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
  1. Provide containers as required.
  2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
  3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

### 3.03 SALVAGING DEMOLITION WASTE

### 3.04 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Receivers and Processors: *The General Contractor shall be responsible for coordinating all recycling receivers and processors for demolition and construction wastes throughout the course of the project.* List below is provided for information only; available recycling receivers and processors include, but are not limited to, the following:
  - Asphalt and Concrete:
    1. Granite Rock Concrete, 100 Graniterock Way, San Jose, CA 408.574.3000
    2. Reed & Graham, Inc., 690 Sunol, San Jose, CA 408.287.1400
    3. Raisch Products, 99 Pullman Way, San Jose, CA 408.227.9222
  - General Building Materials:
    4. Green Waste Recovery, 625 Charles St., San Jose, CA 408.283.4800
    5. Waste Management Office, 6175 South Front Road, Livermore, CA 925.447.1300
    6. BFI Waste Services of Salinas, 271 Rianda St., Salinas, CA 831.775.3840
- C. Recycling Incentives: Revenues, savings, rebates, and other incentives received for recycling waste materials shall **accrue to Contractor**.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
  1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.
  2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
  4. Store components off the ground and protect from the weather.
  5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

### 3.05 RECYCLING DEMOLITION WASTE

- A. Asphaltic Concrete Paving: Grind asphalt to maximum 1 ½" size.
  1. Crush asphaltic concrete paving and screen to comply with requirements in Division 31 Section "Earth Moving" for use as general fill.
- B. Asphaltic Concrete Paving: Break up asphalt to 4" size and transport paving to asphalt-recycling facility.
- C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
  1. Pulverize concrete to maximum 1-1/2" size.
  2. Crush concrete and screen to comply with requirements in Division 31 Section "Earth Moving" for use as satisfactory soil for fill or subbase.
- D. Concrete and Concrete Paving: Break up concrete to 4" size and transport to concrete recycling facility.

- E. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
  1. Pulverize broken masonry to maximum 4-inch size.
  2. Clean and stack undamaged, whole masonry units on wood pallets.
  3. Transport to masonry recycling facility.
- F. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- G. Metals: Separate metals by type.
  1. Structural Steel: Stack members according to size, type of member, and length.
  2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- H. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- I. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- J. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
  1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.
- K. Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
  1. Store clean, dry carpet in a closed container or trailer for a Carpet Reclamation Agency or carpet recycler.
- L. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- M. Plumbing Fixtures: Separate by type and size.
- N. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- O. Lighting Fixtures: Separate lamps by type and protect from breakage.
- P. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.
- Q. Conduit: Reduce conduit to straight lengths and store by type and size.

### **3.06 RECYCLING CONSTRUCTION WASTE**

- A. General: Contractor shall coordinate recycling of construction waste with product provider so that to the extent possible scrap materials, drop and clean cut-offs may be recycled through the product manufacturer and re-enter in the manufacturing process. When not possible, construction waste should go through a recycling facility, in lieu of entering the land fill.
- B. Packaging
  1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
  2. Polystyrene Packaging: Separate and bag materials.
  3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood (or use for storage of gyp. board noted below).
  4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- C. Site-Clearing Wastes: Chip brush, branches, and trees on-site and comply with the following:
  1. Remove chip brush, branches and trees to off site recycling facility.
  2. Comply with requirements in Division 32 Section "Plants" for use of chipped organic waste as organic mulch.

- D. Wood Materials:
  - 1. Stack large clean cut-offs of lumber, nail free, i.e. pieces of scrap, drop, etc. in dry location and remove to off -site recycling facility.
  - 2. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
  - 3. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
    - a. Comply with requirements in Division 32 Section "Plants." for use of clean sawdust as organic mulch.
- E. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.
  - 1. Coordinate with gypsum manufacturer to reclaim and recycle unused scraps or drop material so that it may be reused as at manufacturer's plant of origin or other recycling facility.
  - 2. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
    - a. Comply with requirements in Division 32 Section "Plants." for use of clean ground gypsum board as inorganic soil amendment.

### **3.07 DISPOSAL OF WASTE**

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill acceptable to authorities having jurisdiction.
  - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Burning of waste materials is not permitted.
- C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

**END OF SECTION 01 7419**

**SECTION 01 7800  
CLOSEOUT SUBMITTALS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Record Drawings.
- D. Warranties and bonds.

**1.02 RELATED REQUIREMENTS**

- A. Section 00 7200 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.
- D. Individual Product Sections: Specific requirements for operation and maintenance data.
- E. Individual Product Sections: Warranties required for specific products or Work.

**1.03 DESCRIPTION OF REQUIREMENTS**

- A. Definitions: Project closeout is the term used to describe certain collective project requirements, indicating completion of the work, that are to be fulfilled near the end of the contract time in preparation for final payment to the Contractor and the normal termination of the Contract.
- B. Specific requirements for individual units of work are included in the appropriate sections in Divisions 2 through 14.
- C. Time of closeout is directly related to "Substantial Completion"; therefore, the time of closeout may be either a single time period for the entire Work or a series of time periods for individual elements of the Work that have been certified as substantially complete at different dates. This time variation, if any, shall be applicable to the other provisions of this section.

**1.04 SUBMITTALS**

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
  - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
  - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
  - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
  - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
  - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
  - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
  - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

## **PART 2 PRODUCTS - NOT USED**

## **PART 3 EXECUTION**

### **3.01 PROJECT RECORD DOCUMENTS**

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
  - 5. Reviewed shop drawings, product data, and samples.
  - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
  - 1. Manufacturer's name and product model and number.
  - 2. Product substitutions or alternates utilized.
  - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
  - 1. Measured depths of foundations in relation to finish first floor datum.
  - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  - 4. Field changes of dimension and detail.
  - 5. Details not on original Contract drawings.

### **3.02 OPERATION AND MAINTENANCE DATA**

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

### **3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES**

- A. For Each Product, Applied Material, and Finish:
  - 1. Product data, with catalog number, size, composition, and color and texture designations.
  - 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.



- E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

### **3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS**

- A. For Each Item of Equipment and Each System:
  - 1. Description of unit or system, and component parts.
  - 2. Identify function, normal operating characteristics, and limiting conditions.
  - 3. Include performance curves, with engineering data and tests.
  - 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- D. Include color coded wiring diagrams as installed.
- E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- G. Provide servicing and lubrication schedule, and list of lubricants required.
- H. Include manufacturer's printed operation and maintenance instructions.
- I. Include sequence of operation by controls manufacturer.
- J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- K. Provide control diagrams by controls manufacturer as installed.
- L. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- M. Include test and balancing reports.
- N. Additional Requirements: As specified in individual product specification sections.

### **3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS**

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- D. Maintenance Manuals Media Disks: Organize operating and maintenance data into electronic media. Scan all manuals or provide manufacturer's provided pdf copies of manuals. Organize by CSI Masterformat 2004 Division and specification number and place in appropriate named folder
- E. Prepare data in the form of an instructional manual.
  - 1. PROJECT NAME, Year of completion
  - 2. Client Name
  - 3. Disk Content: i.e. As-Built Drawings, Operation and Maintenance Manuals, Submittals, etc.
  - 4. Close Out Disk \_\_\_ of \_\_\_

- F. Provide type written labeled CD jackets for each CD.
- G. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- H. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- I. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- J. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- K. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
- L. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- M. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
- N. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
  - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
  - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
    - a. Significant design criteria.
    - b. List of equipment.
    - c. Parts list for each component.
    - d. Operating instructions.
    - e. Maintenance instructions for equipment and systems.
    - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
  - 3. Part 3: Project documents and certificates, including the following:
    - a. Shop drawings and product data.
    - b. Air and water balance reports.
    - c. Certificates.
    - d. Photocopies of warranties and bonds.
- O. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.
- P. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

### **3.06 RECORD DRAWINGS**

- A. Electronic Media: At the completion of Project, Contractor shall affix an "AS-BUILT" stamp on each sheet and include their company name stamp with signatures on each sheet of "AS-BUILT" document. Contractor shall have all drawings scanned into electronic format. Submit to the Architect electronic media with drawings in .pdf format showing all deviations from original drawings clearly indicated.
- B. Note related change-order numbers where applicable.
- C. Each drawing shall be a separate file and shall be named individually by the actual drawing sheet name. Example: "T1- Title Sheet" Files named by default sequential scan number will be

rejected. Organize record drawing sheets into discipline by folder, separating by chapter as necessary.

- D. Miscellaneous Record Submittals: Refer to other Sections of these Specifications for requirements of miscellaneous record- keeping and submittals in connection with the actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified scanned and filed, ready for continued use and reference. Submit to the Architect/ Engineer for the Owner's records.

### **3.07 WARRANTIES AND BONDS**

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

**END OF SECTION 01 7800**

**SECTION 02 41 00 – SITE DEMOLITION**

**PART 1 – GENERAL**

**1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS**

- A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 015000, Construction Facilities and Temporary Controls.
- B. Section 310000, Earthwork.

**1.03 REGULATORY REQUIREMENTS**

- A. Conform to applicable jurisdictional authority regulations and codes for disposal of debris.
- B. Coordinate clearing Work with utility companies.
- C. Maintain emergency access ways at all times.
- D. Contractor shall comply with all applicable laws and ordinances regarding hazardous materials, including contaminated soils, hazardous material transformers, and similar materials or components.

**1.04 SUBMITTALS:**

- A. Schedule: Submit a detailed sequence of demolition and removal work, including dates for shutoff, capping, and continuance of utility services.
- B. Procedures: Submit written procedures documenting the proposed methods to be used to control dust and noise.

**1.05 EXISTING CONDITIONS**

- A. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.
- B. Conduct demolition to minimize interference with adjacent structures or items to remain. Maintain protected egress and access at all times.

**1.06 PROTECTION**

- A. Adequate protection measures shall be provided to protect workmen and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations.
- B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.
- C. Safety Precautions Prevent damage to existing elements identified to remain or to be salvaged, and prevent injury to the public and workmen engaged on site. Demolish roofs, walls and other building elements in such manner that demolished materials fall within foundation lines of building. Do not allow demolition debris to accumulate on site. Pull down hazardous work at end of each day; do not leave standing or hanging overnight or over weekends.
- D. Protect existing items which are not indicated to be altered.
  - 1. Protect utilities designated to remain from damage.
  - 2. Protect trees, plant growth, and features designated to remain as final landscaping as shown on drawings.

3. Protect bench marks from damage or displacement.
- E. Trees: Carefully protect existing trees that are to remain. Provide temporary irrigation as necessary to maintain health of trees.
- F. Fire Safety: The contractor shall conform to chapter 33 of the California Fire Code (CFC), "Fire Safety During Construction and Demolition", at all times during the construction process. A copy of this chapter can be provided.
- G. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.
- H. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The contractor shall make a reasonable effort on a daily basis to keep all excavations and the site free from water during entire progress of work, regardless of cause, source, or nature of water.
- I. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.
- J. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance. Dust control measures shall be in accordance with the local jurisdiction.

## **PART 2 - PRODUCTS**

**Not Used**

## **PART 3 – EXECUTION**

### **3.01 EXAMINATION**

- A. Examine conditions of work in place before beginning work; report defects.
- B. Report existence of hazardous materials or unsafe structural conditions.

### **3.02 PREPARATION**

- A. Scheduling:
  1. General: Coordinate and schedule demolition work as required by the Owner and as necessary to facilitate construction progress.
- B. Hazardous Materials:
  1. General: Identify chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations, and notify such jurisdictional agencies as may be required. Collect and legally dispose of such materials at official disposal locations away from the site.
  2. Asbestos: If asbestos or materials containing asbestos are encountered, stop work immediately and contact the Owner. Do not proceed with demolition until directed by Owner.
- C. Utility and Service Termination
  1. Locate and identify existing utility, service and irrigation system components affected by work of this contract. Review existing record drawings, conduct site investigations, contact Underground Service Alert and other qualified cable/pipe/line locator services, and implement all other means necessary to define the location of underground systems.
  2. Prior to beginning any demolition, properly disconnect all water, gas and electrical power supply at appropriate disconnect locations. Obtain all necessary releases and approvals from serving utility companies.
  3. Prior to demolition or disconnect, obtain Owners approval that such system does not impact facilities or systems beyond the extent of this contract.

4. Mark location of disconnected systems. Identify and indicate stub-out locations on Project Record Documents.
- D. Verify that existing plant life and features designated to remain are tagged or identified.
  1. The Architect will mark the features, trees, and shrubs to remain within the construction area. Contractor shall not commence clearing and grubbing operations until authorized by the Owner and all protective measures are in place.
- E. Coordinate the time and duration of all system disconnects with Owner.

### **3.03 DEMOLITION**

- A. General Requirements
  1. Clear areas required for access to site and execution of Work, including pavements, structures, foundations, vegetation, trash and debris.
  2. Coordinate with Owner the time of day and route to remove demolished materials from premises.
  3. Remove demolished materials from site as work progresses. Upon completion of work, leave areas of work in clean condition.
  4. Remove all buried debris, rubble, trash, or other material not deemed suitable by the Geotechnical Engineer.
  5. Fill all voids or excavations resulting from clearing, demolition, or removal of vegetation with specified fill material.
- B. Fixture and Equipment Removal:
  1. Remove existing fixtures and equipment as identified and shown on drawings and required by Architect.
  2. Verify all service connections to fixtures and equipment designated for removal have been properly disconnected.
  3. Remove all conductors from conduit at all abandoned circuits.

### **3.04 UTILITY AND BUILDING SERVICES REMOVAL AND RE-INSTALLATION**

- A. Where crossing paths and potential points of interference with existing utility services are shown or can be reasonably inferred from surface conditions or evidence of subsurface systems, such as meter boxes, vaults, relief vents, cleanouts and similar components.
  1. Review all contract documents showing crossing paths and potential points of interference.
  2. Pot-hole or determine by other means the accurate depth and location of such utilities.
  3. Incorporate all costs required to complete work under this contract, including additional trenching, re-routing of existing and new utilities, and all means necessary to construct work under this contract.
  4. No additional cost to the Owner will be allowed for work necessary to accommodate utility conflicts where such crossing paths are shown on contract drawings or can be reasonably inferred from surface conditions or components.
- B. Remove all conductors from conduit at all abandoned electrical circuits.
- C. Seal off ends of all piping, drains and other components as directed by Architect and serving utility.
- D. Where necessary to maintain service to existing utility and building systems, relocate or redirect all conduit and conductors, piping, drains, and associated system components.
  1. Re-circuit all electrical as required.
  2. Re-circuit all landscape irrigation valving and control systems as required.
  3. Temporarily terminate landscape system components in approved boxes or with approved caps, suitable for re-connection or extension.

4. Extend or otherwise modify all site drainage systems, including catch basins, drain inlets and piping. Fine grade to maintain proper drainage flow pattern to drains.
- E. Demolish structure in an orderly and careful manner.
  1. Use of explosives prohibited.

### **3.05 SITE PAVEMENT REMOVAL**

- A. Remove sidewalk and curb where required for new construction as specified and as indicated on the Drawings.
  1. Remove all paving by saw-cutting.
  2. Remove concrete paving and curbing at locations shown on drawings. Locate closest adjacent expansion or weakened plane joint to define start of removal or saw-cutting.
- B. Remove asphalt concrete paving areas where required for new construction as specified and as indicated on the Drawings.
  1. Remove all paving by saw-cutting.
  2. Remove paving assembly as required to expose subgrade.

### **3.06 LANDSCAPE AND IRRIGATION SYSTEMS DEMOLITION AND RENOVATION**

- A. Clearing, grubbing, and planting demolition.
  1. Remove grass and grass roots to a minimum depth of two inches below existing grade.
  2. Remove all shrubs, plants and other vegetation within the area of the work unless designated to remain. Grub and remove all roots of all vegetation to a depth of 24 inches below existing grade.
  3. Remove only those trees which are specifically designated for removal, or as shown on the drawings, within the construction area. Remove all stumps. Remove root ball and root systems larger than 1 inch in diameter to a depth of two feet below existing or finished grades, whichever is lower and a minimum of five feet beyond the edge of paving, structure, wall or walkway.
  4. Hand cut existing tree roots over 1 inch in diameter as necessary for trenching or other new construction, apply multiple coats of emulsified asphalt sealant especially made for horticultural use on cut or damaged plant tissues to cut faces and adjacent surfaces. Cover exposed roots with wet burlap to prevent roots from dying out until backfilling is complete.
  5. Disking and mixing of vegetation, trash, debris, and other deleterious materials with surface soils prior to grading is not permitted.
  6. Remove all buried debris, organic material, rubble, trash, or other material not deemed suitable by the Geotechnical Engineer.
  7. Fill all voids or excavations resulting from clearing, demolition, or removal of vegetation with fill material in compliance with Section 310000.
  8. Selected equipment of such sizes and capacities that the existing environment is disturbed as little as possible, and to afford ease of mobility within limited and relatively confined work areas. Make every effort to preserve the topography in its natural state.
  9. Keep drains, catch basins, surface drainage courses and related drainage system components clear of debris and construction materials.
  10. Remove irrigation piping and appurtenances as necessary within area of work, unless noted otherwise to remain. Replace irrigation piping and appurtenances to irrigate new and/or existing landscaping. Contractor shall be responsible for temporary landscape irrigation until such time that irrigation system is restored and operational.

**3.07 DISPOSAL**

Demolished materials become property of the Contractor and shall be removed from premises, except those items specifically listed to be retained by Owner.

- A. Dispose of all demolished material, trash, debris, and other materials not used in the work in accordance with the regulations of jurisdictional authority.
- B. Burning and Burying of Materials: NOT ALLOWED.
- C. Haul Routes:
  - 1. Obtain permits as required by jurisdictional agencies. Establish haul routes in advance; post flagmen for the safety of the public and workmen.
  - 2. Keep streets free of mud, rubbish, etc.; assume responsibility for damage resulting from hauling operations; hold Owner free of liability in connection therewith.
- D. Remove demolished materials and debris from site on a daily basis.

**3.08 CLEANING**

- A. Upon completion of work of this Section promptly remove from the working area all scraps, debris.
- B. Clean excess material from surface of all remaining paved surfaces and utility structures.
- C. Power wash all concrete surfaces to remove stains, dried mud, tire marks, and rust spots.

END OF SECTION



**SECTION 02 4113**  
**SELECTIVE STRUCTURE DEMOLITION**

**PART 1 - GENERAL:**

**1.01 RELATED DOCUMENTS:**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Refer to Division 1 for Construction Waste Management and Disposal.

**1.02 DESCRIPTION OF WORK:**

- A. Extent of selective demolition work is indicated on drawings.
- B. Types of Selective Demolition Work: Demolition requires the selective removal and subsequent salvage or offsite disposal of the following:
  - 1. Removal of portions of building structure, as required, to accommodate new construction.
  - 2. Removal of interior partitions as indicated on drawings.
  - 3. Removal of doors and frames indicated "remove".
  - 4. Removal of built-in casework indicated "remove".
  - 5. Removal of existing windows indicated "remove".
  - 6. Removal and protection of existing fixtures and equipment items indicated "salvage".
  - 7. Removal of fixtures, finishes, appliances, etc., indicated "remove".
- C. Removal Work Specified Elsewhere:
  - 1. Roofing see Section 07 51 00.
  - 2. Cutting non-structural floors and walls for piping, ducts, and conduit is included with the work of the respective mechanical and electrical Divisions 21 through 28 specification sections.
  - 3. Cutting holes in roof deck and complete installation of new rooftop equipment is specified in Division 23 sections.
- D. Related Work Specified Elsewhere:
  - 1. Remodeling construction work and patching is included within the respective sections of specifications, including removal of materials for re-use and incorporated into remodeling or new construction.
  - 2. Relocation of pipes, conduits, ducts, other mechanical and electrical work are specified in Divisions 21 through 28.

**1.03 SUBMITTALS:**

- A. Schedule: Submit schedule indicating proposed methods and sequence of operations for selective demolition work to Owner's Representative for review prior to commencement of work. Include coordination of shut-off, capping, and continuation of utility services as required, together with details for dust and noise control protection.
- B. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
- C. Coordinate with Owner's continuing occupation of portions of existing building, with Owner's partial occupancy of completed new addition, and with Owner's reduced usage during summer months.
- D. Coordinate submittal with Division 1 Construction Waste Management and Disposal for construction and demolition waste.

**1.04 JOB CONDITIONS:**

- A. Occupancy: Owner will be continuously occupying areas of the building immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner of demolition activities which will severely impact Owner's normal operations.

- B. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished.
  - 1. Owner will remove and salvage selected elements from the area of work prior to start of demolition or during progress of work. Elements so affected will be clearly marked/identified and are to be excluded from work.
  - 2. Conditions existing at time of commencement of contract will be maintained by Owner insofar as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.
- C. Partial Demolition and Removal: Items indicated to be removed but of salvable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.
  - 1. Storage or sale of removed items on site will not be permitted.
- D. Protections: Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective demolition work.
  - 1. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to and from occupied portions of building.
  - 2. Erect temporary covered passageways as required by authorities having jurisdiction.
  - 3. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished, and adjacent facilities or work to remain.
  - 4. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.
  - 5. Protect floors with suitable coverings when necessary.
  - 6. Construct temporary insulated solid dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks as required.
  - 7. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces, and installation of new construction to insure that no water leakage or damage occurs to structure or interior areas of existing building.
  - 8. Remove protections at completion of work.
- E. Damages: Promptly repair damages caused to adjacent surfaces by demolition work at no cost to Owner. Restore damaged finishes to match adjacent undamaged work.
- F. Traffic: Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
- G. Explosives: Use of explosives will not be permitted.
- H. Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.
  - 1. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, acceptable to governing authorities.
- I. Environmental Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.
  - 1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

**PART 2 - PRODUCTS (NOT APPLICABLE).**

**PART 3 - EXECUTION**

**3.01 INSPECTION:**

- A. Prior to commencement of selective demolition work, inspect areas in which work will be performed. Photograph existing conditions to structure surfaces, equipment or to surrounding

properties which could be misconstrued as damage resulting from selective demolition work; file with Owner's Representative prior to starting work.

- B. Permits: Where applicable, Contractors shall give all notices to governmental agencies, obtain all required permits, arrange for agency inspections and pay all associated fees related to legally mandated environmental protection regulations.

### 3.02 PREPARATION:

- A. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.
- B. Cease operations and notify the Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.
- C. Cover and protect furniture, equipment and fixtures to remain from soiling or damage when demolition work is performed in rooms or areas from which such items have not been removed.
- D. Erect and maintain dust-proof partitions and closures as required to prevent spread of dust or fumes to occupied portions of the building.
- E. Where selective demolition occurs immediately adjacent to occupied portions of the building, construct dust-proof partitions of minimum 4" studs, 5/8" drywall (joints taped) on occupied side, 1/2" fire-retardant plywood on demolition side, and fill partition cavity with sound-deadening insulation.
- F. Provide weatherproof closures for exterior openings resulting from demolition work.
- G. Locate, identify, stub off and disconnect utility services that are not indicated to remain.
- H. Provide by-pass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of 72 hours advance notice to Owner if shut- down of service is necessary during change-over.

### 3.03 DEMOLITION:

- A. Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.
- B. **Perform all selective demolition work necessary for installation of new work, including but not limited to, removal of walls, foundations, electrical, ductwork, plumbing, roofing, finishes, etc.**
- C. For renovation work remove existing door hardware indicated to be replaced by new hardware as shown in the door and hardware schedules.
- D. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.
- E. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors or framing.
- F. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.
- G. Demolish foundation walls to a depth as indicated but not less than 12" below existing ground surface. Demolish and remove below-grade wood or metal construction. Break up below-grade concrete slabs.
- H. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions. Use power saw where possible.
- I. Completely fill below-grade areas and voids resulting from demolition work. Provide fill consisting of approved fill material, gravel or sand, free of trash and debris, stones over 6" diameter, roots or other organic matter. See Division 31 for compaction requirements.

- J. Remove existing door hardware for new door hardware designated on opening and hardware schedules.
- K. If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's Representative in written, accurate detail. Pending receipt of directive from Owner's Representative rearrange selective demolition schedule as necessary to continue overall job progress without delay.
- L. Remove all unused or abandoned (E) electrical, mechanical and plumbing systems in entirety to source. Remove all conduits, conductors, boxes, etc. Patch, repair and paint to match adjacent surfaces.
- M. Remove and dispose of demolished materials per specifications section Division 1- Construction Waste Management and Disposal.

**3.04 SALVAGE MATERIALS:**

- A. Salvage Items: Where indicated on Drawings as "Salvage Deliver to Owner", carefully remove indicated items, clean, store, and turn over to Owner and obtain receipt.
- B. Historic artifacts: including cornerstones and their contents, commemorative plaques and tablets, antiques, and other articles of historic significance remain the property of the Owner. Notify Owner's representative if such items are encountered and obtain acceptance regarding method of removal and salvage for Owner.
- C. Carefully remove, clean, and deliver to Owner the following items:

**3.05 DISPOSAL OF DEMOLISHED MATERIALS:**

- A. Remove debris, rubbish and other materials resulting from demolition operations from building site per Division 1 Construction Waste Management and Disposal.
- B. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution.
- C. Burning of removed materials is not permitted on project site.

**3.06 CLEAN-UP AND REPAIR:**

- A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.
- B. Repair all surfaces to match existing surfaces of doors and frames at removed hardware conditions left evident after new hardware installations.
- C. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work. All grass and lawn areas altered or destroyed due to construction work shall be replaced with sod of similar grass type as existing adjacent grasses. Contractor shall ensure lawn is level and returned to its original condition to the satisfaction of the architect.
- D. Repair all surfaces to match existing adjacent surfaces where existing system has been removed and left evident after new system installation, i.e. ducts, louvers, conduits, etc.

**3.07 PROJECT CLOSE-OUT: (NOT APPLICABLE)**

**END OF SECTION 02 4113**

**SECTION 03 0500  
CONCRETE SEALER**

**PART 1 GENERAL**

**PART 2 PRODUCTS**

**2.01 MANUFACTURER**

- A. Basis of Design: W. R. MEADOWS, INC., PO Box 338, Hampshire, Illinois 60140-0338. (800) 342-5976. (847) 683-4500. Fax (847) 683-4544. Website www.wrmeadows.com.

**2.02 MATERIALS**

- A. Performance: Water-based acrylic curing and sealing compound shall be a non-yellowing, clear, acrylic curing and sealing compound meeting the following requirements:
1. ASTM C 309, Type 1, Class B
  2. AASHTO M 148, Type 1, Class B
  3. ASTM C 1315, Class A, Section 6.4.1 – non-yellowing
  4. ASTM C 1315, Section 6.6 – exceed 50 MPa (70 psi) adhesion requirements
- B. Basis of Design:
1. VOCOMP-25, by W. R. Meadows, Inc.
  2. Or approved Equal

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Examine surfaces to receive curing and sealing compound. Notify architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

**3.02 SURFACE PREPARATION**

- A. Protect adjacent surfaces not designated to receive curing and sealing compound.
- B. Clean and prepare surfaces to receive curing and sealing compound in accordance with
- C. Ensure concrete surface is clean and dry, with all stains, oil, grease, dust, and dirt removed.
- D. Remove all mastic and/or blemishes by means of bead blasting, diamond cutting, etc. or other mechanical means to provide a clean substrate for installation of new exposed concrete finish. Contractor shall mechanically clean the entire area or room for an even and monolithic finish.
- E. Concrete surface water should be dissipated when used on new concrete.
- F. Concrete surfaces should not be marred by walking workers.

**3.03 APPLICATION**

- A. Apply curing and sealing compound in accordance with manufacturer's instructions.
- B. Ensure product is mixed for optimum performance. Avoid aggressive mixing as foaming may occur.
- C. Use an industrial sprayer with a 5916 tip that produces a flow rate of 1/10 of one gallon per minute.
- D. Alternatively apply using a lint-free roller or lamb's wool roller.
- E. Avoid puddling in low areas.

**3.04 PROTECTION**

- A. Restrict foot traffic for at least four hours; 12 hours is preferable.
- B. Provide protection for finished surface throughout construction duration.
- C. **As necessary, prior to owner taking occupancy, clean and reapply coating to bring final surface to a semi-gloss finish.**

**END OF SECTION 03 0500**



**SECTION 03 0516**  
**UNDERSLAB VAPOR BARRIER**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Sheet vapor barrier under concrete slabs on grade.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 1000 - Concrete Forming and Accessories: Forms and accessories for formwork.
- B. Section 03 2000 - Concrete Reinforcing.
- C. Section 03 3000 - Cast-in-Place Concrete: Preparation of subgrade, granular fill, placement of concrete.

**1.03 REFERENCE STANDARDS**

- A. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011.
- B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products.
- C. Test Data: Submit report of tests showing compliance with specified requirements.
- D. Samples: Submit samples of underslab vapor barrier to be used.
- E. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Underslab Vapor Barrier:
  - 1. Water Vapor Permeance: Not more than 0.010 perms, maximum.
  - 2. Complying with ASTM E1745 Class A.
  - 3. Thickness: 15 mils.
  - 4. Basis of Design:
    - a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil):  
[www.stegoindustries.com/#sle](http://www.stegoindustries.com/#sle).
    - b. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

**3.02 INSTALLATION**

- A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.
- B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.
- C. Lap joints minimum 6 inches.
- D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

- E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.
- F. Repair damaged vapor retarder before covering with other materials.

**END OF SECTION 03 0516**



**SECTION 03 1000  
CONCRETE FORMING AND ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 2000 - Concrete Reinforcing.
- B. Section 03 3000 - Cast-in-Place Concrete.
- C. Section 05 1200 - Structural Steel Framing: Placement of embedded steel anchors and plates in cast-in-place concrete.

**1.03 REFERENCE STANDARDS**

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2015.
- B. ACI 301 - Specifications for Structural Concrete; 2016.
- C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014.
- D. ACI 347R - Guide to Formwork for Concrete; 2014.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on void form materials and installation requirements.
- C. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.

**PART 2 PRODUCTS**

**2.01 FORMWORK - GENERAL**

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
- B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.
- C. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.
- D. Comply with relevant portions of ACI 347R, ACI 301, and ACI 318.

**2.02 WOOD FORM MATERIALS**

- A. Softwood Plywood: PS 1, C Grade, Group 2.

**2.03 FORMWORK ACCESSORIES**

- A. Form Ties: Removable type, galvanized metal, fixed length, cone type, with waterproofing washer, \_\_\_\_ inch back break dimension, free of defects that could leave holes larger than 1 inch in concrete surface. Provide \_\_\_\_\_ manufactured by \_\_\_\_\_.
- B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
  - 1. Composition: Colorless reactive, mineral oil-based, soy-based, or vegetable-oil based compound.
  - 2. Do not use materials containing diesel oil or petroleum-based compounds.

3. VOC Content: None; water-based.
4. Products:
  - a. SpecChem, LLC; Bio Strip WB (water-based): [www.specchemllc.com/#sle](http://www.specchemllc.com/#sle).
  - b. W. R. Meadows, Inc; Duogard: [www.wrmeadows.com/#sle](http://www.wrmeadows.com/#sle).
  - c. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- C. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- D. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 1200.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

### **3.02 ERECTION - FORMWORK**

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Coordinate this section with other sections of work that require attachment of components to formwork.
- F. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect before proceeding.

### **3.03 APPLICATION - FORM RELEASE AGENT**

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

### **3.04 INSERTS, EMBEDDED PARTS, AND OPENINGS**

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items that will be cast directly into concrete.
- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
- D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

### **3.05 FORMWORK TOLERANCES**

- A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.

### **3.06 FIELD QUALITY CONTROL**

- A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

### **3.07 FORM REMOVAL**

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

**END OF SECTION 03 1000**

**SECTION 03 2000  
CONCRETE REINFORCING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Reinforcing steel for cast-in-place concrete.
- B. Supports and accessories for steel reinforcement.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 1000 - Concrete Forming and Accessories.
- B. Section 03 3000 - Cast-in-Place Concrete.

**1.03 REFERENCE STANDARDS**

- A. ACI 301 - Specifications for Structural Concrete; Latest Edition.
- B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; Latest Edition.
- C. ACI SP-66 - ACI Detailing Manual; 2004.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
- F. CRSI (DA4) - Manual of Standard Practice; Latest Edition.
- G. CRSI (P1) - Placing Reinforcing Bars; Latest Edition.
- H. CCR California Code of Regulations: Title 24, 2016 – California Building Code (CBC)

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
- C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.
- D. Reports: Submit certified copies of mill test report of reinforcement materials analysis.

**1.05 QUALITY ASSURANCE**

- A. Perform work of this section in accordance with ACI 301.
  - 1. Maintain one copy of each document on project site.

**PART 2 PRODUCTS**

**2.01 REINFORCEMENT**

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) for #4 Bars and larger (ASTM A615, Grade 40 (40,000 psi) for #3 Bars.
  - 1. Plain billet-steel bars.
  - 2. Unfinished.
- B. Steel Welded Wire Reinforcement (WWR): Galvanized, deformed type; ASTM A1064/A1064M.
  - 1. Form: Flat Sheets.
- C. Reinforcement Accessories:
  - 1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
  - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

## **2.02 FABRICATION**

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
- B. Welding of reinforcement is not permitted.
- C. Locate reinforcing splices not indicated on drawings at point of minimum stress.
  - 1. Review locations of splices with Architect.

## **PART 3 EXECUTION**

### **3.01 PLACEMENT**

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor barrier.
- C. Accommodate placement of formed openings.
- D. Comply with applicable code for concrete cover over reinforcement.

**END OF SECTION 03 2000**

**SECTION 03 3000  
CAST-IN-PLACE CONCRETE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Floors and slabs on grade.
- B. Concrete shear walls, elevator shaft walls, and foundation walls.
- C. Miscellaneous concrete elements, including equipment pads, equipment pits, light pole bases, flagpole bases, thrust blocks, and manholes.
- D. Concrete curing.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 1000 - Concrete Forming and Accessories: Forms and accessories for formwork.
- B. Section 03 2000 - Concrete Reinforcing.
- C. Section 07 9200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.
- D. Section 31 3116 - Termite Control: Field-applied termiticide and mildewcide for concrete surfaces.

**1.03 REFERENCE STANDARDS**

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; Latest Edition.
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- C. ACI 301 - Specifications for Structural Concrete; Latest Edition.
- D. ACI 302.1R - Guide for Concrete Floor and Slab Construction; 2004 (Errata 2007).
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.
- F. ACI 305R - Hot Weather Concreting; 2010.
- G. ACI 306R - Cold Weather Concreting; 2010.
- H. ACI 308R - Guide to Curing Concrete; 2001 (Reapproved 2008).
- I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; Latest Edition.
- J. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.
- K. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.
- L. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.
- M. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.
- N. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.
- O. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.
- P. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.
- Q. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2007.
- R. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2014.
- S. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

- T. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
- U. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.
- V. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.
- W. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2014.
- X. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures; 2010.
- Y. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013.
- Z. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.
- AA. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2014.
- AB. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2014.
- AC. ASTM D994/D994M - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type); 2011.
- AD. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.
- AE. ASTM E1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 1996 (Reapproved 2008).
- AF. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- AG. COE CRD-C 48 - Method of Test for Water Permeability of Concrete; 1992.
- AH. CCR California Code of Regulations: Title 24, 2016 – California Building Code (CBC)

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
  - 1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
- C. Mix Design: Submit proposed concrete mix design.
  - 1. Indicate proposed mix design complies with requirements of ACI 301, **Section 4 - Concrete Mixtures**.
  - 2. Indicate proposed mix design complies with requirements of ACI 318, **Chapter 5 - Concrete Quality, Mixing and Placing**.
  - 3. Indicate proposed mix design complies with fiber reinforcing manufacturer's written recommendations.
- D. Test Reports: Submit report for each test or series of tests specified.

#### **1.05 QUALITY ASSURANCE**

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.

#### **1.06 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

## **PART 2 PRODUCTS**

### **2.01 REINFORCEMENT MATERIALS**

- A. Comply with requirements of Section 03 2000.

### **2.02 CONCRETE MATERIALS**

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
  - 1. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
  - 1. Acquire aggregates for entire project from same source.
- C. Fly Ash: ASTM C618, Class C or F.
- D. Calcined Pozzolan: ASTM C618, Class N.
- E. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.
- F. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

### **2.03 ADMIXTURES**

- A. Chemical Admixture Manufacturers:
- B. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- C. Air Entrainment Admixture: ASTM C260/C260M.
- D. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- E. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
- F. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
- G. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
- H. Accelerating Admixture: ASTM C494/C494M Type C.
- I. Retarding Admixture: ASTM C494/C494M Type B.
- J. Water Reducing Admixture: ASTM C494/C494M Type A.

### **2.04 ACCESSORY MATERIALS**

- A. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
  - 1. Grout: Comply with ASTM C1107/C1107M.
  - 2. Height Change, Plastic State; when tested in accordance with ASTM C827/C827M:
    - a. Maximum: Plus 4 percent.
    - b. Minimum: Plus 1 percent.
  - 3. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch.
  - 4. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch.
  - 5. Products containing aluminum powder are not permitted.

### **2.05 CURING MATERIALS**

- A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
  - 1. Manufacturers:
    - a. Dayton Superior Corporation; AquaFilm Concentrate J74:  
[www.daytonsuperior.com/#sle](http://www.daytonsuperior.com/#sle).
    - b. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
  - 1. Product dissipates within 4 to 6 weeks.



2. Manufacturers:
  - a. Dayton Superior Corporation; Resin Cure with Dye J11WD:  
www.daytonsuperior.com/#sle.
  - b. Dayton Superior Corporation; Clear Cure VOC J7WB:  
www.daytonsuperior.com/#sle.
  - c. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- C. Curing Agent, Water Replacement Type: Clear, water based, liquid water cure replacement agent complying with ASTM C309 standards for water retention, and with ACI 302.1R.
  1. Manufacturers:
    - a. Sinak Corporation; The CURE™WCE: www.sinak.com/#sle.
    - b. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- D. Moisture-Retaining Sheet: ASTM C171.
  1. Curing paper, regular.
  2. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.
  3. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.
- E. Polyethylene Film: ASTM D2103, 4 mil, 0.004 inch thick, clear.
- F. Water: Potable, not detrimental to concrete.

## **2.06 CONCRETE MIX DESIGN**

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
  1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- D. Normal Weight Concrete:
  1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: shall be per the Concrete Notes on the Structural Drawings.
  2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
  3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
  4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
  5. Water-Cement Ratio: shall be per the Concrete Notes on the Structural Drawings.
  6. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
  7. Maximum Slump: 4 inches.
  8. Maximum Aggregate Size: shall be per the Concrete Notes on the Structural Drawings.

## **2.07 MIXING**

- A. Transit Mixers: Comply with ASTM C94/C94M.
- B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

### **3.02 PREPARATION**

- A. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

### **3.03 PLACING CONCRETE**

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

### **3.04 SLAB JOINTING**

- A. Locate joints as indicated on drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

### **3.05 FLOOR FLATNESS AND LEVELNESS TOLERANCES**

- A. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
  1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15, on-grade only.
  2. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25, on-grade only.
- B. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155 (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.
- C. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.
- D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

### **3.06 CONCRETE FINISHING**

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
  1. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
- D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
  1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
  2. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

### **3.07 CURING AND PROTECTION**

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Surfaces Not in Contact with Forms:
  1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.

2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
  - a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.
  - b. Spraying: Spray water over floor slab areas and maintain wet.
  - c. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.
3. Final Curing: Begin after initial curing but before surface is dry.
  - a. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges.
  - b. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

### **3.08 FIELD QUALITY CONTROL**

- A. Provide free access to concrete operations at project site and cooperate with appointed firm.
- B. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- C. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- D. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
- E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

### **3.09 DEFECTIVE CONCRETE**

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

### **3.10 PROTECTION**

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

**END OF SECTION 03 3000**

**SECTION 05 5000**  
**METAL FABRICATIONS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Shop fabricated steel items.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 05 5213 - Pipe and Tube Railings.
- C. Section 09 9113 - Exterior Painting: Paint finish.

**1.03 REFERENCE STANDARDS**

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
- E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.
- G. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.
- H. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.
- I. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.
- J. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- K. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2014.
- L. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015a.
- M. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- N. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.
- O. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2008.
- P. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
- Q. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).
- R. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
  - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

### **1.05 QUALITY ASSURANCE**

- A. Testing and Inspection: Comply with State Chapter 17A, Title 24, Vol. 2, 2016
- B. Welding: Qualify procedures and personnel according to the American Welding Society.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS - STEEL**

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Slotted Channel Framing: ASTM A653/A653M, Grade 33.
- F. Slotted Channel Fittings: ASTM A1011/A1011M.
- G. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
- H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- I. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

### **2.02 FABRICATION**

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- C. Continuously seal joined members by continuous welds.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- G. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- H. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support loads.

### **2.03 FABRICATED ITEMS**

- A. Bollards: Schedule 40 Steel pipe, crowned cap, as detailed; galvanized finish.

1. Fabricate bollards with 3/8-inch- thick steel baseplates for bolting to existing concrete slab. Drill baseplates at all 4 corners for 3/4-inch anchor bolts.1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.
  2. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch- thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and 3/4 inch larger than OD of bollard.
  3. Fabricate internal sleeves for removable bollards from Schedule 40 steel pipe or 1/4-inch wall-thickness steel tubing with an OD approximately 1/16 inch less than ID of bollards. Match drill sleeve and bollard for 3/4 inch steel machine bolt.
  4. Provide concrete filled bollards for nonremovable bollards. Removable bollards shall not be filled with concrete.
- B. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.
- C. Door Frames for Overhead Door Openings, Wall Openings, and \_\_\_\_: Channel sections; prime paint finish.

## **2.04 FINISHES - STEEL**

- A. Prime paint steel items.
1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat. Use lead and chromate-free primer in compliance with VOC content allowed by the most current regulations of the EPA.
- E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements.
- F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.
- G. Galvanize Repair Paint: High zinc dust content paint for regalvanizing welds in steel complying with SSPC- 20, GalvaStick method or ZRC Galvilite Galvanizing Repair Compound Paint Method. Repair with aerosol galvanized coatings is not acceptable.

## **2.05 FABRICATION TOLERANCES**

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.

### **3.02 PREPARATION**

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

### **3.03 INSTALLATION**

- A. Install items plumb and level, accurately fitted, free from distortion or defects.

- B. Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections
- D. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- E. Field weld components as indicated on drawings.
- F. Perform field welding in accordance with AWS D1.1/D1.1M.
- G. Obtain approval prior to site cutting or making adjustments not scheduled.
- H. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.
- I. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- J. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
  - 1. Revise subparagraph below if only metallic grout is used at concealed, protected locations.
  - 2. Use nonshrink grout, nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
  - 3. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
- K. Nosings: Center nosings on tread widths. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces. Seal nosings exposed to exterior with elastomeric sealant complying with Division 7 "Joint Sealants" to provide a watertight installation.

#### **3.04 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION 05 5000**

**SECTION 05 5150**  
**ALUMINUM ACCESS LADDER**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Aluminum access ladders.

**1.02 RELATED SECTIONS**

- A. Section 055000 – Metal Fabrications: Fasteners and installation requirements used to attach ladders to structure.
- B. Section 15050 – Basic Electrical Materials and Methods: For electrical grounding of ladders.

**1.03 REFERENCES**

- A. AA – Aluminum Association.
- B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- D. OSHA 1910.27 – Fixed Ladders.

**1.04 SUBMITTALS**

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product.
- C. Shop Drawings:
  - 1. Detail fabrication and erection of each ladder indicated. Include plans, elevations, sections, and details of metal fabrications and their connections.
  - 2. Provide templates for anchors and bolts specified for installation under other Sections.
  - 3. Provide reaction loads for each hanger and bracket.
- D. Qualification Data:
  - 1. Refer to Quality Assurance provisions for submittal requirements evidencing experience, certifications and resources.
- E. Selection Samples: For each finish specified, two complete sets of color chips representing manufacturer's full range of available colors.
- F. Verification Samples: For each finish specified, two samples, minimum size 6 inches (150 mm) square, represent actual product color.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: A firm experienced in producing aluminum metal ladders similar to those indicated for this Project.
  - 1. Record of successful in-service performance.
  - 2. Sufficient production capacity to produce required units.
  - 3. Professional engineering competent in design and structural analysis to fabricate ladders in compliance with industry standards and local codes.
- B. Installer Qualifications: Competent and experienced firm capable of selecting fasteners and installing ladders to attain designed operational and structural performance.
- C. Product Qualification: Product design shall comply with OSHA 1910.27 minimum standards for ladders.
- D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
  - 1. Install ladder in area designated by Architect.
  - 2. Do not proceed with remaining work until workmanship and installation are approved by Architect.
  - 3. Rework mock-up as required to produce acceptable work.



## **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.

## **1.07 PROJECT CONDITIONS**

- A. Field Measurements: Verify dimensions by field measurement before fabrication.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, indicate established dimensions on shop drawing submittal and proceed with fabrication.

## **1.08 WARRANTY**

- A. Manufacturer has responsibility for an extended Corrective Period for work of this Section for a period of 5 years from date of Substantial Completion against all the conditions indicated below, and when notified in writing from Owner, manufacturer shall promptly and without inconvenience and cost to Owner correct said deficiencies.
  - 1. Defects in materials and workmanship.
  - 2. Deterioration of material and surface performance below minimum OSHA standards as certified by independent third party testing laboratory. Ordinary wear and tear, unusual abuse or neglect excepted.
  - 3. Within the warranty period, the manufacturer shall, at its option, repair, replace, or refund the purchase price of defective ladder.
- B. Manufacturer shall be notified immediately of defective products, and be given a reasonable opportunity to inspect the goods prior to return. Manufacturer will not assume responsibility, or compensation, for unauthorized repairs or labor. Manufacturer makes no other warranty, expressed or implied, to the merchantability, fitness for a particular purpose, design, sale, installation, or use, of the ladder; and shall not be liable for incidental or consequential damages, losses of or expenses, resulting from the use of ladder products.

## **1.09 EXTRA MATERIALS**

- A. Furnish touchup kit for each type and color of paint finish provided.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Acceptable Manufacturer: O'Keeffe's, Inc.; 325 Newhall St. San Francisco, CA 94124. ASD. Toll Free Tel: (888) 653-3333. Tel: (415) 824-4900. Fax: (415) 824-5900. Email: info@okeeffes.com. Web: <http://www.okeeffes.com>.
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

### **2.02 APPLICATIONS/SCOPE**

- A. Fixed and Cage Ladder Design:
  - 1. Safety cages are required on ladders over 24 feet (7315 mm)
  - 2. Safety cages are required on all ladders in high or hazardous areas.
  - 3. Landing platforms are required at 50 feet (15,240 mm) above the bottom of the ladder.
  - 4. Rail and harness fall arrest system as alternate to safety cage and landing platforms shall be a permissible manufacturer's option.
    - a. Fixed Ladder Bottom Bracket:
    - b. Bottom floor supported bracket.
    - c. Bottom wall supported bracket.
    - d. Bracket as drawn.
- B. Fixed Access Ladder:
  - 1. Tubular Rail Low Parapet Access Ladder with Platform and Return.
    - a. Model 503 as manufactured by O'Keeffe's Inc.

### **2.03 FINISHES**

- A. Mill finish. As extruded.

- B. Clear Anodic Finish: AA-M10C22A41 Mechanical finish as fabricated. Architectural Class I, clear coating 0.018 mm or thicker.
- C. Paint. Urethane over chemically pretreated substrate.
  - 1. Fire Red (RAL 2002).
  - 2. Alert Orange (RAL 2003).
  - 3. Warning Blue (RAL 5005).
  - 4. Caution Yellow (RAL 1018).
  - 5. Safety Green (RAL 6001).
  - 6. As scheduled on drawings.

## **2.04 MATERIALS**

- A. Aluminum Sheet: Alloy 5005-H34 to comply with ASTM B209.
- B. Aluminum Extrusions: Alloy 6063-T6 to comply with ASTM B221.

## **2.05 FABRICATION**

- A. Rungs: Not less than 1-1/4 inches (32 mm) in section and 18-3/8 inches (467mm) long, formed from tubular aluminum extrusions. Squared and deeply serrated on all sides.
  - 1. Rungs shall withstand a 1,500 pound (454 kg) load without deformation or failure.
- B. Channel Side Rails: Not less than 1/8 inch (3 mm) wall thickness by 3 inches (76 mm) wide.
- C. Heavy Duty Tubular Side Rails: Assembled from two interlocking aluminum extrusions no less than 1/8 inch (3 mm) wall thickness by 3 inches (76 mm) wide. Construction shall be self-locking stainless steel fasteners, full penetration TIG welds and clean, smooth and burr-free surfaces.
- D. Walk-Through Rail and Roof Rail Extension: Not less than 3 feet 6 inches (1067 mm) above the landing and shall be fitted with deeply serrated, square, tubular grab rails.
- E. Landing Platform: 1-1/2 inches (38 mm) or greater diameter, tubular aluminum guardrails and decks of serrated aluminum treads.
- F. Ladder Safety Post: Retractable hand hold and tie off.
- G. Rail and Harness Fall Arrest System: Supplied where specified as alternate to safety cage and landing platforms, in accordance with OSHA regulation 1910.27; permanently mounted to ladder rungs and complete with necessary components.
- H. Safety Cages:
  - 1. Fabricate ladder safety cages to comply with authority having jurisdiction. Assemble by welding. Spacing of primary hoops, secondary hoops and vertical bars shall not exceed that required by code.
  - 2. Safety cage hoops and vertical bars: 3/16 inch (5 mm) by 2 inches (51 mm) aluminum bar.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Coordinate anchorages. Furnish setting drawings, templates, and anchorage structural loads for fastener resistance.
- B. Do not begin installation until supporting structure is complete and ladder installation will not interfere with supporting structure work.
- C. If supporting structure is the responsibility of another installer, notify Architect of unsatisfactory supporting work before proceeding.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction.

### **3.03 PROTECTION**

- A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION 05 5150**

**SECTION 05 5213  
PIPE AND TUBE RAILINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Wall mounted handrails.
- B. Free-standing railings.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 09 2116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.
- C. Section 09 9113 - Exterior Painting: Paint finish.

**1.03 REFERENCE STANDARDS**

- A. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013.
- B. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Metal Rail Infill:
  - 1. The Western Group; Woven Wire: [www.architecturalwire.com/#sle](http://www.architecturalwire.com/#sle).

**2.02 RAILINGS - GENERAL REQUIREMENTS**

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.
- B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.
- C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.
- D. Allow for expansion and contraction of members and building movement without damage to connections or members.
- E. Dimensions: See drawings for configurations and heights.
  - 1. Top Rails and Wall Rails: 1-1/2 inches diameter, round.
  - 2. Intermediate Rails: 1-1/2 inches diameter, round.
  - 3. Posts: 1-1/2 inches diameter, round.
- F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
- G. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.
- H. All handrails shall be free of any burrs, sharp or rough areas, all welds ground smooth.

## **2.03 FABRICATION**

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- D. Welded Joints:
  - 1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
  - 2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
  - 3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. L. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- F. Close exposed ends of railing members with prefabricated end fittings.
- G. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.
  - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- I. Woven-Wire Mesh Infill Panels: Fabricate infill panels from woven-wire mesh crimped into 1-by-1/2-by-1/8-inch metal channel frames. Make wire mesh and frames from same metal as railings in which they are installed.
- J. Orient wire mesh with parallel and perpendicular to top rail, unless otherwise shown on drawings.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Field verify all dimensions, slopes, etc. prior to fabrication.

### **3.02 PREPARATION**

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Anchor railings securely to structure.

### **3.04 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION 05 5213**

**SECTION 06 1000  
ROUGH CARPENTRY**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Structural dimension lumber framing.
- B. Non-structural dimension lumber framing.
- C. Rough opening framing for doors, windows, and roof openings.
- D. Sheathing.
- E. Subflooring.
- F. Underlayment.
- G. Roof-mounted curbs.
- H. Roofing nailers.
- I. Roofing cant strips.
- J. Preservative treated wood materials.
- K. Miscellaneous framing and sheathing.
- L. Communications and electrical room mounting boards.
- M. Concealed wood blocking, nailers, and supports.
- N. Miscellaneous wood nailers, furring, and grounds.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 03 3000 - Cast-in-Place Concrete: Setting anchors in concrete.
- C. Section 05 5000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
- D. Section 06 1733 - Wood I-Joists.
- E. Section 06 1800 - Glued-Laminated Construction.
- F. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.
- G. Section 07 6200 - Sheet Metal Flashing and Trim: Sill flashings.
- H. Section 07 7200 - Roof Accessories: Prefabricated roof curbs.
- I. Section 31 3116 - Termite Control: Field-applied termiticide and mildewcide for wood materials.

**1.03 REFERENCE STANDARDS**

- A. ANSI A208.1 - American National Standard for Particleboard; 2009.
- B. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2015.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- G. AWPA U1 - Use Category System: User Specification for Treated Wood; 2012.
- H. ICC (IBC) - International Building Code; 2015.
- I. ICC (IECC) - International Energy Conservation Code; 2012.

- J. ICC-ES AC308 - Acceptance Criteria for Termite Physical Barrier Systems; 2014 (editorially revised 2017).
- K. PS 1 - Structural Plywood; 2009.
- L. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
- M. PS 20 - American Softwood Lumber Standard; 2010.
- N. RIS (GR) - Standard Specifications for Grades of California Redwood Lumber; 2000.
- O. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2004, and supplements.
- P. WWPA G-5 - Western Lumber Grading Rules; 2011.
- Q. CCR California Code of Regulations: Title 24, 2016 – California Building Code (CBC)
- R. ANSI/AWC NDS – National Design Specification for Wood Construction.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.
- C. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.
- D. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.
- E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

#### **1.06 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

### **PART 2 PRODUCTS**

#### **2.01 GENERAL REQUIREMENTS**

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
  - 1. Species: Douglas Fir-Larch, unless otherwise indicated.
  - 2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
  - 3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee ([www.alsc.org](http://www.alsc.org)) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Lumber fabricated from old growth timber is not permitted.

#### **2.02 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Laminated-Veneer Lumber:
    - a. Boise Cascade Corporation.
    - b. Georgia-Pacific Corporation.
    - c. Louisiana-Pacific Corporation.
    - d. Union Camp Corp.; Building Products Division.



- e. Willamette Industries, Inc.
- 2. Metal Framing Anchors:
  - a. KC Metals Products, Inc.
  - b. Silver Metal Products, Inc.
  - c. Simpson Strong-Tie Company, Inc.
- 3. Expansion Bolts:
  - a. Ramset/Redhead "TruBolt
  - b. Hilti Kwik - Bolt II
- 4. Powder Driven Fasteners:
  - a. Hilti Fastening Systems
  - b. Impex Tool Corporation

### **2.03 DIMENSION LUMBER FOR CONCEALED APPLICATIONS**

- A. Grading Agency: Western Wood Products Association; WWPA G-5.
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D.1. Stud Framing (2 to 4 inches thick x 4 inches):
  - 1. Species: Douglas Fir-Larch.
  - 2. Grade: No. 2.
- D.2. Stud Framing (2 to 4 inches thick x 6 inches and wider):
  - 1. Species: Douglas Fir-Larch.
  - 2. Grade: No. 1.
- E. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16 ):
  - 1. Species: Douglas Fir-Larch.
  - 2. Grade: No. 1 & Btr. (OMIT THE & Btr. – No. 1 & Btr is a specific grade and not required)
- F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
  - 1. Lumber: S4S, No. 2 or Standard Grade.
  - 2. Boards: Standard or No. 3.

### **2.04 TIMBERS FOR CONCEALED APPLICATIONS**

- A. Grading Agency: Western Wood Products Association; WWPA G-5.
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry (23 percent maximum).
- D. Beams and Posts 5 inches and over in thickness:
  - 1. Species: Douglas Fir-Larch.
  - 2. Grade: No. 1.

### **2.05 STRUCTURAL COMPOSITE LUMBER**

- A. At Contractor's option, structural composite lumber may be substituted for concealed dimension lumber and timbers.

### **2.06 CONSTRUCTION PANELS**

- A. Subfloor/Underlayment Combination: Any PS 2 type, rated Single Floor.
  - 1. Bond Classification: Exterior.
  - 2. Span Rating: 48.
  - 3. Performance Category: 1-1/8 PERF CAT.
  - 4. Thickness: 3/4 inches, nominal.
- B. Subfloor/Underlayment Combination: Oriented strand board wood structural panel; PS 2, rated Single Floor.
  - 1. Bond Classification: Exterior.
  - 2. Performance Category: 19/32 PERF CAT.
  - 3. Span Rating: 20.

4. Edges: Tongue and groove.
  5. Surface Finish: Fully sanded face.
- C. Roof Sheathing: Any PS 2 type, rated Structural I Sheathing.
1. Bond Classification: Exterior.
  2. Span Rating: 60.
  3. Performance Category: 3/4 PERF CAT.
- D. Wall Sheathing: Plywood, PS 1, Grade C-D, Exposure I.
- E. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- F. Other Applications:
1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
  2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
  3. Other Locations: PS 1, C-D Plugged or better.

## 2.07 ACCESSORIES

- A. Fasteners and Anchors:
1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
  2. Drywall Screws: Bugle head, hardened steel, power driven type, length to achieve full penetration of sheathing substrate.
  3. Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
    - a. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
  4. Nails, Brads, and Staples: ASTM F 1667, FS FF-N-105.
  5. Power-Driven Fasteners: ICC ESR-1539.
  6. Wood Screws: ASME B18.6.1.
  7. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
  8. Lag Bolts: ASME B18.2.1.
  9. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers. No upset threads allowed.
  10. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
    - a. Material (interior): Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
    - b. Material (exterior): Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.
- B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
- C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
- D. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.

- E. Termite-Resistant Sill Plate Barrier: Self-adhesive, film-backed barrier with release sheet; adheres to concrete substrates and blocks termite access.
  - 1. Thickness: 68 mils (0.068 inch).
  - 2. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
  - 3. Water Vapor Permeance: 0.035 perm, maximum, when tested in accordance with ASTM E96/E96M.
  - 4. Manufacturers:
    - a. Polyguard Barrier Systems, Inc, a division of Polyguard Products, Inc; TERM Sill Plate Barrier: [www.polyguardbarriers.com/#sle](http://www.polyguardbarriers.com/#sle).
    - b. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- F. Sill Flashing: As specified in Section 07 6200.
- G. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed.
  - 1. Manufacturers:
    - a. Franklin International, Inc; Titebond PROvantage Weatherproof Subfloor Adhesive: [www.titebond.com/#sle](http://www.titebond.com/#sle).
    - b. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
  - 2. Construction Adhesives:
    - a. Manufacturers:
      - 1) Franklin International, Inc; Titebond Fast Set Polyurethane Construction Adhesive: [www.titebond.com/#sle](http://www.titebond.com/#sle).
      - 2) Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- H. Water-Resistive Barrier: As specified in Section 07 2500.
- I. Building Paper: Water resistant Kraft paper.

## **2.08 FACTORY WOOD TREATMENT**

- A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
  - 1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWWA standards.
- B. Preservative Treatment:
  - 1. Preservative Pressure Treatment of Lumber Above Grade: AWWA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
    - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
    - b. Treat lumber exposed to weather.
    - c. Treat lumber in contact with roofing, flashing, or waterproofing.
    - d. Treat lumber in contact with masonry or concrete.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.
- B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.
- C. Coordinate installation of rough carpentry members specified in other sections.

### **3.02 INSTALLATION - GENERAL**

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

### **3.03 FRAMING INSTALLATION**

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices unless otherwise specifically detailed.
- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes, AWC (WFCM) Wood Frame Construction Manual, and \_\_\_\_\_.
- E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.
- F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- G. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

### **3.04 BLOCKING, NAILERS, AND SUPPORTS**

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- E. Provide the following specific non-structural framing and blocking:
  - 1. Cabinets and shelf supports.
  - 2. Wall brackets.
  - 3. Handrails.
  - 4. Grab bars.
  - 5. Towel and bath accessories.
  - 6. Wall-mounted door stops.
  - 7. Chalkboards and marker boards.
  - 8. Wall paneling and trim.
  - 9. Joints of rigid wall coverings that occur between studs.

### **3.05 ROOF-RELATED CARPENTRY**

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- B. Provide wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

### **3.06 INSTALLATION OF CONSTRUCTION PANELS**

- A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.
- B. Subflooring: Glue and nail to framing; staples are not permitted.
- C. Underlayment: Secure to subflooring with nails and glue.

1. At locations where resilient flooring will be installed, fill and sand splits, gaps, and rough areas.
  2. Place building paper between floor underlayment and subflooring.
- D. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
1. At long edges provide solid edge blocking where joints occur between roof framing members.
  2. Nail panels to framing; staples are not permitted.
- E. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
1. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.
- F. Communications and Electrical Room Mounting Boards: Provide fire retardant treated plywood. Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
  2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
  3. Install adjacent boards without gaps.
  4. Size and Location: As indicated on drawings.
- G. PARTICLEBOARD UNDERLAYMENT INSTALLATION
1. Comply with the National Particleboard Association's recommendations for type of subfloor indicated. Fill and sand gouges, gaps, and chipped edges. Sand uneven joints flush.
    - a. Fastening Method: Glue and screw underlayment to subflooring.
- H. HARDBOARD UNDERLAYMENT
1. Comply with AHA's "Application Instructions for Basic Hardboard Products" and hardboard manufacturer's written instructions for preparing and applying hardboard underlayment.
    - a. Fastening Method: Screw underlayment to subflooring.
- I. MACHINE APPLIED NAILING
1. Machine Nailing: Use of machine nailing is subject to a satisfactory jobsite demonstration for each project and the approval of the Project Inspector, the Structural Engineer and DSA. The approval is subject to continued satisfactory performance. If the nail heads penetrate the outer ply more than would be normal for a hand-held hammer, or if minimum allowable edge distances are not maintained, the performance will be deemed unsatisfactory and machine nailing shall be discontinued.
    - a. Applications: Application and location of use: plywood shear walls or roof and floor sheathing.
    - b. Manufacturer's:
      - 1) Halstead Enterprises, Inc. (ICBO Report No. 4296)
      - 2) Air Nail Co. (ICBO Report 3540P)
    - c. Minimum Penetration into Studs, Joists or Rafters:
      - 1) 8d Common - 1-1/2 inch
      - 2) 10d Common - 1-5/8 inch
      - 3) 16d Common - 1-3/4 inch
    - d. Conditions:
      - 1) A satisfactory jobsite demonstration is required for approval by the Project Architect or Structural Engineer and the DSA Field Engineer. The approval is subject to continued satisfactory performance. If nail heads penetrate the outer surface more than would be normal for a hand hammer, or if minimum allowable edge distances are not maintained, the performance will be deemed unsatisfactory.

- 2) Nails shall be full headed common wire nails with spacing as shown on the Structural Drawings.
- 3) Minimum edge distance of nail from the edge of plywood and framing shall be 3/8 inch for 2x framing. For 3x and thicker framing, distances shall be measured at the surface between the plywood and backing. The plywood joint shall be centered over a single member.
- 4) Only 1/2 inch or greater thickness of plywood, may be machine nailed.
- 5) Slanting of nails to direct the nail toward the center line of the framing may be done but slope should not be more than 1 in 6 from a line at right angles to the surface of the plywood.
- 6) Overdriving of nails such that the heads cut the outer veneer is not allowed. Re-nailing may not be accepted as a remedy.
- 7) Underdriven nails are required to be driven with a hand held hammer so that the head of the nail is flush with the top surface of the plywood.
- 8) Machine nailing shall be used only where the back side can be inspected for "shiners".
- 9) "Shiners" or nails which do not penetrate fully into framing or blocking shall be removed and replaced. All remedial nailing shall be done by hand.
- 10) If any framing members, blocking or joists, receiving the points of the nails, are damaged (split, nail holes too close, etc.), they shall be removed and replaced.
- 11) Toe and end gun nailing are not permitted.

#### J. FIRE AND DRAFT STOPS

1. Fire Stops, Where Required: Firestopping shall be provided in the following locations:
  - a. In concealed spaces of stud walls and partitions, including furred spaces, at the ceiling and floor levels, and 10 foot intervals both vertical and horizontal.
  - b. At all interconnections between concealed vertical and horizontal spaces such as occurs at soffits, drop ceilings and cove ceilings.
  - c. In concealed spaces between stair stringers at top and bottom of run and between studs along and in line with run of stairs if walls under the stairs are unfinished.
  - d. In openings around vents, pipes, ducts, chimneys, fireplaces and similar openings which afford a passage for fire at ceiling and floor levels, with noncombustible materials.
2. Fire Stop Construction: Except as provided in item D above, fire-stopping shall consist of 2 inches nominal lumber or two thicknesses of 1 inch nominal lumber with broken lap joints or one thickness of 23/32 inch plywood with joints backed by 23/32 inch plywood.
  - a. Fire stops may also be gypsum board, mineral wool or other approved materials, securely fastened in place.
  - b. Walls having parallel or staggered studs for sound transmission control shall have fire stops of mineral wool or other approved non-rigid material.
3. Draft Stops Where Required: Draft stopping shall be provided in the following locations:
  - a. Draft Stops shall be installed in the floor-ceiling assemblies of buildings or portions of buildings so that the area of the concealed space does not exceed 1,000 square feet and so that the horizontal dimension between stops does not exceed 60 feet.
  - b. Draft stops shall be installed in attics, mansards, overhangs, false fronts set out from walls and similar concealed spaces so that the area between draft stops does not exceed 3,000 square feet and the greatest horizontal dimension does not exceed 60 feet.
4. Draft Stop Construction: Draft stopping shall be not less than 1/2 inch gypsum board, 3/8 inch plywood or other approved materials adequately supported.
  - a. Openings in the draft stop partitions shall be protected by self-closing doors with automatic latches constructed as required for partitions.

#### K. ATTIC ACCESS

1. Opening 22 inches by 30 inches is required with 30 inch and greater clear headroom. If 30 inch or less clear height then access opening not required.
- L. VENTILATION:
1. 1 square foot per 150 square feet of attic area or rafter area above insulation if no eave vents are provided and insulation is not graphically shown attached to the roof sheathing sides. And 1 square foot per 300 square feet if at least 50 percent of required area is provided at eave line.
- M. WINDOW AND DOOR FLASHING
1. Apply flashing material horizontally with 2 inch over-lap and 6 inch end lap; fasten to sheathing with corrosion resistant staples.
- N. BUILDING PAPER APPLICATION
1. Apply building paper horizontally with 2-inch overlap and 6-inch end lap; fasten to sheathing with corrosion resistant staples or roofing nails. Cover upstanding flashing with 4-inch overlap.

### **3.07 SITE APPLIED WOOD TREATMENT**

- A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.
- B. Allow preservative to dry prior to erecting members.

### **3.08 TOLERANCES**

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.
- C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

### **3.09 CLEANING**

- A. Waste Disposal: Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.
  1. Comply with applicable regulations.
  2. Do not burn scrap on project site.
  3. Do not burn scraps that have been pressure treated.
  4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

**END OF SECTION 06 1000**

**SECTION 06 1733**  
**WOOD I-JOISTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Wood I-joists for roof and floor framing.
- B. Bridging, bracing, and anchorage.
- C. Framing for openings.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 1000 - Rough Carpentry: Installation requirements for miscellaneous framing.
- C. Section 06 1000 - Rough Carpentry: Material requirements for blocking, plates, and miscellaneous framing.

**1.03 REFERENCE STANDARDS**

- A. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a.
- B. ASTM D5055 - Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists; 2013.
- C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2012.
- D. PS 1 - Structural Plywood; 2009.
- E. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
- F. CCR California Code of Regulations: Title 24, 2016 – California Building Code (CBC)

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's literature describing materials, dimensions, allowable spans and spacings, bearing and anchor details, bridging and bracing requirements, and installation instructions; identify independent inspection agency.
- C. Shop Drawings: Indicate sizes and spacing of joists, bracing and bridging, bearing stiffeners, holes to be cut (if any), and framed openings between joists.
- D. Certificate: Certification by joist manufacturer that products delivered are of the same design and construction as those evaluated by the independent inspection agency.

**1.05 QUALITY ASSURANCE**

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

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site in manufacturer's original packaging with manufacturer's name and product identification intact and legible.
- B. Protect products from damage due to weather and breakage.
- C. Protect joists from warping or other distortion by stacking in upright position, braced to resist movement, with air circulation under coverings and around stacks.
- D. Handle individual joists in the upright position.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Wood I-Joists:
  - 1. Red Built Company; [www.redbuilt.com](http://www.redbuilt.com).



2. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

## **2.02 MATERIALS**

- A. Wood I-Joists: Solid lumber top and bottom flanges and oriented strand board (OSB) webs bonded together with structural adhesive, with published span rating to meet project requirements.
  1. Span Rating: Established and monitored in accordance with ASTM D5055 by independent inspection agency.
  2. Plywood: Comply with PS 1.
  3. Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.
  4. Depth: As indicated on drawings.
  5. Fabrication Tolerances:
    - a. Flange Width: Plus/minus 1/32 inch.
    - b. Flange Thickness: Minus 1/16 inch.
    - c. Joist Depth: Plus 0, minus 1/8 inch.
  6. Marking: Mark each piece with depth, joist spacing, and allowable span for joist spacing.
  7. Provide bearing stiffeners if required by span rating or joist hanger manufacturer.
- B. Wood-Based Components:
  1. Wood fabricated from old growth timber is not permitted.
- C. Joist Bridging: Type, size and spacing recommended by joist manufacturer.
- D. Wood Blocking, Plates, and Miscellaneous Framing: As specified in Section 06 1000.
- E. Fasteners: Electrogalvanized steel, type to suit application.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that supports and openings are ready to receive joists.
- B. Verify that field measurements are as indicated on shop drawings.

### **3.02 PREPARATION**

- A. Coordinate placement of bearing items.

### **3.03 ERECTION**

- A. Install joists in accordance with manufacturer's instructions.
- B. Set structural members level and plumb, in correct position.
- C. Make provisions for erection loads and for sufficient temporary bracing to maintain structure plumb and in true alignment until completion of erection and installation of permanent bracing.
- D. Do not field cut or alter structural members without approval of Architect.
- E. Install permanent bridging and bracing.
- F. Install headers and supports to frame openings required.
- G. Frame openings between joists with lumber in accordance with Section 06 1000.
- H. Coordinate installation of sheathing/decking with work of this section.

### **3.04 TOLERANCES**

- A. Framing Members: 1/2 inch maximum, from true position.

**END OF SECTION 06 1733**

**SECTION 06 1800**  
**GLUED-LAMINATED CONSTRUCTION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Glue laminated wood beams and purlins.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

**1.03 REFERENCE STANDARDS**

- A. AITC 117 - Standard Specifications for Structural Glued Laminated Timber of Softwood Species; 2010.
- B. AITC A190.1 - American National Standard for Wood Products - Structural Glued Laminated Timber; 2007.
- C. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a.
- D. RIS (GR) - Standard Specifications for Grades of California Redwood Lumber; 2000.
- E. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2004, and supplements.
- F. WWPA G-5 - Western Lumber Grading Rules; 2011.
- G. CCR California Code of Regulations: Title 24, 2016 – California Building Code (CBC)

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials, application technique and resultant performance information.
- C. Shop Drawings: Indicate framing system, sizes and spacing of members, loads and cambers, bearing and anchor details, bridging and bracing, and framed openings.
- D. Manufacturer's Qualification Statement.

**1.05 QUALITY ASSURANCE**

- A. Designer Qualifications: Design structural members under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
- B. Manufacturer/Fabricator Qualifications: Company specializing in manufacture of glue laminated structural units with three years of documented experience, and certified by AITC in accordance with AITC A190.1.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Protect members to AITC requirements for not wrapped.
- B. Leave individual wrapping in place until finishing occurs.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Glued-Laminated Structural Units:
  - 1. Western Wood Structures, Inc: [www.westernwoodstructures.com/#sle](http://www.westernwoodstructures.com/#sle).
  - 2. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

**2.02 GLUED-LAMINATED UNITS**

- A. Glued-Laminated Units: Fabricate in accordance with AITC 117 Industrial grade.
  - 1. Verify dimensions and site conditions prior to fabrication.
  - 2. Cut and fit members accurately to length to achieve tight joint fit.
  - 3. Fabricate member with camber built in.

4. Do not splice or join members in locations other than those indicated without permission.
5. After end trimming, seal with penetrating sealer in accordance with AITC requirements.

### **2.03 MATERIALS**

- A. Lumber: Softwood lumber complying with RIS (GR) grading rules with 12 percent maximum moisture content before fabrication. Design for the values as shown on the plans.
  1. Lumber fabricated from old growth timber is not permitted.
- B. Laminating Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.

### **2.04 FABRICATION**

- A. Fabricate glue laminated structural members in accordance with AITC Industrial grade.
- B. Cut and fit members accurately to length to achieve tight joint fit.
- C. Fabricate member with camber built in.
- D. Do not splice or join members in locations other than those indicated without permission.
- E. After end trimming, seal with penetrating sealer in accordance with AITC requirements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that supports are ready to receive units.
- B. Verify sufficient end bearing area.

### **3.02 PREPARATION**

- A. Coordinate placement of bearing items.

### **3.03 ERECTION**

- A. Lift members using protective straps to prevent visible damage.
- B. Set structural members level and plumb, in correct positions or sloped where indicated.
- C. Provide temporary bracing and anchorage to hold members in place until permanently secured.
- D. Fit members together accurately without trimming, cutting, splicing, or other unauthorized modification.

### **3.04 TOLERANCES**

- A. Framing Members: 1/2 inch maximum from true position.

**END OF SECTION 06 1800**

**SECTION 07 2100  
THERMAL INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.
- B. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.
- C. Batt insulaation for sound attenuation insulation

**1.02 RELATED REQUIREMENTS**

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 1000 - Rough Carpentry: Supporting construction for batt insulation.
- C. Section 09 2116 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.

**1.03 REFERENCE STANDARDS**

- A. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- C. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- D. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.
- D. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.
- E. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- F. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

**1.05 QUALITY ASSURANCE**

- A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); [www.airbarrier.org/#sle](http://www.airbarrier.org/#sle):
  - 1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.
  - 2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

**1.06 FIELD CONDITIONS**

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Thermal Insulation:
  - 1. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

### **2.02 APPLICATIONS**

- A. Insulation in Wood Framed Walls: Batt insulation with separate vapor retarder.
- B. Insulation in Wood Framed Ceiling Structure: Batt insulation with separate vapor retarder.
- C. Insulation in Wood Framed walls as sound attenuation: Batt insulation with no vapor retarder.

### **2.03 BATT INSULATION MATERIALS**

- A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
  - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
  - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
  - 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
  - 4. Formaldehyde Content: Zero.
  - 5. Thermal Resistance: R of 19 at wall construction
    - a. Thermal Resistance: R 30 at roof and floor construction
  - 6. Facing: Aluminum foil, flame spread 25 rated; one side.
  - 7. Manufacturers:
    - a. CertainTeed Corporation; \_\_\_\_\_: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
    - b. Johns Manville; \_\_\_\_\_: [www.jm.com/#sle](http://www.jm.com/#sle).
    - c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
  - 8. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

### **2.04 ACCESSORIES**

- A. Interior Vapor Retarder: Modified polyethylene/polyacrylate (PE/PA) film reinforced with polyethylene terephthalate (PET) fibers, 12 mils, 0.012 inch thick.
  - 1. Width: 4.9 feet.
  - 2. Manufacturers:
    - a. SIGA Cover Inc; SIGA-Majrex: [www.sigacover.com/#sle](http://www.sigacover.com/#sle).
    - b. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- B. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
  - 1. Application: Sealing of interior circular penetrations, such as pipes or cables.
  - 2. Width: Are required for application.
  - 3. Temperature Resistance: Minus 40 degrees F to 212 degrees F
- C. Flashing Tape: Special polyolefin film with high performance adhesive.
  - 1. Application: Interior window and door sill flashing tape.
  - 2. Width: Are required for application.
  - 3. Temperature Resistance: Minus 40 degrees F to 212 degrees F
- D. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
- E. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.
- F. Line Wire: Standard gauge as required to support blanket/batt insulation
- G. Wire Mesh: Galvanized steel, hexagonal wire mesh.
- H. Adhesive: Type recommended by insulation manufacturer for application.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

### **3.02 BATT INSTALLATION**

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.
- F. Staple or nail facing flanges in place at maximum 6 inches on center.
- G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
- H. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches on center. Lap and seal sheet retarder joints over member face.
- I. Tape seal tears or cuts in vapor retarder.
- J. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.
- K. E. If insulation units are located in an unsupported ceiling area, provide line wire to support insulation units from dropping out from between supports. Space line wire at 16 " on center maximum.
- L. If insulation units are to be installed at the upper portion of the joists or rafters to eliminate the void between the roof deck and the conditioned cavity, use 5/8" staples and 18 gauge galvanized sag-wires.
- M. Contractors Option: Use Simpson "IS" insulation supports between joists and rafters. Comply with manufacturer's recommendation for installation requirements.

### **3.03 PROTECTION**

- A. Do not permit installed insulation to be damaged prior to its concealment. If insulation is damaged, contractor to replace insulation prior to concealment.

**END OF SECTION 07 2100**

**SECTION 07 2500  
WEATHER BARRIERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate; not air tight or vapor retardant.

**1.02 RELATED REQUIREMENTS**

- A. Section 06 1000 - Rough Carpentry: Water-resistive barrier under exterior cladding.
- B. Section 07 2100 - Thermal Insulation: Vapor retarder installed in conjunction with batt insulation.

**1.03 DEFINITIONS**

- A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.
- B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.
- C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
  - 1. Water Vapor Permeance: For purposes of conversion,  $57.2 \text{ ng}/(\text{Pa s sq m}) = 1 \text{ perm}$ .
- D. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

**1.04 REFERENCE STANDARDS**

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 2014.
- C. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications; 2010.
- D. ASTM D5590 - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay; 2000 (Reapproved 2010).
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- G. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.
- H. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; ICC Evaluation Service, Inc; 2013.
- I. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; ICC Evaluation Service, Inc; 2011.
- J. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; ICC Evaluation Service, Inc; 2015.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. Shop Drawings: Provide drawings of special joint conditions.

- D. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.
- E. Manufacturer's Installation Instructions: Indicate preparation.
- F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification; keep copies of each contractor accreditation and installer certification on site during and after installation, and present on-site documentation upon request.

## **PART 2 PRODUCTS**

### **2.01 WEATHER BARRIER ASSEMBLIES**

- A. Water-Resistive Barrier: Provide on exterior walls under exterior cladding.
  1. Under Portland cement stucco, use two separate layers of building paper.

### **2.02 WATER-RESISTIVE BARRIER MATERIALS (NEITHER AIR BARRIER OR VAPOR RETARDER)**

- A. Building Paper: Asphalt-saturated Kraft building paper complying with requirements of ICC-ES AC308 Grade D.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that surfaces and conditions are ready to accept the work of this section.

### **3.02 PREPARATION**

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

### **3.03 INSTALLATION**

- A. Install materials in accordance with manufacturer's instructions.
- B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.
- C. Mechanically Fastened Sheets - On Exterior:
  1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
  2. Overlap seams as recommended by manufacturer but at least 6 inches.
  3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.
  4. Attach to framed construction with fasteners extending through sheathing into framing. Space fasteners at 12 to 18 inches on center along each framing member supporting sheathing.
  5. Where stud framing rests on concrete or masonry, extend lower edge of sheet at least 4 inches below bottom of framing and seal to foundation with sealant.
  6. Install water-resistive barrier over jamb flashings.
  7. Install air barrier and vapor retarder UNDER jamb flashings.
  8. Install head flashings under weather barrier.
  9. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.
- D. Openings and Penetrations in Exterior Weather Barriers:
  1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
  2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
  3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.



4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

#### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Coordination of ABAA Tests and Inspections:
  1. Provide testing and inspection required by ABAA QAP.
  2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
  3. Cooperate with ABAA testing agency.
  4. Allow access to air barrier work areas and staging.
  5. Do not cover air barrier work until tested, inspected, and accepted.
- C. Do not cover installed weather barriers until required inspections have been completed.
- D. Take digital photographs of each portion of the installation prior to covering up.

#### **3.05 PROTECTION**

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.
- B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

**END OF SECTION 07 2500**

**SECTION 07 2600**  
**SLAB-ON-GRADE VAPOR RETARDER**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Provide vapor retarder system for slab-on-grade concrete, including sealing joints and protrusions through vapor retarder and sand bed below vapor retarder.

**1.02 SUBMITTALS**

- A. Product Data: Submit manufacturer's literature.

**1.03 PROJECT CONDITIONS**

- A. Do not apply vapor retarder during inclement weather or when air temperature is below 40 degrees F.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

- A. Stego Industries, Inc./Stego Wrap (15 mil).
- B. Substitutions: Refer to Section 01 25 00

**2.02 MATERIALS**

- A. Vapor Retarder: ASTM E1745, Class A water resistant retarder consisting of 15 mil polyolefin film.
  - 1. Permeance: Maximum .025 perms, ASTM F1249 and E154 tests.
  - 2. Resistance to Puncture: Minimum 2200 grams, ASTM D1709, Method B.
  - 3. Tear Resistance: Minimum 8.74 lbs., ASTM D1004.
  - 4. Tensile Strength: Minimum 35 lbs/in., ASTM E154, Section 9, Method D-882, in both directions.
- B. Joint Sealer: Pressure sensitive tape as recommended by vapor retarder manufacturer and providing comparable permeance to vapor retarder.

**PART 3 - EXECUTION**

**3.01 PREPARATION**

- A. Ensure sleeves, curbs and projections that pass through vapor retarder are properly and rigidly installed.
- B. Ensure substrate is free of projections and irregularities that may be detrimental to proper installation of vapor retarder.

**3.02 INSTALLATION**

- A. Apply vapor retarder in accordance with manufacturer's recommendations and installation instructions and in accordance with ASTM E1643; comply with most restrictive where conflicts occur.
- B. Seal items projecting through vapor retarder with pressure sensitive tape.
- C. Seams: Minimum 6" overlap, sealed with pressure sensitive tape for vapor tight seal.
- D. Lay vapor retarder membrane smooth with no fishmouths or bunches of material.
- E. Inspect and repair vapor retarder prior to application of concrete slab; tape tears and repair damage.

**END OF SECTION 07 2600**

SECTION 075419 - POLYVINYL-CHLORIDE (PVC/TPA) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Mechanically-fastened thermoplastic PVC/TPA roofing system on wood or metal deck, including:
2. Roof insulation.
3. Roof insulation cover board.
4. Walkway material.

1.3 DEFINITIONS

- A. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
  1. Base flashings and membrane terminations.
    - a. Indicate details meet requirements of NRCA and FMG required by this Section.
  2. Tapered insulation, including slopes.
  3. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
- C. Samples for Verification: For the following products:
  1. Sheet roofing, of color specified, including T-shaped side and end lap seam.
  2. Roof insulation.
  3. Walkway pads or rolls.

4. Metal termination bars.
5. Six insulation fasteners of each type, length, and finish.
6. Six roof cover fasteners of each type, length, and finish.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Contractor's Product Certificate: Submit notarized certificate, indicating products intended for Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.
- B. Qualification Data: For Installer, Manufacturer, and Roofing Inspector.
  1. Include letter from Manufacturer written for this Project indicating approval of Installer.
- C. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
  1. Submit evidence of compliance with performance requirements, including FM Global listing.
  2. Product Compatibility: Indicate manufacturer has verified compatibility of roofing system components, including but not limited to: Roofing membrane, flashing sheets, adhesives, and sealants.
- D. Warranties: Unexecuted sample copies of special warranties.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Maintenance Data: To include in maintenance manuals.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years' experience installing products comparable to those specified, able to communicate verbally with Contractor, Architect, and employees, and qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.
- B. Manufacturer Qualifications: Approved manufacturer listed in this Section, UL listed for roofing systems identical to that specified for this Project, with minimum five years experience in manufacture of specified products in successful use in similar applications.
- C. Roofing Inspector Qualifications: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:

1. An authorized full-time technical employee of the manufacturer.

D. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
  1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

## 1.9 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- B. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
  - 1. Provide tie-offs at end of each day's work to cover exposed roofing and insulation with a course of roofing sheet securely in place with joints and edges sealed.
  - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
  - 3. Remove temporary plugs from roof drains at end of each day.
  - 4. Remove and discard temporary seals before beginning work on adjoining roofing.

## 1.10 WARRANTY

- A. Warranty, General: Warranties specified shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. Manufacturer's Warranty: Manufacturer's standard or customized form, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.
  - 1. Manufacturer's warranty includes roofing membrane, base flashings, fasteners, roofing membrane accessories and other components of roofing system specified in this Section.
  - 2. Warranty Period: 20 years from date of Substantial Completion.
- C. Installer's Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section and related Sections indicated above, including all components of membrane roofing such as single ply roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
  - 1. Warranty Period: Two years from date of Substantial Completion.
- D. Extended Roof System Warranty: Warranties specified in this Section include the following components and systems specified in other sections supplied by the roofing system Manufacturer, and installed by the roofing system Installer:
  - 1. Sheet metal flashing and trim, including roof penetration flashings.
  - 2. Manufactured copings, roof edge, counterflashings, and reglets.

3. Roof curbs, hatches, and penetration flashings.
4. Roof and parapet expansion joint assemblies.
5. Metal roof, wall, and soffit panels and trim.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by a manufacturer meeting qualification requirements in Quality Assurance Article.
- B. Basis-of-Design Manufacturer/Product: The roof system specified in this Section is based upon products of Tremco, Inc. or Owner Approved Equal.
- C. Source Limitations: Obtain components for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
  1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
  2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- C. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.
- D. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.
- E. Energy Performance: Roofing system shall have an initial solar reflectance index of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.
- F. FMG 1-90 Wind uplift Classification

## 2.3 THERMOPLASTIC MEMBRANE MATERIALS

- A. Thermoplastic PVC/TPA sheet, ASTM D4434 Type IV internally fabric reinforced, Energy Star qualified, CRRC listed, and California Title 24 Energy Code compliant.
  - 1. Basis of design product: Tremco, TPA Roof Membrane or Garland Solar Bright 60 Evaloy KEE single ply roofing system.
  - 2. Tensile Strength at 0 deg. F (-18 deg. C), minimum, ASTM D 751: 300 lbf/in.
  - 3. Tear Strength at 77 deg. F (25 deg. C), minimum, ASTM D 751: 100 lbf.
  - 4. Elongation at 0 deg. F (-18 deg. C), minimum at fabric break, ASTM D 751: 25 percent.
  - 5. Minimum Thickness, nominal, ASTM D 751: 60 mils.
  - 6. Exposed Face Color: White.
  - 7. Reflectance, ASTM C 1549: 86 percent.
  - 8. Thermal Emittance, ASTM C 1371: 0.86.
  - 9. Solar Reflectance Index (SRI), ASTM E 1980: 108.
  - 10. Recycled Content, minimum: 25 percent preconsumer.
- B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC/TPA sheet membrane.

## 2.4 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.
  - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Membrane Bonding Adhesive:
  - 1. Elastomeric solvent-based contact-type adhesive for bonding TPA single ply membranes and flashings to substrates..
    - a. TPA Single Ply Bonding Adhesive or Equal.
    - b. Density at 77 deg. F (25 deg. C), minimum, ASTM D 1475: 7.0 lb/gal.
    - c. Percent solids, minimum: 25 percent.
- C. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 mm by 3 mm) thick; with anchors.



- D. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch (25 mm wide by 1.3 mm) thick, prepunched.
- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening components to substrate, and acceptable to membrane roofing system manufacturer.
- F. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

## 2.5 ROOF INSULATION MATERIALS

- A. Glass-mat-faced gypsum panel, ASTM C1177/C 1177M.
  - 1. Basis of design product: Tremco/GP Gypsum DensDeck.
  - 2. Thickness: 1/2 inch.
- B. Polyisocyanurate board insulation, high density, ASTM C 1289 Type II Class 4 CFC- and HCFC- free, with recycled content glass-fiber mat facer on both major surfaces. CCMC listed.
  - 1. Compressive Strength, ASTM C 1621: Grade 4: Not less than 80 psi (550 kPa).
  - 2. Conditioned Thermal Resistance at 75 deg. F (24 deg. C): 2.5 at 0.5 inches (13 mm) thick.
  - 3. Thickness as required to infill metal roofing seams of roofing to remain under new.
- C. Molded Polystyrene (EPS) Board Insulation.
- D. General: Preformed roof insulation boards manufactured [or approved] by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Global-approved roof insulation.
- E. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

## 2.6 WALKWAY MATERIALS

- A. Walkway roll, reinforced PVC/TPA membrane roll with serrated slip-resistant surface, fabricated for heat welding to compatible PVC/TPA membrane surface.
  - 1. TPA Walkway Roll or Equal.
  - 2. Roll Size: 36 inches by 60 feet.
  - 3. Thickness: 0.080 inch.
  - 4. Color: Grey.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
  - 1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
  - 2. Wood Roof Deck: Verify that wood deck is securely fastened with no projecting fasteners.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

#### 3.3 INSTALLATION, GENERAL

- A. Install roofing system in accordance with manufacturer's recommendations.

#### 3.4 INSULATION INSTALLATION

- A. Install tapered insulation under area of roofing to conform to slopes indicated.
- B. Install insulation under area of roofing to achieve required thickness to infill between existing metal roofing seams. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- C. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- D. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
  - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

- E. Cover Boards: Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and mechanically fasten to roof deck.
  - 1. Mechanically fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.
  - 2. Loosely lay cover boards and secure to deck with mechanical fasteners installed with mechanically-attached membrane.

### 3.5 MECHANICALLY FASTENED MEMBRANE ROOFING INSTALLATION

- A. Mechanically fasten membrane roofing over area to receive roofing and install according to roofing system manufacturer's written instructions.
  - 1. Install sheet according to ASTM D 5082.
- B. Start installation of membrane roofing in presence of roofing system manufacturer's technical personnel.
- C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Mechanically fasten or adhere membrane roofing securely at terminations, penetrations, and perimeter of roofing.
- E. Apply membrane roofing with side laps shingled with slope of roof deck where possible.
- F. Welded Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
  - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
  - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
  - 3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.
- G. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

### 3.6 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

### 3.7 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

### 3.8 FIELD QUALITY CONTROL

- A. Manufacturer Inspector: Manufacturer will employ technical personnel to inspect the roof while it is being installed. Roof will be inspected a minimum of 3 times per week while in progress.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.
- D. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.9 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

**SECTION 07 7200  
ROOF ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Curbs.
- B. Roof penetrations mounting curbs.
- C. Roof hatches, manual and automatic operation, including smoke vents.
- D. Non-penetrating pedestals.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 6200 - Sheet Metal Flashing and Trim: Roof accessory items fabricated from sheet metal.

**1.03 REFERENCE STANDARDS**

- A. 29 CFR 1910.23 - Guarding floor and wall openings and holes; current edition.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- E. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).
- F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.
- H. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.
- I. UL (DIR) - Online Certifications Directory; current listings at [database.ul.com](http://database.ul.com).

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
  - 4. Maintenance requirements.
- C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.
  - 1. Non-penetrating Rooftop Supports: Submit design calculations for loadings and spacings.
  - 2. Submit shop drawings sealed and signed by a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- D. Shop Drawings General: Show fabrication and installation details. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other Work.
- E. Warranty Documentation:
  - 1. Submit manufacturer warranty.

2. Ensure that forms have been completed in Owner's name and registered with manufacturer.
3. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.

#### **1.06 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

#### **1.07 QUALITY ASSURANCE**

- A. Standards: Comply with the following:
  1. SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.
  2. NRCA's "Roofing and Waterproofing Manual" details for installing units.

### **PART 2 PRODUCTS**

#### **2.01 ROOF HATCHES AND VENTS, MANUAL AND AUTOMATIC OPERATION**

- A. Manufacturers - Roof Hatches:
  1. Bilco Company; Type TB (various types and special size): [www.bilco.com/#sle](http://www.bilco.com/#sle).
  2. Milcor, Inc; \_\_\_\_\_: [www.milcorinc.com/#sle](http://www.milcorinc.com/#sle).
  3. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- B. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
  1. Material: Mill finished aluminum, 11 gage, 0.0907 inch thick.
  2. Insulation: Manufacturer's standard; 1 inch rigid glass fiber, located on outside face of curb.
  3. Curb Height: 12 inches from finished surface of roof, minimum.
- C. Safety Railing System: Manufacturer's standard accessory safety rail system mounted directly to curb.
  1. Comply with 29 CFR 1910.23, with a safety factor of two.
  2. Posts and Rails: Aluminum tube.
  3. Gate: Same material as railing; automatic closing with latch.
  4. Finish: Manufacturer's standard, factory applied finish.
  5. Gate Hinges and Post Guides: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper aluminum.
  6. Mounting Brackets: Hot dipped galvanized steel, 1/4 inch thick, minimum.
  7. Fasteners: Stainless steel, Type 316.
  8. Manufacturers:
    - a. BILCO Company; Bil-Guard 2.0: [www.bilco.com/#sle](http://www.bilco.com/#sle).
    - b. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- D. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
  1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf load.
  2. Hinges: Heavy duty pintle type.
  3. Hold open arm with vinyl-coated handle for manual release.
  4. Latch: Upon closing, engage latch automatically and reset manual release.
  5. Manual Release: Pull handle on interior.
  6. Locking: Padlock hasp on interior.

## **2.02 NON-PENETRATING ROOFTOP SUPPORTS/ASSEMBLIES**

- A. Non-Penetrating Rooftop Support/Assemblies: Manufacturer-engineered and factory-fabricated, with pedestal bases that rest on top of roofing membrane, and not requiring any attachment to roof structure and not penetrating roofing assembly.
  - 1. Design Loadings and Configurations: As required by applicable codes.
  - 2. Height: Provide minimum clearance of 6 inches under supported items to top of roofing.
  - 3. Support Spacing and Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
  - 4. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
  - 5. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.
  - 6. Manufacturers:
    - a. Metal Roof Innovations, Ltd. S-5! Attachment Solutions; S-5! Utility System: [www.s-5.com/#sle](http://www.s-5.com/#sle).
    - b. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- B. Pipe Supports: Provide attachment fixtures complying with MSS SP-58 and as indicated.
  - 1. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
  - 2. See relevant piping system specification section for additional requirements.
- C. Duct Supports: Provide extruded aluminum supports and sized in accordance with diameter of supported ducts, and with base that is non-penetrating of roofing membrane.
- D. Non-Penetrating Pedestals: Steel pedestals with square, round, or rectangular bases.
  - 1. Bases: High density polypropylene.
  - 2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
  - 3. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
  - 4. Manufacturers:
    - a. Portals Plus; Pedestal Plus: [www.portalsplus.com/#sle](http://www.portalsplus.com/#sle).
    - b. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### **3.02 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.
- B. Install roof accessory items according to construction details of NRCA's "Roofing and Waterproofing Manual," unless otherwise indicated,
- C. Separation: Separate metal from incompatible metal or corrosive substrates, including wood, by coating concealed surfaces, at locations of contact, with bituminous coating or providing other permanent separation.
- D. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.

- E. Cap Flashing: Where required as component of accessory, install cap flashing to provide waterproof overlap with roofing or roof flashing (as counterflashing). Seal overlap with thick bead of mastic sealant.
- F. Operational Units: Test-operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.
- G. Heat-and-Smoke Vents: Locate, install, and test according to NFPA 204M.

**3.04 CLEANING**

- A. Clean installed work to like-new condition.

**3.05 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

**END OF SECTION 07 7200**



**SECTION 07 9005  
JOINT SEALERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Sealants and joint backing.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 08 8000 - Glazing: Glazing sealants and accessories.
- C. Section 09 2116 - Gypsum Board Assemblies: Acoustic sealant.
- D. Section 09 3000 - Tiling: Sealant used as tile grout.

**1.03 REFERENCE STANDARDS**

- A. ASTM C834 - Standard Specification for Latex Sealants; 2014.
- B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
- E. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2005 (Reapproved 2010).

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate the work with other sections referencing this section.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating sealant chemical characteristics.
- C. Manufacturer's Installation Instructions: Indicate special procedures.

**1.06 QUALITY ASSURANCE**

- A. Maintain one copy of each referenced document covering installation requirements on site.

**1.07 MOCK-UP**

- A. Provide mock-up of sealant joints in conjunction with window under provisions of Section 01 4000.
- B. Construct mock-up with specified sealant types and with other components noted.
- C. Locate where directed.
- D. Mock-up may remain as part of the Work.

**1.08 FIELD CONDITIONS**

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

**1.09 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Gunnable and Pourable Sealants:
  - 1. BASF Construction Chemicals-Building Systems: [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com).

2. Bostik Inc: [www.bostik-us.com](http://www.bostik-us.com).
3. Dow Corning Corporation: [www.dowcorning.com](http://www.dowcorning.com).
4. Hilti, Inc: [www.us.hilti.com](http://www.us.hilti.com).
5. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
6. Tremco Global Sealants: [www.tremcosealants.com](http://www.tremcosealants.com).
7. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

## 2.02 SEALANTS

- A. Sealants and Primers - General: Provide products having volatile organic compound (VOC) content as specified in Section 01 6116.
- B. Type \_\_\_ - General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25 minimum; Uses M, G, and A; single component.
  1. Color: To be selected by Architect from manufacturer's full range.
  2. Applications: Use for:
    - a. Control, expansion, and soft joints in masonry.
    - b. Joints between concrete and other materials.
    - c. Joints between metal frames and other materials.
    - d. Other exterior joints for which no other sealant is indicated.
- C. Type \_\_\_ - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
  1. Color: To be selected by Architect from manufacturer's full range.
  2. Applications: Use for:
    - a. Other interior joints for which no other type of sealant is indicated.
  3. Products:
    - a. Bostik Inc; \_\_\_\_: [www.bostik-us.com](http://www.bostik-us.com).
    - b. Pecora Corporation; AC-20 + Silicone Acrylic Latex Caulking Compound: [www.pecora.com](http://www.pecora.com).
    - c. BASF Construction Chemicals-Building Systems; \_\_\_\_: [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com).
    - d. Tremco Global Sealants; \_\_\_\_: [www.tremcosealants.com](http://www.tremcosealants.com).
- D. Type \_\_\_ - Bathtub/Tile Sealant: White silicone; ASTM C920, Uses I, M and A; single component, mildew resistant.
  1. Applications: Use for:
    - a. Joints between plumbing fixtures and floor and wall surfaces.
    - b. Joints between kitchen and bath countertops and wall surfaces.
  2. Products:
    - a. Bostik Inc; \_\_\_\_: [www.bostik-us.com](http://www.bostik-us.com).
    - b. BASF Construction Chemicals-Building Systems; \_\_\_\_: [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com).
    - c. Pecora Corporation; 898NST Sanitary Silicone Sealant - Class 50: [www.pecora.com](http://www.pecora.com).
    - d. Tremco Global Sealants; \_\_\_\_: [www.tremcosealants.com](http://www.tremcosealants.com).
    - e. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- E. Type \_\_\_ - Acoustical Sealant for Concealed Locations:
  1. Composition: Acrylic latex emulsion sealant.
  2. Applications: Use for concealed locations only:
    - a. Sealant bead between top stud runner and structure and between bottom stud track and floor.
  3. Products:
    - a. Bostik Inc; \_\_\_\_: [www.bostik-us.com](http://www.bostik-us.com).
    - b. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant: [www.pecora.com](http://www.pecora.com).
    - c. BASF Construction Chemicals-Building Systems; \_\_\_\_: [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com).

- d. Tremco Global Sealants; \_\_\_\_: [www.tremcosealants.com](http://www.tremcosealants.com).
  - e. Hilti, Inc.; CP 506 Smoke and Acoustical Sealant: [www.us.hilti.com](http://www.us.hilti.com).
  - f. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- F. Type \_\_\_\_ - Concrete Floor Joint Filler: Self-leveling, pourable, semi-rigid sealant intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
- 1. Composition: Single or multi-part, 100 percent solids by weight.
  - 2. Hardness: 85 after 7 days, when tested in accordance with ASTM D2240 Shore A.
  - 3. Color: To be selected by Architect from manufacturer's standard colors.
  - 4. Joint Width: 1/8 inch.
  - 5. Joint Width, Maximum: 1/4 inch.
  - 6. Joint Depth: Provide product suitable for joints from 1/8 inch to 2 inches in depth including space for backer rod.
  - 7. Applications: Use for:
    - a. Control joints in concrete slabs and floors not filled with filler placed in form.
    - b. joints in concrete slabs and floors.
  - 8. Products:
    - a. ARDEX Americas; ARDISEAL RAPID PLUS: [www.ardexamericas.com](http://www.ardexamericas.com).
    - b. W.R. Meadows, Inc; Rezi-Weld Flex: [www.wrmeadows.com](http://www.wrmeadows.com).
    - c. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- G. Type \_\_\_\_ - Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C920, Class 25, Uses T, I, M and A; single component.
- 1. Color: Gray.
  - 2. Applications: Use for:
    - a. Joints in sidewalks and vehicular paving.
  - 3. Products:
    - a. Bostik Inc; \_\_\_\_: [www.bostik-us.com](http://www.bostik-us.com).
    - b. Pecora Corporation; NR-201 Self-Leveling Traffic and Loop Sealant: [www.pecora.com](http://www.pecora.com).
    - c. BASF Construction Chemicals-Building Systems; \_\_\_\_: [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com).

## 2.03 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

### 3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Protect elements surrounding the work of this section from damage or disfigurement.

- E. Exposed Concrete Floor Joints: Test joint filler in inconspicuous area of floor slab. Verify specified product does not stain or discolor slab.

### **3.03 INSTALLATION**

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Perform acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- E. Install bond breaker where joint backing is not used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- H. Tool joints concave.
- I. Concrete Floor Joint Filler: Install concrete floor joint filler per manufacturer's written instructions. After floor joint filler is fully cured, shave joint filler flush with top of concrete slab.

### **3.04 CLEANING**

- A. Clean adjacent soiled surfaces.

### **3.05 PROTECTION**

- A. Protect sealants until cured.

**END OF SECTION 07 9005**

**SECTION 08 1113  
HOLLOW METAL DOORS AND FRAMES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal frames for wood doors.
- C. Fire-rated hollow metal doors and frames.
- D. Thermally insulated hollow metal doors with frames.
- E. Hollow metal borrowed lites glazing frames.
- F. Accessories, including glazing, louvers, and matching panels.

**1.02 RELATED REQUIREMENTS**

- A. Section 08 7100 - Door Hardware.
- B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.
- C. Section 09 9113 - Exterior Painting: Field painting.

**1.03 ABBREVIATIONS AND ACRONYMS**

- A. ANSI: American National Standards Institute.
- B. ASCE: American Society of Civil Engineers.
- C. HMMA: Hollow Metal Manufacturers Association.
- D. NAAMM: National Association of Architectural Metal Manufacturers.
- E. NFPA: National Fire Protection Association.
- F. SDI: Steel Door Institute.
- G. UL: Underwriters Laboratories.

**1.04 REFERENCE STANDARDS**

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2007 (R2011).
- C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.
- D. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2003 (R2009).
- E. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.
- F. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.
- G. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.
- H. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2015.
- I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- J. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.

- K. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2014.
- L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- M. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.
- N. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.
- O. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.
- P. ITS (DIR) - Directory of Listed Products; current edition.
- Q. NAAMM HMMA 805 - Recommended Selection and Usage Guide for Hollow Metal Doors and Frames; 2012.
- R. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- S. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
- T. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.
- U. NAAMM HMMA 850 - Fire-Protection and Smoke Control Rated Hollow Metal Door and Frame Products; 2014.
- V. NAAMM HMMA 860 - Guide Specifications for Hollow Metal Doors and Frames; 2013.
- W. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2006.
- X. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.
- Y. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2016.
- Z. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.
- AA. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.
- AB. UL (DIR) - Online Certifications Directory; current listings at [database.ul.com](http://database.ul.com).
- AC. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- AD. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

#### **1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.
- F. Manufacturer's Qualification Statement.

#### **1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Provide hollow metal doors and frames from SDI Certified manufacturer: [www.steeldoor.org/sdicertified.php/#sle](http://www.steeldoor.org/sdicertified.php/#sle).
- B. Installer Qualifications: An employer of workers trained and approved by manufacturer.

- C. Source Limitations: Obtain custom steel doors and frames through one source from a single manufacturer.
- D. C. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- E. E. Fire-Rated Door and Frame Assemblies: Where fire-rated door assemblies are indicated or required, provide fire-rated door and frame assemblies that comply with HMMA 850-00 and 2010 CBC, Section 715, and have been tested, listed and labeled in accordance with 2010 CBC, Section 715. "Fire Tests of Door Assemblies" by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.
- F. 1. Test Pressure: Test according to UBC Standard 7-2. After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches or less above the sill
- G. F. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to 2010 CBC, Section 715. Label each individual glazed lite
- H. Maintain at the project site a copy of all reference standards dealing with installation.

### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.
- C. B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- D. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high, wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

### **1.08 PROJECT COORDINATION**

- A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.
- B. Coordinate installation of anchorages for custom steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Hollow Metal Doors and Frames:
  - 1. Titan Metal Products, Inc: [www.titanmetalinc.com](http://www.titanmetalinc.com)
  - 2. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

### **2.02 PERFORMANCE REQUIREMENTS**

- A. Requirements for Hollow Metal Doors and Frames:
  - 1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
  - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
  - 3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
  - 4. Typical Door Face Sheets: Flush.

5. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
  6. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
    - a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

## 2.03 HOLLOW METAL DOORS

- A. Door Finish: Factory primed and field finished.
- B. Type \_\_\_\_, Exterior Doors: Thermally insulated.
1. Based on NAAMM HMMA Custom Guidelines:
    - a. Comply with guidelines of NAAMM HMMA 860 for Hollow Metal Doors and Frames.
    - b. Performance Level 3 - Heavy Duty, in accordance with NAAMM HMMA 805.
    - c. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
    - d. Door Face Metal Thickness: 18 gage, 0.042 inch, minimum.
  2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
    - a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
  3. Door Thickness: 1-3/4 inch, nominal.
  4. Top Closures for Outswinging Doors: Flush with top of faces and edges.
  5. Door Face Sheets: Flush.
  6. Weatherstripping: Refer to Section 08 7100.
- C. Type \_\_\_\_, Interior Doors, Non-Fire-Rated:
1. Based on NAAMM HMMA Custom Guidelines:
    - a. Comply with guidelines of NAAMM HMMA 860 for Hollow Metal Doors and Frames.
    - b. Performance Level 3 - Heavy Duty, in accordance with NAAMM HMMA 805.
    - c. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
    - d. Door Face Metal Thickness: 18 gage, 0.042 inch, minimum.
  2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
  3. Door Thickness: 1-3/4 inch, nominal.
- D. Type \_\_\_\_, Fire-Rated Doors:
1. Based on NAAMM HMMA Custom Guidelines: Comply with NAAMM HMMA 850 requirements for fire-rated doors.
    - a. Comply with guidelines of NAAMM HMMA 860 for Hollow Metal Doors and Frames.
    - b. Performance Level 3 - Heavy Duty, in accordance with NAAMM HMMA 805.
    - c. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
    - d. Door Face Metal Thickness: 18 gage, 0.042 inch, minimum.
  2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
    - a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
    - b. Attach fire rating label to each fire rated unit.
  3. Door Thickness: 1-3/4 inch, nominal.



## **2.04 HOLLOW METAL FRAMES**

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Exterior Door Frames: Full profile/continuously welded type.
  - 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
  - 2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
  - 3. Frame Finish: Factory primed and field finished.
  - 4. Weatherstripping: Separate, see Section 08 7100.
- C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
  - 1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
  - 2. Frame Finish: Factory primed and field finished.
- D. Door Frames, Fire-Rated: Full profile/continuously welded type.
  - 1. Fire Rating: Same as door, labeled.
  - 2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
  - 3. Frame Finish: Factory primed and field finished.
- E. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.
- F. Transom Bars: Fixed, of profile same as jamb and head.

## **2.05 FINISHES**

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

## **2.06 ACCESSORIES**

- A. Glazing: As specified in Section 08 8000, factory installed.
- B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
- C. Astragals for Double Doors: Specified in Section 08 7100.
  - 1. Fire-Rated Doors: Steel, shape as required for fire rating.
- D. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.
- F. F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50 respectively; passing ASTM E 136 for combustion characteristics.

## **2.07 FINISHES**

- A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard. Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

### **3.02 INSTALLATION**

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

- B. Install fire rated units in accordance with NFPA 80.
- C. 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged
- D. Install door silencers in frames before grouting
- E. e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
- F. Coordinate frame anchor placement with wall construction.
- G. f. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances
- H. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with post installed expansion anchors
- I. Fill frame cavity with mineral wool insulation prior to installation of wall sheathing.
- J. Install door hardware as specified in Section 08 7100.
- K. Comply with glazing installation requirements of Section 08 8000.
- L. Coordinate installation of electrical connections to electrical hardware items.
- M. Touch up damaged factory finishes.

### **3.03 TOLERANCES**

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

### **3.04 ADJUSTING**

- A. Adjust for smooth and balanced door movement.
- B. Leave work in complete and proper operating condition. Remove and replace defective work including custom steel doors or frames that are warped, bowed, or otherwise unacceptable.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

**END OF SECTION 08 1113**

**SECTION 08 7100  
DOOR HARDWARE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Hardware for hollow metal doors.
- B. Hardware for fire-rated doors.
- C. Thresholds.
- D. Weatherstripping, seals and door gaskets.

**1.02 RELATED REQUIREMENTS**

- A. Section 08 1113 - Hollow Metal Doors and Frames.

**1.03 REFERENCE STANDARDS**

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. BHMA A156.1 - American National Standard for Butts and Hinges; 2013.
- C. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; 2011.
- D. BHMA A156.3 - American National Standard for Exit Devices; 2014.
- E. BHMA A156.4 - American National Standard for Door Controls - Closers; 2013.
- F. BHMA A156.5 - American National Standard for Cylinders and Input Devices for Locks; 2014.
- G. BHMA A156.6 - American National Standard for Architectural Door Trim; 2010.
- H. BHMA A156.7 - American National Standard for Template Hinge Dimensions; 2014.
- I. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders; 2010.
- J. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000; 2012.
- K. BHMA A156.16 - American National Standard for Auxiliary Hardware; 2013.
- L. BHMA A156.18 - American National Standard for Materials and Finishes; 2012.
- M. BHMA A156.21 - American National Standard for Thresholds; 2014.
- N. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association; 2012.
- O. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.
- P. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.
- Q. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.
- R. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; 1993; also in WDHS-1/WDHS-5 Series, 1996.
- S. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.
- T. NFPA 101 - Life Safety Code; 2015.
- U. UL (DIR) - Online Certifications Directory; current listings at [database.ul.com](http://database.ul.com).

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware will be installed upon.
- B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

- C. Convey Owner's keying requirements to manufacturers.
- D. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by all affected installers.
- E. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

#### **1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.
- C. Hardware Schedule: Detailed listing of each item of hardware to be installed on each door. Use door numbering scheme as included in the Contract Documents. Identify electrically operated items and include power requirements.
- D. Keying Schedule: Submit for approval of Owner.
- E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- F. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.
- G. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- H. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
  1. See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS, for additional provisions.
  2. Tools: One set of all special wrenches or tools applicable to each different or special hardware component, whether supplied by the hardware component manufacturer or not.

#### **1.06 QUALITY ASSURANCE**

- A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.
- B. Hardware Supplier Qualifications: Company specializing in supplying the type of products specified in this section with at least three years documented experience.
- C. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.
- D. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Coordination." In addition to Owner, Construction Manager, Contractor, conference participants shall also include Installer's Architectural Hardware Consultant and Owner's security consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
  1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
  2. Preliminary key system schematic diagram.
  3. Requirements for key control system.
  4. Address for delivery of keys.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.
- B. Provide secure lock up for door hardware delivered to site.

- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

#### **1.08 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide 3 year warranty for all hardware with the following exceptions:
- C. Provide 10 year warranty for Exit Devices and Manual Closures.

#### **1.09 MAINTENANCE SERVICE**

- A. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies same as those used in the manufacture and installation of original products.
- B. In addition to maintenance service, contractor shall schedule warranty service with the owner at the completion of the project for any adjustments nine months after substantial complete.

#### **1.10**

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Allegion Brands, Ives, LCN, Schlage, Steelcraft, or Von Duprin: [www.allegion.com/us](http://www.allegion.com/us).
- B. Assa Abloy Brands, Corbin Russwin, Curries, McKinney, Norton, Sargent, or Yale: [www.assaabloydss.com](http://www.assaabloydss.com).
- C. C. R. Laurence Company, Inc: [www.crl-arch.com/sle](http://www.crl-arch.com/sle).
- D. DORMA USA, Inc: [www.dorma.com](http://www.dorma.com).
- E. Hager Companies: [www.hagerco.com](http://www.hagerco.com).
- F. Trimco Hardware: [www.trimcohardware.com](http://www.trimcohardware.com).
- G. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

#### **2.02 GENERAL REQUIREMENTS**

- A. Provide door hardware specified, or as required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.
- B. Provide items of a single type of the same model by the same manufacturer.
- C. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:
  - 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements.
- D. Provide products that comply with the following:
  - 1. Applicable provisions of federal, state, and local codes.
  - 2. ADA Standards for Accessible Design. Comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." ANSI A117.1 FED-STD-795, "Uniform Federal Accessibility Standards," and 2010 CBC, Sections 1133B.2.1 and 1008, Title 24.
  - 3. Applicable provisions of NFPA 101, Life Safety Code.
  - 4. Fire-Rated Doors: NFPA 80.
  - 5. Hardware on Fire-Rated Doors, Except Hinges: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.
  - 6. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
  - 7. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide hardware that enables door assembly to comply with air leakage requirements of the applicable code.

- E. Finishes: Provide door hardware of the same finish unless otherwise indicated.
  - 1. Finish: Satin chrome plated over nickel on brass or bronze, 626 (approx US26D).
  - 2. Finish Definitions: BHMA A156.18.
  - 3. Exceptions:
    - a. Where base metal is specified to be different, provide finish that is an appearance equivalent according to BHMA A156.18.
    - b. Hinges for Fire-Rated Doors: Steel base metal with plated finish.
    - c. Door Closer Covers and Arms: Shall be sprayed aluminum finish (**Plastic closure covers not accepted**).
    - d. Thresholds shall be mill finish aluminum
    - e. Push, Pull and kick plates shall be stainless steel.
  - 4. Protection of Finishes: Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
  - 5. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- F. Fasteners:
  - 1. Mineral Core Wood Doors: Sex bolts.
  - 2. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
    - a. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
    - b. Steel Machine or Wood Screws: For the following fire-rated applications:
      - 1) Mortise hinges to doors.
      - 2) Strike plates to frames.
      - 3) Closers to doors and frames.
    - c. Steel Through Bolts: For the following fire-rated applications unless door blocking is provided:
      - 1) Surface hinges to doors.
      - 2) Closers to doors and frames.
      - 3) Surface-mounted exit devices.
    - d. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
    - e. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
  - 3.

### 2.03 LOCKS AND LATCHES

- A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
  - 1. Hardware Sets indicate locking functions required for each door.
  - 2. If no hardware set is indicated for a swinging door provide an office lockset.
  - 3. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
  - 4. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.
- B. Lock Cylinders: Manufacturer's standard tumbler type, six-pin standard core.

1. Provide cams and/or tailpieces as required for locking devices required.
- C. Keying: Grand master keyed.
- D. Latches: Provide a latch for every door that is not required to lock, unless specifically indicated "push/pull" or "not required to latch".

#### **2.04 HINGES**

- A. Hinges: Provide hinges on every swinging door.
1. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
  2. Provide ball-bearing hinges at all doors.
  3. Provide hinges in the quantities indicated.
  4. Provide non-removable pins on outswinging doors. Provide set screw in hinge barrel that when tightened into a groove in hinge pin, prevent removal of pin while door is closed.
  5. Provide non-removable pins on outswinging interior doors at storage rooms.
  6. Square hinges
- B. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7; standard weight, unless otherwise indicated.
1. Provide hinge width required to clear surrounding trim.
- C. Quantity of Hinges Per Door:
1. Doors From 60 inches High up to 90 inches High: Three hinges.
- D. Manufacturers - Hinges:
1. Assa Abloy Brands; McKinney: [www.assaabloydss.com](http://www.assaabloydss.com).
  2. Hager Companies: [www.hagerco.com](http://www.hagerco.com).
  3. Stanley Black & Decker: [www.stanleyblackanddecker.com](http://www.stanleyblackanddecker.com).
  4. Baldwin Hardware Corporation.
  5. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

#### **2.05 PUSH/PULLS**

- A. Push/Pulls: Comply with BHMA A156.6.
1. Provide push and pull on doors not specified to have lockset, latchset, exit device, or auxiliary lock.
  2. On solid doors, provide matching push plate and pull plate on opposite faces.
- B. Manufacturers - Push/Pulls:
1. Assa Abloy Brands, McKinney: [www.assaabloydss.com](http://www.assaabloydss.com).
  2. Hager Companies: [www.hagerco.com](http://www.hagerco.com).
  3. Trimco: [www.trimcohardware.com](http://www.trimcohardware.com).
  4. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

#### **2.06 LOCKS, LATCHES AND CYLINDERS**

- A. *Regulatory Requirements: All rooms shall include locks that allow doors to classrooms and any room with an occupancy of five or more persons to be locked from the inside in compliance with DSA's BU 11-05.*
- B. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22 N).
  2. Latches and Locks for Means of Egress Doors: Comply with 2010 CBC, Section 1008. Latches shall not require more than 15 lbf (67 N) to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- C. Lock Cylinders: Manufacturer's standard tumbler type, seven-pin standard core.
1. Provide cylinders for each and all locking device including locksets, panic hardware, mortise lock, removable mullions, etc.
  2. Bored-Lock Type: Cylinders with tailpieces to suit locks.
    - a. Retain subparagraph below with any of three subparagraphs above; high-security grade is not available with interchangeable core.

- b. High-Security Grade: BHMA A156.5, Grade 1A, listed and labeled as complying with pick- and drill-resistant testing requirements in UL 437 (Suffix A).
  - 3.
- D. Keying: Grand master keyed.
  - 1. Key to clients existing keying system.
    - a. Schlage
  - 2. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal.
  - 3. Construction Cores: Provide construction cores that are replaceable by permanent cores.
    - a. Replace construction cores with permanent cores as directed by Owner.
    - b. Furnish permanent cores to Owner for installation.
  - 4. Keys
    - a. Provide Nickel silver keys.
      - 1) Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
        - (a) Notation: "DO NOT DUPLICATE."
- E. Lock Trim:
  - 1. Levers: Cast.
  - 2. Escutcheons (Roses): Cast.
  - 3. Dummy Trim: Match lever lock trim and escutcheons.
- F. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
  - 1. Bored Locks: Minimum 1/2-inch (13-mm) latchbolt throw.
- G. Backset: 2-3/4 inches (70 mm), unless otherwise indicated.
- H. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set.

## **2.07 CYLINDRICAL LOCKSETS**

- A. Locking Functions: As defined in BHMA A156.2, and as follows.
  - 1. Intruder Classroom: F110, keyed both sides.
  - 2. Hotel: F93.
  - 3. Two-Key Entry: F88, outside locked by key from both sides, free egress
- B. Manufacturers - Cylindrical Locksets:
  - 1. Schlage, an Allegion brand; \_\_\_\_\_: [www.allegion.com/us](http://www.allegion.com/us).
  - 2. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

## **2.08 FLUSHBOLTS AND COORDINATORS**

- A. Manual Flushbolts: Provide lever extensions for top bolt at over-size doors.
- B. Self-Latching Flushbolts: Automatically latch upon closing of door; manually retracted.
- C. Coordinators: Provide on doors having closers and self-latching or automatic flushbolts to ensure that leaves close in proper order.
- D. Manufacturers - Flushbolts:
  - 1. Assa Abloy Brands, McKinney: [www.assaabloydss.com](http://www.assaabloydss.com).
  - 2. Hager Companies: [www.hagerco.com](http://www.hagerco.com).
  - 3. Ives, an Allegion brand: [www.allegion.com/us](http://www.allegion.com/us).
  - 4. Trimco: [www.trimcohardware.com](http://www.trimcohardware.com).
  - 5. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

## **2.09 CLOSERS**

- A. Closers: Complying with BHMA A156.4.
  - 1. Provide surface-mounted, door-mounted closers unless otherwise indicated.
  - 2. Provide a door closer on every exterior door.



3. Provide a door closer on every fire- and smoke-rated door. Spring hinges are not an acceptable self-closing device unless specifically so indicated. Coordinate and interface integral smoke detector and closer device with fire alarm system.
  4. On pairs of swinging doors, if an overlapping astragal is present, provide coordinator to ensure the leaves close in proper order.
  5. At outswinging exterior doors, mount closer in inside of door.
  6. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." ANSI A117.1. FED-STD-795, "Uniform Federal Accessibility Standards." CBC 1133B.
    - a. Comply with the following maximum opening-force requirements:
      - 1) Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
      - 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
  7. Door Closers for Means of Egress Doors: Comply with 2010 CBC, Section 1008.1.3. Door closers shall not require more than 5 lbf to set door in motion and not more than 5 lbf to open door to minimum required width.
- B. Manufacturers - Surface Mounted Closers:
1. Assa Abloy Brands, Corbin Russwin, Norton, Rixson, Sargent, or Yale: [www.assaabloydss.com](http://www.assaabloydss.com).
  2. LCN, an Allegion brand: [www.allegion.com/us](http://www.allegion.com/us).
  3. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

## 2.10 STOPS AND HOLDERS

- A. Stops: Complying with BHMA A156.8; provide a stop for every swinging door, unless otherwise indicated.
1. Provide floor stop/holder. Maximum 4" from wall.
  2. If floor stops are not practical, provide wall stops.
  3. If wall stops are not practical, due to configuration of room or furnishings, provide overhead stop.
  4. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop unless specifically so stated.
- B. Silencers for Metal Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum diameter 1/2 inch (13 mm); fabricated for drilled-in application to frame.
- C. Manufacturers - Wall and Floor Stops/Holders:
1. Assa Abloy Brands, McKinney: [www.assaabloydss.com](http://www.assaabloydss.com).
  2. Hager Companies: [www.hagerco.com](http://www.hagerco.com).
  3. Trimco., Inc: [www.trimcohardware.com](http://www.trimcohardware.com).
  4. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- D. Manufacturers - Magnetic Holder/Releases:
1. Hager Companies: [www.hagerco.com](http://www.hagerco.com).
  2. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

## 2.11 GASKETING AND THRESHOLDS

- A. Gasketing and Thresholds - Basis of Design: Pemko.
- B. Gaskets: Complying with BHMA A156.22.
1. On each door in smoke partition, provide smoke gaskets; top, sides, and meeting stile of pairs. If fire/smoke partitions are not indicated on drawings, provide smoke gaskets on each door identified as a "smoke door" and 20-minute rated fire doors.
  2. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 and 2010 CBC, Section 715.
    - a. Test Pressure: Tested for smoke and draft control at 1.57 psf.

3. On each exterior door, provide weatherstripping gaskets, unless otherwise indicated; top, sides, and meeting stiles of pairs.
    - a. Where exterior door is also required to have fire or smoke rating, provide gaskets functioning as both smoke and weather seals.
  4. On each exterior door, provide door bottom sweep, unless otherwise indicated.
  5. On doors indicated as "sound-rated", "acoustical", or with an STC rating, provide sound-rated gaskets and automatic door bottom; make gaskets completely continuous, do not cut or notch gaskets for installation.
- C. Thresholds: Complying with BHMA A156.21.
1. At each exterior door, provide a threshold unless otherwise indicated.
  2. Field cut threshold to frame for tight fit.
  3. Standard: BHMA A156.21
  4. Accessibility Requirements: Where thresholds are indicated comply with accessibility requirements, comply with "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG) FED-STD-795, "Uniform Federal Accessibility Standards" CBC 1133B
    - a. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
  5. Manufacturers:
    - a. Pemko Manufacturing Co. (PEM).
- D. Fasteners At Exterior Locations: Non-corroding.
- E. Manufacturers - Gasketing and Thresholds:
1. Pemko Manufacturing Co: [www.pemko.com](http://www.pemko.com).
  2. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

## 2.12 PROTECTION PLATES AND ARCHITECTURAL TRIM

- A. Protection Plates:
1. Kickplate: Provide on push side of every door with closer, except aluminum storefront and glass entry doors.
  2. Latch Guard: Provide latch protector at all exterior swinging doors where latch is visible.
- B. Drip Guard: Provide projecting drip guard over all exterior doors unless they are under a projecting roof or canopy.
- C. Manufacturers - Protection Plates and Architectural Trim:
1. Rockwood Manufacturing Company, an Assa Abloy brand: [www.rockwoodmfg.com](http://www.rockwoodmfg.com).
  2. Hager Companies: [www.hagerco.com](http://www.hagerco.com).
  3. Trimco: [www.trimcohardware.com](http://www.trimcohardware.com).
  4. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

## 2.13 KEY CONTROLS

- A. Key Management System: For each keyed lock on project, provide one set of consecutively numbered duplicate key tags with hanging hole and snap catch.
1. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to number of keys to be managed.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.

### 3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Do not install surface mounted items until finishes applied to substrate are complete.

- D. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.
- E. Mounting heights for hardware from finished floor to center line of hardware item. As indicated in the following list; unless noted otherwise in Door Hardware Sets Schedule or on the drawings.
  - 1. For steel doors and frames: Comply with DHI (LOCS) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames".
  - 2. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
    - a. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
    - b. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
  - 3. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- F. Set exterior door thresholds with full-width bead of elastomeric sealant on each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

**3.03 ADJUSTING**

- A. Adjust work under provisions of Section 01 7000 - Execution and Closeout Requirements.
- B. Adjust hardware for smooth operation.
- C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

**3.04 CLEANING**

- A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

**3.05 PROTECTION**

- A. Protect finished Work under provisions of Section 01 7000 - Execution and Closeout Requirements.
- B. Do not permit adjacent work to damage hardware or finish.

**3.06 SCHEDULE - ATTACHED**

**HARDWARE SETS**

**4.01 HARDWARE SETS - GENERAL**

- A. These Hardware Sets indicate requirements for single doors of that type, with conditional requirements for pairs and other situations.
- B. Pairs of Swinging Doors: Provide one of each specified item on each leaf unless specifically stated otherwise. Treat pairs as two active leaves unless otherwise indicated.

**4.02 EXTERIOR OPENINGS**

Door Hardware Set No. 1 (Exterior, non-panic, single)

1-1/2 Pr.	Butts FBB 199	5 x 4-1/2	NRP
1	Lockset ND95PD	RHO	
1	Door Closer 7500H	SNB	
1	Kickplates	10" x 2" LDW	
1	Door Shoe	216	
1	Threshold	229 x 192 (modified/combination)	w/ galvanized expansion anchors
1	Door Stop	1233 or 1298	
1	Door Holder	1267 with Anchor Plate	1268

### 4.03 INTERIOR OPENINGS

Door Hardware Set No. 2 (Interior, non-panic, single, labeled).

1-1/2 Pr. Butts FBB 168 4-1/2 x 4-1/2  
1 Lockset ND50PD RHO  
1 Door Closer 7500 SNB  
1 Kickplates 10" x 2" LDW  
1 Door Stop W1212  
1 Wall Bumper 1270CV  
1 Smoke Seal - S88D x HSS-2000

Door Hardware Set No. 3 (Interior, non-panic, double, labeled).

3Pr. Butts FBB 168 4-1/2 x 4-1/2  
1 Lockset ND50PD RHO  
1 Single Dummy Trim 170 RHO  
2 Push Plate 47 3" x 12"  
2 Automatic Flush Bolts FB31P/FB41P Glynn-Johnson  
2 Kickplates 10" x 2" LDW  
2 Door Stops W1212  
2 Wall Bumpers 1270CV  
2 Door Closers 7500 SNB  
2 Smoke Seal - S88D x HSS-2000

Door Hardware Set No. 23 (Interior, single-compartment toilet, single).

1-1/2 Pr. Butts FBB 179 4-1/2 x 4-1/2  
1 Latchset ND85PD RHO  
1 Door Closer 7500 SNB  
1 Kickplates 10" x 2" LDW  
1 Door Stop W1212  
1 Wall Bumper 1270CV

Door Hardware Set No. 27 (Interior Between Classrooms)

1-1/2 Pr. Butts 168 4-1/2 x 4-1/2  
1 Lockset ND66PD RHO  
1 Kickplates 10" x 2" LDW  
1 Door Stop W1212  
1 Wall Bumper 1270CV  
1 Automatic Door Bottom 434AR

**END OF SECTION 08 7100**

## SECTION 08 8000

### GLAZING

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Glass.
- B. Glazing compounds and accessories.

##### 1.02 RELATED REQUIREMENTS

- A. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

##### 1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.
- C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2011).
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- E. ASTM C1036 - Standard Specification for Flat Glass; 2011.
- F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- I. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.
- J. GANA (GM) - GANA Glazing Manual; 2009.
- K. GANA (SM) - GANA Sealant Manual; 2008.

##### 1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
- D. Samples: Submit two samples 1' by 1' inch in size of glass and plastic units, showing coloration and design.
- E. Samples: Submit 12 inch long bead of glazing sealant, color as selected.

##### 1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual and GANA Sealant Manual for glazing installation methods.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

##### 1.06 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

## 1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Sealed Insulating Glass Units: Provide a ten (10) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.
- C. Laminated Glass: Provide a ten (10) year warranty to include coverage for delamination, including replacement of failed units.

## PART 2 PRODUCTS

### 2.01 INSULATING GLASS UNITS

- A. Type IG-1 - Sealed Insulating Glass Units: Vision glass, double glazed.
  - 1. Application: All exterior glazing unless otherwise indicated.
  - 2. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
    - a. Tint: Clear.
  - 3. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
    - a. Tint: Clear.
  - 4. Total Thickness: 1 inch.

### 2.02 GLASS MATERIALS

- A. Float Glass Manufacturers:
  - 1. AGC Flat Glass North America, Inc: [www.na.agc-flatglass.com](http://www.na.agc-flatglass.com).
  - 2. Guardian Industries Corp: [www.sunguardglass.com](http://www.sunguardglass.com).
  - 3. Pilkington North America Inc: [www.pilkington.com/na](http://www.pilkington.com/na).
  - 4. PPG Industries, Inc: [www.ppgideascales.com](http://www.ppgideascales.com).
  - 5. Substitutions: Refer to Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- B. Float Glass: Provide float glass based glazing unless noted otherwise.
  - 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality-Q3.
  - 2. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and Kind FT.
  - 3. Tinted Types: ASTM C1036, Class 2 - Tinted, color and performance characteristics as indicated.
  - 4. Thicknesses: As indicated; for exterior glazing comply with requirements indicated for wind load design regardless of thickness indicated.

### 2.03 SEALED INSULATING GLASS UNITS

- A. Manufacturers:
  - 1. Any of the manufacturers specified for float glass.
  - 2. Substitutions: Refer to Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- B. Sealed Insulating Glass Units: Types as indicated.
  - 1. Application: Exterior, except as otherwise indicated.
  - 2. Durability: Certified by an independent testing agency to comply with ASTM E2190.
  - 3. Edge Spacers: Aluminum, bent and soldered corners.
  - 4. Edge Seal: Glass to elastomer with supplementary silicone sealant.
  - 5. Purge interpane space with dry hermetic air.

### 2.04 GLAZING COMPOUNDS

- A. Manufacturers:
  - 1. Bostik Inc: [www.bostik-us.com](http://www.bostik-us.com).
  - 2. Momentive Performance Materials, Inc (formerly GE Silicones): [www.momentive.com](http://www.momentive.com).
  - 3. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
  - 4. BASF Construction Chemicals-Building Systems: [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com).
  - 5. Substitutions: Refer to Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- B. Butyl Sealant, Type \_\_\_\_: Single component; ASTM C920, Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

- C. Silicone Sealant, Type \_\_\_\_: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; \_\_\_\_\_ color.

## **2.05 GLAZING ACCESSORIES**

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
- C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; hardness range of 5 to 30 cured Shore A durometer; coiled on release paper; black color.
  - 1. Manufacturers:
    - a. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
    - b. Tremco Global Sealants: [www.tremcosealants.com](http://www.tremcosealants.com).
    - c. Substitutions: Refer to Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- D. Glazing Clips: Manufacturer's standard type.
- E. Smoke Removal Unit Targets: Adhesive targets affixed to glass to identify glass units intended for removal for smoke control.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that openings for glazing are correctly sized and within tolerance.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

### **3.02 PREPARATION**

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant.
- D. Install sealants in accordance with ASTM C1193 and GANA Sealant Manual.
- E. Install sealants in accordance with manufacturer's instructions.

### **3.03 INSTALLATION - EXTERIOR WET/DRY METHOD (PREFORMED TAPE AND SEALANT)**

- A. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with butyl sealant.
- B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.
- E. Install removable stops, with spacer strips inserted between glazing and applied stops 1/4 inch below sight lines.
  - 1. Place glazing tape on glazing pane of unit with tape flush with sight line.
- F. Fill gap between glazing and stop with \_\_\_\_\_ type sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.
- G. Apply cap bead of \_\_\_\_\_ type sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

### **3.04 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT)**

- A. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
- D. Install removable stops, spacer shims inserted between glazing and applied stops at 24 inch intervals, 1/4 inch below sight line.
- E. Fill gaps between pane and applied stop with \_\_\_\_\_ type sealant to depth equal to bite on glazing, to uniform and level line.
- F. Trim protruding tape edge.

### **3.05 FIELD QUALITY CONTROL**

- A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- B. Monitor and report installation procedures and unacceptable conditions.

### **3.06 CLEANING**

- A. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Clean glass and adjacent surfaces.

### **3.07 PROTECTION**

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

**END OF SECTION 08 8000**



**SECTION 09 0561**  
**COMMON WORK RESULTS FOR FLOORING PREPARATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This section applies to floors identified in contract documents that are receiving the following types of floor coverings:
  - 1. Resilient tile and sheet.
- B. Removal of existing floor coverings.
- C. Preparation of new and existing concrete floor slabs for installation of floor coverings.
- D. Testing of concrete floor slabs for moisture and alkalinity (pH).
- E. Patching compound.
- F. Remedial floor coatings.
- G. Preparation of new and existing wood-based floors and subfloors for installation of new floor coverings.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Limitations on curing requirements for new concrete floor slabs.

**1.03 REFERENCE STANDARDS**

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.
- B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 1999 (Reapproved 2014).
- C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.
- D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.
- E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2011.
- F. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; Resilient Floor Covering Institute; October 2011.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

**1.05 SUBMITTALS**

- A. Visual Observation Report: For existing floor coverings to be removed.
- B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
  - 1. Moisture and alkalinity (pH) limits and test methods.
  - 2. Manufacturer's required bond/compatibility test procedure.
- C. Testing Agency's Report:
  - 1. Description of areas tested; include floor plans and photographs if helpful.
  - 2. Summary of conditions encountered.
  - 3. Moisture and alkalinity (pH) test reports.
  - 4. Recommendations for remediation of unsatisfactory surfaces.
  - 5. Submit report to Architect.
  - 6. Submit report not more than two business days after conclusion of testing.

- D. Adhesive Bond and Compatibility Test Report.
- E. Copy of RFCI (RWP).

#### **1.06 QUALITY ASSURANCE**

- A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.
- B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
  - 1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.
  - 2. Acceptable Testing Agencies:
    - a. Independent Floor Testing & Inspection, Inc. (IFTI): [www.ifti.com/#sle](http://www.ifti.com/#sle).
    - b. Other testing agency approved by Owner.
- C. Contractor's Responsibility Relating to Independent Agency Testing:
  - 1. Provide access for and cooperate with testing agency.
  - 2. Confirm date of start of testing at least 10 days prior to actual start.
  - 3. Allow at least 4 business days on site for testing agency activities.
  - 4. Achieve and maintain specified ambient conditions.
  - 5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.
- B. Deliver materials in manufacturer's packaging; include installation instructions.
- C. Keep materials from freezing.

#### **1.08 FIELD CONDITIONS**

- A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.
- B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS**

- A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
  - 1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
  - 2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
  - 3. Products:
    - a. ARDEX Engineered Cements; ARDEX Feather Finish:  
[www.ardexamericas.com/#sle](http://www.ardexamericas.com/#sle).
    - b. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

- C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
  - 1. Thickness: As required for application and in accordance with manufacturer's installation instructions.
  - 2. Products:
    - a. ARDEX Engineered Cements; ARDEX MC RAPID: [www.ardexamericas.com/#sle](http://www.ardexamericas.com/#sle).
    - b. Floor Seal Technology, Inc; MES 100 with Floor Seal FloorCem SLU: [www.floorseal.com/#sle](http://www.floorseal.com/#sle).
    - c. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

## **PART 3 EXECUTION**

### **3.01 CONCRETE SLAB PREPARATION**

- A. Perform following operations in the order indicated:
  - 1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
    - a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
    - b. Removal of existing floor covering.
  - 2. Preliminary cleaning.
  - 3. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
  - 4. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
  - 5. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
  - 6. Specified remediation, if required.
  - 7. Patching, smoothing, and leveling, as required.
  - 8. Other preparation specified.
  - 9. Adhesive bond and compatibility test.
  - 10. Protection.

### **3.02 REMOVAL OF EXISTING FLOOR COVERINGS**

- A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.
- B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

### **3.03 PRELIMINARY CLEANING**

- A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.
- B. Do not use solvents or other chemicals for cleaning.

### **3.04 MOISTURE VAPOR EMISSION TESTING**

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F1869 and as follows.
- D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.
- F. Report: Report the information required by the test method.

### **3.05 INTERNAL RELATIVE HUMIDITY TESTING**

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F2170 Procedure A and as follows.
- D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.
- F. Report: Report the information required by the test method.

### **3.06 ALKALINITY TESTING**

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
- C. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.
- D. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

### **3.07 PREPARATION**

- A. See individual floor covering section(s) for additional requirements.
- B. Comply with requirements and recommendations of floor covering manufacturer.
- C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
- D. Do not fill expansion joints, isolation joints, or other moving joints.

### **3.08 ADHESIVE BOND AND COMPATIBILITY TESTING**

- A. Comply with requirements and recommendations of floor covering manufacturer.

### **3.09 APPLICATION OF REMEDIAL FLOOR COATING**

- A. Comply with requirements and recommendations of coating manufacturer.

### **3.10 PROTECTION**

- A. Cover prepared floors with building paper or other durable covering.

**END OF SECTION 09 0561**

**SECTION 09 2116**  
**GYPSUM BOARD ASSEMBLIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Performance criteria for gypsum board assemblies.
- B. Gypsum wallboard.
- C. Joint treatment and accessories.
- D. Textured finish system.
- E. Vinyl tackboard wall paneling

**1.02 RELATED REQUIREMENTS**

- A. Section 06 1000 - Rough Carpentry: Building framing and sheathing.
- B. Section 07 2100 - Thermal Insulation: Acoustic insulation.
- C. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.
- D. Section 07 8400 - Firestopping: Top-of-wall assemblies at fire rated walls.
- E. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

**1.03 REFERENCE STANDARDS**

- A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
- B. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2014).
- C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2014.
- D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2015.
- E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.
- F. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.
- G. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.
- H. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.
- I. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.
- J. ASTM C1280 - Standard Specification for Application of Gypsum Sheathing Board; 2013.
- K. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.
- L. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2015.
- M. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2013.
- N. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.
- O. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- P. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.

- Q. ASTM E413 - Classification for Rating Sound Insulation; 2010.
- R. GA-216 - Application and Finishing of Gypsum Board; 2013.
- S. GA-226 - Application of Gypsum Board to Form Curved Surfaces; Gypsum Association; 2008.
- T. GA-600 - Fire Resistance Design Manual; 2015.
- U. ICC (IBC) - International Building Code; 2015.
- V. UL (FRD) - Fire Resistance Directory; current edition.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on accessories and joint finishing system.
- C. Test Reports: For stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.
- D. Samples: Submit two samples of gypsum board finished with proposed texture application, 12 by 12 inches in size, illustrating finish color and texture.

#### **1.05 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum \_\_ years of experience.
- B. A. Single Source: Obtain gypsum board products from a single manufacturer, or from manufacturer's recommended by the prime manufacturer of gypsum board.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- 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 keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.
- C. Handle gypsum board to prevent damage to edges, ends and surfaces. Protect metal corner beads and trims from being bent or damaged.

#### **1.07 PROJECT CONDITIONS**

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
  - 1. Cold Weather Protection: When ambient outdoor temperatures are below 55 degrees F, maintain continuous, uniform, comfortable building working temperatures of not less than 55 degrees F for a minimum of 48 hours prior to, during and following application of gypsum board and joint treatment or bonding of adhesives.
  - 2. Ventilation: Ventilate building spaces as required to remove water in excess of that required for drying of joint treatment material immediately after its application. Avoid drafts during dry, hot weather to prevent too rapid drying.

### **PART 2 PRODUCTS**

#### **2.01 GYPSUM BOARD ASSEMBLIES**

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
  - 1. See PART 3 for finishing requirements.
- B. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:
  - 1. Fire Rated Partitions: As shown on documents.
  - 2. Fire Rated Area Separation Walls: As shown on documents.
  - 3. ICC IBC Item Numbers: Comply with applicable requirements of ICC IBC for the particular assembly.
  - 4. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.

5. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

## 2.02 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
  1. American Gypsum Company; \_\_\_\_: [www.americangypsum.com/#sle](http://www.americangypsum.com/#sle).
  2. CertainTeed Corporation; \_\_\_\_: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
  3. Georgia-Pacific Gypsum; \_\_\_\_: [www.gpgypsum.com/#sle](http://www.gpgypsum.com/#sle).
  4. National Gypsum Company; \_\_\_\_: [www.nationalgypsum.com/#sle](http://www.nationalgypsum.com/#sle).
  5. PABCO Gypsum; \_\_\_\_: [www.pabco gypsum.com/#sle](http://www.pabco gypsum.com/#sle).
  6. USG Corporation; \_\_\_\_: [www.usg.com/#sle](http://www.usg.com/#sle).
  7. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
  1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
  2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
  4. Thickness:
    - a. Vertical Surfaces: 5/8 inch.
    - b. Ceilings: 5/8 inch.
    - c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
- C. Prefinished Vinyl Covered Tackboard Wall Paneling: ASTM E-84-87.
  1. Products:
    - a. Lamvin, Inc. 760. 806.6400
    - b. Chatfield Clark. 909.823.4297
  2. Thickness: 1/2 inch by 48 inches by full height
  3. Flame Spread: Class II - 75 or less.
  4. Trims: "L" angle, "H" bead, "J" bead and etc., as manufactured by panel manufacturer.

## 2.03 GYPSUM WALLBOARD ACCESSORIES

- A. Acoustic Insulation: As specified in Section 07 2100.
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- C. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
  1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
  2. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
  3. Joint Compound: Setting type, field-mixed.
- D. Textured Finish Materials: Latex-based compound; plain.
  1. Products:
    - a. CertainTeed Corporation; Extreme Texture Coat/Acrylic Texture with M2Tech: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
    - b. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- E. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.
- F. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.
- G. Nails for Attachment to Wood Members: ASTM C514.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that project conditions are appropriate for work of this section to commence.

### **3.02 ACOUSTIC ACCESSORIES INSTALLATION**

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
  - 1. Place one bead continuously on substrate before installation of perimeter framing members.
  - 2. Place continuous bead at perimeter of each layer of gypsum board.
  - 3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

### **3.03 JOINT TREATMENT**

- A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
  - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
  - 2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
  - 3. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
  - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
  - 2. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
- C. Fiberboard Tack Base & Vinyl Covered Panels: Provide Level 1 finish on gypboard substrate. Provide tape and compound on all tackboard joints receiving field applied wall coverings. Surface shall be smooth such that no telegraphing of any seams, screws, attachments, etc. are present.

### **3.04 TEXTURE FINISH**

- A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.
  - 1. Skip - Trowel Texture shall be applied to all gypsum board surfaces to be painted. Provide (3) different textured samples for review and approval by Architect on a 2'x2' gypsum board. Level 4 finish required, minimum.
  - 2. Smooth Finish shall be applied to all restrooms, food service, all surfaces to receive appropriate vinyl wall coverings. Level 5 finish required, minimum.

### **3.05 TOLERANCES**

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

**END OF SECTION 09 2116**



**SECTION 09 2236.23**  
**METAL LATH**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Metal lath for cement and gypsum plaster.

**1.02 RELATED REQUIREMENTS**

- A. Section 06 1000 - Rough Carpentry: Sheathing on exterior walls.
- B. Section 07 2500 - Weather Barriers: Weather barrier under exterior plaster and stucco.
- C. Section 08 3100 - Access Doors and Panels: Product requirements for metal access panels integral with metal lath.
- D. Section 09 2400 - Cement Plastering.

**1.03 REFERENCE STANDARDS**

- A. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring; 2003 (Reapproved 2013).
- B. ASTM C847 - Standard Specification for Metal Lath; 2014a.
- C. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.
- D. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster; 2015a.
- E. ASTM C1787 - Standard Specification for Installation of Non Metallic Plaster Bases (Lath) Used with Portland Cement Based Plaster in Vertical Wall Applications; 2014.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on furring and lathing components, structural characteristics, material limitations, and finish.

**1.05 QUALITY ASSURANCE**

- A. Maintain one copy of each installation standard referenced on site throughout the duration of lathing and plastering work.
- B. Installer Qualifications: Company specializing in performing the work of this section with at least three years of documented experience.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A.
- B. Self Furring Expanded Metal Lath:

**2.02 LATH**

- A. Diamond Mesh Metal Lath: ASTM C847, galvanized; self-furring.
  - 1. Weight: To suit application and as specified in ASTM C841 or ASTM C1063 for framing spacing.
  - 2. Weight: 2.5 lb/sq yd.
  - 3. Backed with treated paper.
- B. Corner Mesh: Formed sheet steel, minimum 0.018 inch thick, perforated flanges shaped to permit complete embedding in plaster, minimum 2 inch size; same finish as lath.
- C. Strip Mesh: Expanded metal lath, same weight as lath, 2 inch wide by 24 inch long; same finish as lath.

- D. Beads, Screeds, Joint Accessories, and Other Trim: Depth governed by plaster thickness, and maximum possible lengths.
  - 1. Casing Beads with Weep Holes: Square edges.
    - a. Products:
      - 1) Phillips Manufacturing Co; #66 Expanded Flange Square Casing Bead: [www.phillipsmfg.com/#sle](http://www.phillipsmfg.com/#sle).
      - 2) Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
  - 2. Expansion Joints: Accordion profile with factory-installed protective tape, 2 inch wide flanges.
    - a. Products:
      - 1) Phillips Manufacturing Co; #15 Double V Expansion Joint: [www.phillipsmfg.com/#sle](http://www.phillipsmfg.com/#sle).
      - 2) Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
  - 3. Base Screeds: Bevelled edges.
  - 4. Control Joints: Accordion profile with factory-installed protective tape, 2 inch flanges.

### **2.03 ACCESSORIES**

- A. Access Panels - Non-Fire Rated: Formed stainless steel with brushed finish.
- B. Anchorage: Tie wire, nails, and other metal supports, of type and size to suit application; to rigidly secure materials in place, galvanized.
- C. Fasteners:
  - 1. Self-Sealing Nail, Fasten Seal Nail with integrated butyl rubber sealant, By FastenSeal Product, LLC for use when fastening to wood. Install per ICC ES ESR 1675.
  - 2. Self-Sealing self tapping screws by By FastenSeal Product, LLC for use when fastening to metal studs. Fasteners shall be installed per ICC ES ESR-1271

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that substrates are ready to receive work and conditions are suitable for application.
- C. For exterior plaster and stucco on stud walls, verify that water-resistive barrier has been installed over sheathing substrate completely and correctly.
- D. Do not begin until unacceptable conditions have been corrected.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### **3.02 INSTALLATION - GENERAL**

### **3.03 CONTROL AND EXPANSION JOINT INSTALLATION**

- A. Locate joints as indicated on drawings and comply with ASTM C1063.
  - 1. Area of plaster panel not to exceed 144 sq ft for vertical surfaces.
  - 2. Area of plaster panel not to exceed 100 sq ft for horizontal, curved or angled surfaces.
  - 3. Spacing between control joints not to exceed 18 ft in each direction.
  - 4. Area bounded by control joints not to exceed a length-to-width ratio of 2-1/2 to 1.
- B. Install expansion joints where an expansion joint occurs in base exterior wall.
- C. Install prefabricated joint accessories in accordance with ASTM C1063.
- D. Construct expansion joints of back-to-back casing beads with a backer rod and sealant, set 1/4 inch apart.

### **3.04 ACCESS PANELS INSTALLATION**

- A. Install access panels and rigidly secure in place.
- B. Install frames plumb and level in opening. Secure rigidly in place.
- C. Position to provide convenient access to concealed work requiring access.

### **3.05 LATH INSTALLATION**

- A. Apply lath taut, with long dimension perpendicular to supports.
- B. Lap or nest ends of metal lath in accordance with ASTM C841.
- C. Lap ends of non-metallic lath in accordance with ASTM C1787.
- D. Secure end laps with tie wire where they occur between supports.
- E. Attach lath to wood supports using nails at maximum \_\_\_\_ inches on center.
- F. Attach metal lath to concrete using wire loops. Attach anchors to backup surface; space at maximum 24 inches on center.
- G. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.
- H. Place corner bead at external wall corners; fasten at outer edges of lath only.
- I. Place base screeds at termination of plaster areas; secure rigidly in place.
- J. Place 4 inch wide strips of lath centered over junctions of dissimilar backing materials, and secure rigidly in place.
- K. Place lath vertically above each top corner and each side of door frames to 6 inches above ceiling line.
- L. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.
- M. Place additional strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

**END OF SECTION 09 2236.23**

**SECTION 09 2400  
CEMENT PLASTERING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Cement plastering.

**1.02 RELATED REQUIREMENTS**

- A. Section 06 1000 - Rough Carpentry: Wood stud framing for plaster.
- B. Section 07 2500 - Weather Barriers.
- C. Section 08 3100 - Access Doors and Panels: Access panels.
- D. Section 09 2236.23 - Metal Lath: Lath, furring, beads, screeds, and joint accessories for plaster base.

**1.03 REFERENCE STANDARDS**

- A. ASTM C91/C91M - Standard Specification for Masonry Cement; 2012.
- B. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.
- C. ASTM C206 - Standard Specification for Finishing Hydrated Lime; 2014.
- D. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
- E. ASTM C897 - Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters; 2015.
- F. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster; 2015b.
- G. ASTM C932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering; 2006 (Reapproved 2013).
- H. ASTM C1328/C1328M - Standard Specification for Plastic (Stucco) Cement; 2012.
- I. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.
- J. FM (AG) - FM Approval Guide; current edition.
- K. ICC (IBC) - International Building Code; 2015.
- L. ITS (DIR) - Directory of Listed Products; current edition.
- M. NTMA (SPECS) - NTMA Terrazzo Specifications; current edition located at [www.ntma.com](http://www.ntma.com).
- N. UL (DIR) - Online Certifications Directory; current listings at [database.ul.com](http://database.ul.com).
- O. UL (FRD) - Fire Resistance Directory; current edition.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittals procedures.
- B. Product Data: Provide data on plaster materials and trim accessories.
- C. Evaluation Service Reports: Show compliance with specified requirements.
- D. Samples:
  - 1. Submit two samples, 12" by 12" inch in size illustrating finish color and texture.
  - 2. Submit two samples of each type trim accessory.
- E. Installer's Qualification Statement.

**1.05 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.
- B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

## **1.06 FIELD CONDITIONS**

- A. Exterior Plaster Work: Do not apply plaster when substrate or ambient air temperature is 40 degrees F or lower, or when temperature is expected to drop below 40 degrees F within 48 hours of application.
- B. Interior Plaster Work: Maintain minimum ambient temperature of 50 degrees F during installation of plaster and until fully cured.

## **PART 2 PRODUCTS**

### **2.01 CEMENT PLASTER APPLICATIONS**

- A. Lath Plaster Base: Metal lath.
  - 1. Plaster Type: Factory prepared plaster mix.
  - 2. Number of Coats: Three.
  - 3. First Coat: Apply to a nominal thickness of 3/8 inch.
  - 4. Second Coat: Apply to a nominal thickness of 3/8 inch.
  - 5. Leveling Coat: Apply to a nominal thickness of 1/32 to 1/16 inch.
  - 6. Finish Coat: Apply to a nominal thickness of 1/8 inch.
    - a. Texture: to match existing.

### **2.02 JOBSITE MIXED CEMENT PLASTER**

- A. Materials:
  - 1. Portland Cement: ASTM C150/C150M, Type I.
    - a. Finish Coat: White color.
  - 2. Masonry Cement: ASTM C91/C91M, Type N.
  - 3. Plastic Cement: ASTM C1328/C1328M.
  - 4. Lime: ASTM C206, Type S.
  - 5. Sand: Clean, well graded, and complying with ASTM C897.
  - 6. Water: Clean, fresh, potable, and free of mineral or organic matter that could adversely affect plaster.
  - 7. Admixture: Air entrainment type.

### **2.03 ACCESSORIES**

- A. Lath: As specified in Section 09 2236.23.
- B. Beads, Screeds, and Joint Accessories: As specified in Section 09 2236.23.
- C. Water Resistive Barrier: As specified in Section 07 2500.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions are acceptable prior to starting this work.
- B. Verify concrete surfaces are flat, honeycombs are filled flush, and surfaces are ready to receive work of this section, and that there are no existing bituminous, water repellent, or form release agent coatings on concrete surfaces that may be detrimental to plaster bond.
- C. Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are properly in place.
- D. Verify mechanical and electrical equipment and services located within areas to receive this work have been properly tested and approved.

### **3.02 PREPARATION**

- A. Dampen masonry surfaces to reduce excessive suction.
- B. Clean concrete surfaces of foreign matter using approved acid solutions, solvents, or detergents, and then rinse surfaces thoroughly with clean water.
- C. Roughen smooth concrete surfaces and apply bonding compound in accordance with manufacturer's written installation instructions.

- D. Apply dash bond coat of plaster to solid bases and moist cure for at least 24 hours before applying first coat of jobsite mixed plaster.

### **3.03 MIXING**

- A. Mix only as much plaster as can be used prior to initial set.
- B. Mix materials dry, to uniform color and consistency, before adding water.
- C. Add air entrainment admixtures to each coat to provide 5 to 7 percent air entrainment.
- D. Do not retemper mixes after initial set has occurred.
- E. Protect mixtures from frost or freezing temperatures, contamination, and excessive evaporation.

### **3.04 APPLICATION**

- A. Apply plaster in accordance with manufacturer's written instructions and comply with ASTM C926.
- B. Base Coats:
  - 1. Apply base coat(s) to fully embed lath and to specified thickness.
  - 2. Follow guidelines in ASTM C926 and manufacturer's written installation instructions for moist curing base coats and application of subsequent coats.
- C. Leveling Coat:
  - 1. Apply leveling coat to specified thickness.
  - 2. Fully embed reinforcing mesh in leveling coat.
- D. Finish Coats:
  - 1. Cement Plaster:
    - a. Apply with sufficient material and pressure to ensure complete coverage of base to specified thickness.
    - b. Apply desired surface texture while mix is still workable.
    - c. Float to a consistent finish.

### **3.05 TOLERANCES**

- A. Maximum Variation from True Flatness: 1/4 inch in 10 feet.

### **3.06 REPAIR**

- A. Patching: Remove loose, damaged or defective plaster and replace with plaster of same composition; finish to match surrounding area.

**END OF SECTION 09 2400**

**SECTION 09 5100**  
**ACOUSTICAL CEILINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

**1.02 RELATED REQUIREMENTS**

- A. Section 08 3100 - Access Doors and Panels: Access panels.
- B. Section 26 5100 - Interior Lighting: Light fixtures in ceiling system.

**1.03 REFERENCE STANDARDS**

- A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2013a.
- B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.
- C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2014.
- D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.
- E. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.
- F. UL (FRD) - Fire Resistance Directory; current edition.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on suspension system components and acoustical units.
- C. Samples: Submit two samples 4" by 4" in size illustrating material and finish of acoustical units.
- D. Samples: Submit two samples each, 12 inches long, of suspension system main runner.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS, for additional provisions.
  - 2. Extra Acoustical Units: Quantity equal to 2 percent of total installed, including panels, all components, and hold-down clips.

**1.06 QUALITY ASSURANCE**

- A. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:
  - 1. 2010 CBC, Chapter 16, Section 1615A.1.16, and DSA IR 25-2.10, "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings."
- C. Single Source Limitations:
  - 1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
  - 2. Suspension System: Obtain each type through one source from a single manufacturer.

## 1.07 DELIVERY, STORAGE, AND HANDLING

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

## 1.08 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.
- B. A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acoustic Tiles/Panels:
  - 1. Armstrong World Industries, Inc.; [www.armstrong.com/#sle](http://www.armstrong.com/#sle).
  - 2. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- B. Suspension Systems:
  - 1. Same as for acoustical units.
  - 2. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

### 2.02 ACOUSTICAL UNITS

- A. Acoustical Units - General: ASTM E1264, Class A.
- B. Acoustical Tile Type: Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:
  - 1. Size: **12 x 12 inches** (300 x 300 mm).
  - 2. Thickness: 5/8 inches.
  - 3. Composition: Water felted.
  - 4. Density: 1.05 lb/sf.
  - 5. Light Reflectance: .85 percent, determined in accordance with ASTM E1264.
  - 6. NRC Range: .55, determined in accordance with ASTM E1264.
  - 7. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
  - 8. Joint: Kerfed and rabbeted.
  - 9. Edge: Square.
  - 10. Surface Color: White.
  - 11. Surface Pattern: Non-directional fissured.
- C. Acoustical Panels: Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:
  - 1. Product: Basis of Design, Armstrong World Industries; Fine Fissured #1830
  - 2. Size: **24 x 48 inches**.
  - 3. Thickness: 3/4 inches.
  - 4. Composition: Wet felted.
  - 5. Density: 1.5 lb/sf.
  - 6. Light Reflectance: .85 percent, determined in accordance with ASTM E1264.
  - 7. NRC Range: .55, determined in accordance with ASTM E1264.
  - 8. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
  - 9. Edge: Square.
  - 10. Surface Color: White.



11. Surface Pattern: Non-directional fissured.
12. Suspension System: Exposed grid Type Heavy Duty.
13. Products:
  - a. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

### **2.03 SUSPENSION SYSTEM(S)**

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.
- B. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; heavy-duty.
  1. Profile: Tee; 15/16 inch wide face.
  2. Construction: Double web.
  3. Finish: White painted.

### **2.04 ACCESSORIES**

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Perimeter Moldings: Same material and finish as grid.
  1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
- C. Acoustical Sealant For Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system. paintable, nonstaining latex sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- D. Gasket For Perimeter Moldings: Closed cell rubber sponge tape.
- E. Touch-up Paint: Type and color to match acoustical and grid units.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

### **3.02 INSTALLATION - SUSPENSION SYSTEM**

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
- D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- F. 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- G. Secure wire hangers to ceiling suspension members and to supports above with a minimum of four tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other

devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

- H. Delete subparagraphs below that refer to inapplicable construction types. Revise first subparagraph if power-actuated fasteners are not allowed.
- I. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
- J. Do not attach hangers to steel deck tabs.
- K. Revise first subparagraph below if structural members are spaced too far apart for hangers and another method is required. For alternatives that may need to be detailed on Drawings, consult structural engineer and refer to CISCA's guidelines. See SDI Publication No. 29 and the Evaluations in Division 5 Section "Steel Deck."
- L. Do not attach hangers to steel roof deck. Attach hangers to structural members.
- M. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 6 inches from ends of each member.
- N.
- O. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- P. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- Q. Do not eccentrically load system or induce rotation of runners.
- R. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
  - 1. Install with continuous gasket.
  - 2. Use longest practical lengths.
  - 3. Miter corners.
  - 4. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
  - 5. Unless unavoidable, do not use exposed fasteners, including pop rivets, on moldings and trim.
- S. Install light fixture boxes constructed of gypsum board above light fixtures in accordance with fire rated assembly requirements and light fixture ventilation requirements.

### **3.03 INSTALLATION - ACOUSTICAL UNITS**

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Lay directional patterned units with pattern parallel to longest room axis.
- D. Fit border trim neatly against abutting surfaces.
- E. Install units after above-ceiling work is complete.
- F. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- G. Cutting Acoustical Units:
  - 1. Cut to fit irregular grid and perimeter edge trim.
  - 2. Make field cut edges of same profile as factory edges.
  - 3. Double cut and field paint exposed reveal edges.
- H. Where round obstructions occur, provide preformed closures to match perimeter molding.

- I. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.

**3.04 TOLERANCES**

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

**3.05 CLEANING**

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

**END OF SECTION 09 5100**

**SECTION 09 6500  
RESILIENT FLOORING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Resilient sheet flooring.
- B. Resilient base.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

**1.03 REFERENCE STANDARDS**

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.
- B. C. ASTM E 662: Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
- C. D. ASTM F 1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- D. E. ASTM F 2170: Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes.
- E. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.
- F. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2014).
- G. ASTM F1303 - Standard Specification for Sheet Vinyl Floor Covering with Backing; 2004 (Reapproved 2014).
- H. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012).
- I. ASTM F1913 - Standard Specification for Vinyl Sheet Floor Covering Without Backing; 2004 (Reapproved 2014).
- J. ASTM F2034 - Standard Specification for Sheet Linoleum Floor Covering; 2008 (Reapproved 2013).
- K. ASTM F2195 - Standard Specification for Linoleum Floor Tile; 2013.
- L. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Shop Drawings: Indicate seaming plans and floor patterns.
- D. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- E. Verification Samples: Submit two samples, \_\_\_ by \_\_\_ inch in size illustrating color and pattern for each resilient flooring product specified.
- F. Concrete Testing Standard: Submit a copy of ASTM F710.
- G. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.
- H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS, for additional provisions.
  - 2. Extra Flooring Material: 60 square feet of each type and color.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.
- C. Testing Agency Qualifications: Independent firm specializing in performing concrete slab moisture testing and inspections of the type specified in this section.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- D. Protect roll materials from damage by storing on end.
- E. Do not double stack pallets.

#### **1.07 FIELD CONDITIONS**

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

### **PART 2 PRODUCTS**

#### **2.01 SHEET FLOORING**

- A. Vinyl Sheet Flooring: 1. TRUERUBBER® rubber flooring, with patented color brightener technology.
  - 1. Manufacturers:
    - a. Mohawk Group, 160 South industrial BLVD., Calhoun, GA 30701
    - b. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
  - 2. Minimum Requirements: Comply with ASTM F1913.
  - 3. Thickness: 0.080 inch nominal.
  - 4. Sheet Width: 72 inch minimum.
  - 5. Seams: Heat welded.
  - 6. Integral covered base with cap strip.
  - 7. Color: To be selected by Architect from manufacturer's full range.

#### **2.02 TILE FLOORING**

- A. LVT click Tile
  - 1. Manufacturers:
    - a. Metroflor: Engage Genesis FX3 Droplock 100.
  - 2. Pattern: 1200MW multi-width planks.

#### **2.03 RUBBER FLOORING**

- A. Rubber Sports Flooring: Homogeneous without backing, with color and pattern throughout full thickness.
  - 1. Manufacturers:
    - a. Armstrong Floors, Inc.
    - b. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
  - 2. Minimum Requirements: Comply with ASTM F1913.
  - 3. Thickness: 0.080 inch nominal.
  - 4. Sheet Width: 72 inch minimum.

5. Seams: Heat welded.
6. Integral coved base with cap strip.
7. Color: To be selected by Architect from manufacturer's full range.

## **2.04 RESILIENT BASE**

- A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
  1. Manufacturers:
    - a. Burke Flooring; Commercial Wall Base - TS: [www.burkeflooring.com/#sle](http://www.burkeflooring.com/#sle).
    - b. Johnsonite, a Tarkett Company: [www.johnsonite.com/#sle](http://www.johnsonite.com/#sle).
    - c. Roppe Corp: [www.roppe.com/#sle](http://www.roppe.com/#sle).
    - d. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
  2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
  3. Height: 4 inch.
  4. Thickness: 0.125 inch.
  5. Finish: Satin.
  6. Length: Continuous Roll. (4'-0" segments will not be accepted)
  7. Color: To be selected by Architect from manufacturer's full range.

## **2.05 ACCESSORIES**

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
- C. Moldings, Transition and Edge Strips: Same material as flooring.
- D. Filler for Coved Base: Plastic.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
  1. Test in accordance with ASTM F710.
  2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

### **3.02 PREPARATION**

- A. Prepare floor substrates for installation of flooring in accordance with Section 09 0561.

### **3.03 INSTALLATION - GENERAL**

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Fit joints and butt seams tightly.
- E. Set flooring in place, press with heavy roller to attain full adhesion.
- F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

- H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

### **3.04 INSTALLATION - SHEET FLOORING**

- A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.
- B. Seal seams by heat welding where indicated.
- C. Coved Base: Install as detailed on drawings, using coved base filler as backing at floor to wall junction. Extend sheet flooring vertically to height indicated, and cover top edge with metal cap strip.

### **3.05 INSTALLATION – LVT CLICK FLOORING**

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

### **3.06 INSTALLATION - RESILIENT BASE**

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Install base on solid backing. Bond tightly to wall and floor surfaces.

### **3.07 CLEANING**

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

### **3.08 PROTECTION**

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

**END OF SECTION 09 6500**

**SECTION 09 9000  
PAINTING AND COATING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints, stains, varnishes, and other coatings.
- C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
  - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
  - 2. Elevator pit ladders.
  - 3. Exposed surfaces of steel lintels and ledge angles.
  - 4. Surfaces inside cabinets.
  - 5. Prime surfaces to receive wall coverings.
  - 6. Mechanical and Electrical:
    - a. In finished areas, prime, prep and paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
    - b. In finished areas, paint shop-primed items.
    - c. On the roof and outdoors, paint all equipment that is exposed to weather or to view, including that which is factory-finished.
    - d. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
    - e. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
- D. Do Not Paint or Finish the Following Items:
  - 1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
  - 2. Items indicated to receive other finishes.
  - 3. Items indicated to remain unfinished.
  - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
  - 5. Non-metallic roofing and flashing.
  - 6. Stainless steel, anodized aluminum, bronze, terne, and lead items.
  - 7. Marble, granite, slate, and other natural stones.
  - 8. Floors, unless specifically so indicated.
  - 9. Ceramic and other tiles.
  - 10. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
  - 11. Glass.
  - 12. Acoustical materials, unless specifically so indicated.
  - 13. Concealed pipes, ducts, and conduits.
  - 14. Toilet Partions
  - 15. Metal Lockers
  - 16. Unit Kitchens
  - 17. Elevator Entrances and Equipment (not including smoke doors and frames)
  - 18. Light Fixtures
  - 19. Operating parts, valves, dampers, sensing devices, motors and fans.
- E. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- F. *Interior Paint: All interior paint shall conform to Zero VOC requirements as outlined below.*



## 1.02 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 05 5000 - Metal Fabrications: Shop-primed items.
- C. Section 05 5100 - Metal Stairs: Shop-primed items.

## 1.03 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this section.
  - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
  - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
  - 3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
  - 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

## 1.04 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2014.
- C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.
- D. GreenSeal GS-11 - Paints and Coatings; 2013.

## 1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of all products to be used, with the following information for each:
  - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
  - 2. MPI product number (e.g. MPI #47).
  - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
  - 4. **Manufacturer's Label: Provide a color copy of the manufacturer's label for each product being used. This label shall include the product name and number, sheen. Product labels shall match material brought on site and will be inspected by the inspector. Onsite materials not matching submittals, or not labeled, shall be removed from the site and replaced with properly labeled materials at no cost to the owner.**
  - 5. **Provide a current "Certification of Compliance" for Zero VOC emissions by an independent testing agency for each interior paint product being used. Attach each "Certification of Compliance" to each manufacturer label being submitted. Independent testing agency must be a recognized testing agency by USGBC or CHPS organizations (i.e. Greenguard, Green Seal, SCS, Berkeley Analytical, etc.)**
- C. Samples: Submit three heavy cardboard "drop" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
  - 1. Where sheen is specified, submit samples in only that sheen.
  - 2. Include manufacturer's product number, sheen, texture and color on reverse side.
  - 3. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
- D. Certification: By manufacturer that all paints and coatings comply with ZeroVOC limits specified.

- E. Certification: By manufacturer that all paints and coatings do not contain any of the prohibited chemicals specified; GreenSeal GS-11 certification is not required but if provided shall constitute acceptable certification.
- F. Manufacturer's Instructions: Indicate special surface preparation procedures.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS, for additional provisions.
  - 2. Extra Paint and Coatings: 1 gallon of each color; store where directed.
  - 3. Label each container with color in addition to the manufacturer's label.

#### 1.06 QUALITY ASSURANCE

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

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. ***Product labels shall match material brought on site and will be inspected by the inspector. Onsite materials not matching submittals, or not labeled, shall be removed from the site and replaced with properly labeled materials, at no cost to the owner.***
- D. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.
- E. Coordination of Work: Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coating system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.

#### 1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
  - 1. 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.
- D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Provide all paint and coating products from the same manufacturer to the greatest extent possible.
  - 1. In the event that a single manufacturer cannot provide all specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
- B. Paints, Transparent Finishes and Stains:
  - 1. Benjamin Moore & Co: [www.benjaminmoore.com/#sle](http://www.benjaminmoore.com/#sle).
  - 2. Sherwin-Williams Company: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
  - 3. Dunn Edwards Paint.
  - 4. Kelly Moore Paints.
- C. Primer Sealers: Same manufacturer as top coats.

- D. Block Fillers: Same manufacturer as top coats.
- E. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

## **2.02 PAINTS AND COATINGS - GENERAL**

- A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
  - 1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
  - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
  - 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
  - 4. Supply each coating material in quantity required to complete entire project's work from a single production run.
  - 5. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- B. Primers: As follows unless other primer is required or recommended by manufacturer of top coats; where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
- C. Volatile Organic Compound (VOC) Content:
  - 1. Provide coatings that comply with the most stringent requirements specified in the following:
    - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
  - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors: As indicated on drawings
  - 1. Selection to be made by Architect after award of contract.
  - 2. Extend colors to surface edges; colors may change at any edge as directed by Architect.
  - 3. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.
  - 4. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the color coding scheme indicated.

## **PAINT SYSTEMS - EXTERIOR**

### **3.01 CONCRETE MASONRY UNIT BLOCK FILLERS**

- A. Concrete Unit Masonry Block Filler: Factory-formulated high-performance latex block fillers.
  - 1. Glidden Professional; 3010-1200 Concrete Coatings Block Filler Interior/Exterior: Applied at a dry film thickness of not less than 9.0 mils for Block Walls and 6.5 mils for Smooth Masonry.
  - 2. Kelly-Moore; 521 Prime & Fill Acrylic Block Filler: Applied at a dry film thickness of 10 - 12 mils per coat.
  - 3. Sherwin-Williams; PrepRite Interior/Exterior Block Filler B25W25: Applied at a dry film thickness of not less than 8.0 mils.
  - 4. Dunn-Edwards; Blocfil, Concrete Block Filler Smooth (SBPR00): Applied at a dry film thickness of not less than 8.0 mils.

### **3.02 EXTERIOR PRIMERS**

- A. Exterior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex primer for exterior application.

1. Glidden Professional; 6001-1200 Hydrosealer Exterior Acrylic Primer Sealer: Applied at a dry film thickness of not less than 1.6 mils.
  2. Kelly-Moore; 247 Acry-Shield 100% Acrylic Masonry Primer: Applied at a dry film thickness of 1.5 - 2.0 mils per coat
  3. Sherwin-Williams; Loxon Exterior Masonry Acrylic Primer A24W300: Applied at a dry film thickness of not less than 3.0 mils.
  4. Sherwin-Williams; A-100 Latex Exterior Wood Primer B42W41: Applied at a dry film thickness of not less than 1.4 mils.
  5. Dunn-Edwards; Eff-Stop, Acrylic Masonry Primer/Sealer (ESPR00): Applied at a dry film thickness of not less than 1.5 mils.
- B. Exterior Gypsum Soffit Board Primer: Factory-formulated alkali-resistant acrylic-latex primer for exterior application.
1. Glidden Professional; 6001-1200 Hydrosealer Exterior Acrylic Primer Sealer: Applied at a dry film thickness of not less than 1.6 mils.
  2. Kelly-Moore; 255 Acry Shield 100% Acrylic Exterior Wood Primer: Applied at a dry film thickness of 1.5 - 2.0 mils per coat
  3. Sherwin-Williams; A-100 Exterior Latex Wood Primer B42W41: Applied at a dry film thickness of not less than 1.4 mils.
  4. Dunn-Edwards; Ultra-Grip, Acrylic Multi-Purpose Primer (UGPR00): Applied at a dry film thickness of not less than 1.5 mils.
- C. Exterior Wood Primer for Acrylic Enamels: Factory-formulated latex wood primer for exterior application.
1. Glidden Professional; 6001-1200 Hydrosealer Exterior Acrylic Primer Sealer: Applied at a dry film thickness of not less than 1.6 mils.
  2. Kelly-Moore; 255 Acry-Shield Acrylic Primer: Applied at a dry film thickness of 1.5 - 2.0 mils per coat
  3. Sherwin-Williams; Exterior Latex Wood Primer B42W41: Applied at a dry film thickness of not less than 1.4 mils.
  4. Dunn-Edwards; E-Z Prime, Exterior Acrylic Wood Primer (EZPR00): Applied at a dry film thickness of not less than 1.5 mils.
- D. Exterior Wood Primer for Alkyd Enamels: Factory-formulated latex wood primer for exterior application.
1. Glidden Professional; 6001-1200 Hydrosealer Exterior Acrylic Primer Sealer: Applied at a dry film thickness of not less than 1.6 mils.
  2. Kelly-Moore; 255 Acry-Shield 100% Acrylic Exterior Wood Primer: Applied at a dry film thickness of 1.5 - 2.0 mils per coat
  3. Sherwin-Williams; Exterior Latex Wood Primer B42W42: Applied at a dry film thickness of not less than 1.4 mils.
  4. Dunn-Edwards; E-Z Prime, Exterior Acrylic Wood Primer (EZPR00): Applied at a dry film thickness of not less than 1.5 mils.
- E. Exterior Ferrous-Metal Primer: Factory-formulated rust-inhibitive metal primer for exterior application.
1. Glidden Professional; Devco Coatings Devflex 4020PF DTM Primer/Finish. Applied at a dry film thickness of not less than 2.2 mils.
  2. Kelly-Moore; 1711 Kel-Guard Alkyd White Rust Inhibitive Primer: Applied at a dry film thickness of 1.5 - 2.0 mils per coat.
  3. Kelly-Moore; 5725 DTM-Acrylic Metal Primer/Finish: Applied at a dry film thickness of 1.5 - 2.0 mils per coat
  4. Sherwin-Williams; Procryl Metal Primer B66-310: Applied at a dry film thickness of not less than 2.5 - 4.0 mils.
  5. Dunn-Edwards; Galv-Alum, Epoxy Galvanized/Aluminum Metal Primer (GAPR00): Applied at a dry film thickness of not less than 2.0 mils.

- F. Exterior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application.
  - 1. Glidden Professional; Devco Coatings Devflex 4020PF DTM Primer/Finish. Applied at a dry film thickness of not less than 2.2 mils.
  - 2. ICI Dulux Paints; 4141-XXXX Devguard Multi-Purpose Tank & Structural Primer: Applied at a dry film thickness of not less than 2.0 mils.
  - 3. Kelly-Moore; 1725 Acry-Shield 100% Acrylic Metal Primer Applied at a dry film thickness of 1.5 - 2.0 mils per coat.
  - 4. Kelly-Moore; 5725 DTM-Acryli: Primer/Finish Applied at a dry film thickness of 1.5 - 2.0 mils per coat.
  - 5. Sherwin-Williams; Procryl Metal Primer B66-310
  - 6. Sherwin-Williams; High Satin Polyurethane 100: Applied at a dry film thickness of not less than 2.0 mils.
  - 7. Dunn-Edwards; Ultra-Grip, Acrylic Multi-Purpose Primer (UGPR00): Applied at a dry film thickness of not less than 1.5 mils.
- G. Exterior Aluminum Primer under Acrylic Finishes: Factory-formulated acrylic-based metal primer for exterior application.
  - 1. Glidden Professional; Devco Coatings Devflex 4020PF DTM Primer/Finish. Applied at a dry film thickness of not less than 2.2 mils.
  - 2. ICI Dulux Paints; 4141-XXXX Devguard Multi-Purpose Tank & Structural Primer: Applied at a dry film thickness of not less than 2.0 mils.
  - 3. Kelly-Moore; 1725 Acry-Shield 100% Acrylic Metal Primer: Applied at a dry film thickness of 1.5 - 2.0 mils per coat
  - 4. Kelly-Moore; 5725 DTM-Acrylic Metal Primer: Applied at a dry film thickness of not less than 1.8 mils.
  - 5. Sherwin-Williams; Procryl Metal Primer B66-310
  - 6. Sherwin-Williams; Procryl Metal Primer B66-310: Applied at a dry film thickness of not less than 2.5 mils.
  - 7. Dunn-Edwards; Ultra-Grip, Acrylic Multi-Purpose Primer (UGPR00): Applied at a dry film thickness of not less than 1.5 mils.
- H. Exterior Aluminum Primer under Latex Finishes: Factory-formulated acrylic-based metal primer for exterior application.
  - 1. Glidden Professional; Devco Coatings Devflex 4020PF DTM Primer/Finish. Applied at a dry film thickness of not less than 2.2 mils.
  - 2. Kelly-Moore; 1725 Acry-Shield 100% Acrylic Metal Primer: Applied at a dry film thickness of 1.5 - 2.0 mils per coat.
  - 3. Sherwin-Williams; Procryl Metal Primer B66-310: Applied at a dry film thickness of not less than 2.5 mils.
  - 4. Dunn-Edwards; Ultra-Grip, Acrylic Multi-Purpose Primer (UGPR00): Applied at a dry film thickness of not less than 1.5 mils.

### 3.03 EXTERIOR FINISH COATS

- A. Exterior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for exterior application.
  - 1. Glidden Professional; 2200V Fortis 350 Exterior 100% Acrylic Flat Paint: Applied at a dry film thickness of not less than 1.5 mils.
  - 2. Kelly-Moore; 1240 Acry-Sheild 100% Acrylic Exterior Flat Paint: Applied at a dry film thickness of 1.5 - 2.0 mils per coat
  - 3. Sherwin-Williams; A-100 Exterior Latex Flat House & Trim Paint A6 Series: Applied at a dry film thickness of not less than 1.3 mils.
  - 4. Dunn-Edwards; Spartashield 10, Ext. 100% Acrylic Flat Paint (SSHL10): Applied at a dry film thickness of not less than 1.5 mils.
- B. Exterior Low-Luster Acrylic Paint: Factory-formulated low-sheen (eggshell) acrylic-latex paint for exterior application.

1. Glidden Professional; 2402V Fortis 350 Exterior 100% Acrylic Satin Paint: Applied at a dry film thickness of not less than 1.4 mils.
  2. Kelly-Moore; 1245 Acry-Shield 100% Acrylic Exterior Low Sheen Paint: Applied at a dry film thickness of 1.5 - 2.0 mils per coat.
  3. Sherwin-Williams; A-100 Exterior Latex Satin House & Trim Paint A82 Series: Applied at a dry film thickness of not less than 1.5 mils.
  4. Dunn-Edwards; Spartashield 40, Int. / Ext. 100% Acrylic Low Sheen Paint (SSHL40): Applied at a dry film thickness of not less than 1.5 mils.
- C. Exterior Semigloss Acrylic Enamel: Factory-formulated semigloss waterborne acrylic-latex enamel for exterior application.
1. Glidden Professional; 2406V Fortis 350 Exterior 100% Acrylic Semi-Gloss Paint: Applied at a dry film thickness of not less than 1.4 mils.
  2. Kelly-Moore; 1250 Acry-Shield 100% Acrylic Exterior Semi-Gloss Enamel: Applied at a dry film thickness of 1.5 to 2.0 mils per coat.
  3. Sherwin-Williams; A-100 Latex Gloss A8 Series: Applied at a dry film thickness of not less than 1.3 mils.
  4. Dunn-Edwards; Evershield 50, Int./Ext. 100% Acrylic Semi-Gloss Paint (EVSH50): Applied at a dry film thickness of not less than 1.5 mils.
- D. Exterior Full-Gloss Acrylic Enamel for Concrete, Masonry, and Wood: Factory-formulated full-gloss waterborne acrylic-latex enamel for exterior application.
1. Glidden Professional; 3028N Ultra-Hide 250 100% Acrylic Interior/Exterior Gloss Paint: Applied at a dry film thickness of not less than 1.4 mils.
  2. Kelly-Moore; 1680 Dura-Poxy+ 100% Acrylic Gloss Enamel: Applied at a dry film thickness of 1.5 - 2.0 mils per coat
  3. Sherwin-Williams; DTM Acrylic Coating Gloss (Waterborne) B66W100 Series: Applied at a dry film thickness of not less than 2.4 mils.
  4. Sherwin-Williams; SuperPaint A100 Gloss H8: Applied at a dry film thickness of not less than 1.2 mils.
  5. Dunn-Edwards; Evershield 60, Int./Ext. 100% Acrylic Gloss Paint (EVSH60): Applied at a dry film thickness of not less than 1.5 mils.
- E. Exterior Full-Gloss Acrylic Enamel for Ferrous and Other Metals: Factory-formulated full-gloss waterborne acrylic-latex enamel for exterior application.
1. Glidden Professional; Devco Coatings Devflex 4208QD Interior/Exterior Waterborne Gloss Quick Dry Acrylic Enamel: Applied at a dry film thickness of 1.5 - 2.0 mils.
  2. Kelly-Moore; 5880 DTM High Performance Acrylic Gloss Enamel: Applied at a dry film thickness of 1.7 - 2.2 mils per coat.
  3. Sherwin-Williams; DTM Acrylic Coating Gloss (Waterborne) B66W100 Series: Applied at a dry film thickness of not less than 2.4 mils.
  4. Dunn-Edwards; Evershield 60, Int./Ext. 100% Acrylic Gloss Paint (EVSH60): Applied at a dry film thickness of not less than 1.5 mils.
- F. \*\*\*\*\*Exterior Full-Gloss Latex Enamel: Factory-formulated full-gloss Latex enamel for exterior application.
1. Glidden Professional; Devco Coatings Devflex 4208QD Interior/Exterior Waterborne Gloss Quick Dry Acrylic Enamel: Applied at a dry film thickness of 1.5 - 2.0 mils.
  2. Kelly-Moore; 5880 DTM High Performance Acrylic Gloss Enamel: Applied at a dry film thickness of 1.7 - 2.2 mils per coat.
  3. Sherwin-Williams; Industrial Enamel B-54 Series: Applied at a dry film thickness of not less than 2.0 mils. High solids Polyurethane B65-625
  4. Dunn-Edwards; Evershield 60, Int./Ext. 100% Acrylic Gloss Paint (EVSH60): Applied at a dry film thickness of not less than 2.0 mils.

## PAINT SYSTEMS - INTERIOR

### 4.01 INTERIOR PRIMERS

- A. Interior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex interior primer for interior application.
  - 1. Glidden Professional; 3030-1200 Bond-Prep Acrylic Pigmented Bonding Primer: Applied at a dry film thickness of not less than 1.4 mils.
  - 2. Kelly-Moore; 971 Acry-Plex Interior PVA Primer/Sealer Low Odor/Low VOC Formula: Applied at a dry film thickness of 1.5 - 2.0 mils per coat
  - 3. Sherwin-Williams; PrepRite Masonry Primer B28W300: Applied at a dry film thickness of not less than 3.0 mils.
  - 4. Dunn-Edwards; Eff-Stop, Acrylic Masonry Primer/Sealer (ESPR00): Applied at a dry film thickness of not less than 1.5 mils.
- B. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.
  - 1. Glidden Professional; 1000-1200 High Hide Interior Latex Wall Primer Sealer: Applied at a dry film thickness of not less than 1.2 mils.
  - 2. ICI Dulux Paints; 1030-1200 Ultra-Hide PVA Interior Primer Sealer General Purpose Wall Primer: Applied at a dry film thickness of not less than 1.9 mils.
  - 3. Kelly-Moore; 971 Acry-Plex Interior PVA Primer/Sealer Low Odor/Low VOC Formula: Applied at a dry film thickness of 1.5 - 2.0 mils per coat
  - 4. Sherwin-Williams; PrepRite 200 Latex Wall Primer B28W200 Series: Applied at a dry film thickness of not less than 1.6 mils.
  - 5. Dunn-Edwards, Vinylastic, Interior Pigmented Sealer (VNPR00): Applied at a dry film thickness of not less than 1.5 mils.
- C. Interior Plaster Primer: Factory-formulated latex-based primer for interior application.
  - 1. Glidden Professional; 3030-1200 Bond-Prep Acrylic Pigmented Bonding Primer: Applied at a dry film thickness of not less than 1.4 mils.
  - 2. Kelly-Moore; 971 Acry-Plex Interior PVA Primer/Sealer Low Odor/Low VOC Formula: Applied at a dry film thickness of 1.5 - 2.0 mils per coat
  - 3. Sherwin-Williams; PrepRite 200 Latex Wall Primer B28W200 Series: Applied at a dry film thickness of not less than 1.6 mils.
  - 4. Dunn-Edwards; EFF-STOP, Masonry Primer/Sealer (ESPR00): Applied at a dry film thickness of not less than 1.5 mils.
- D. Interior Wood Primer for Acrylic-Enamel and Semigloss Latex Enamel Finishes: Factory-formulated alkyd- or acrylic-latex-based interior wood primer.
  - 1. Glidden Professional; 3210-1200 Gripper Interior/Exterior Acrylic Primer Sealer: Applied at a dry film thickness of not less than 1.8 mils.
  - 2. Kelly-Moore; 975 Acry Plex 100% Acrylic Interior Enamel Undercoat: Applied at a dry film thickness of 1.5 - 2.0 mils per coat
  - 3. Sherwin-Williams; PrepRite Wall and Wood Primer B49W200 Series: Applied at a dry film thickness of not less than 1.6 mils.
  - 4. Dunn-Edwards; Interkote, Interior Acrylic Enamel Undercoater (IKPR00): Applied at a dry film thickness of not less than 1.5 mils.
  - 5. Sherwin-Williams; PrepRite Classic Interior Primer B28W101 Series: Applied at a dry film thickness of not less than 1.6 mils.
- E. Interior Wood Primer for Full-Gloss Latex Enamel Finishes: Factory-formulated alkyd- or acrylic-latex-based interior wood primer.
  - 1. Glidden Professional; 3210-1200 Gripper Interior/Exterior Acrylic Primer Sealer: Applied at a dry film thickness of not less than 1.8 mils.
  - 2. Kelly-Moore; 985 Flo-Cote Enamel Undercoater: Applied at a dry film thickness of 1.5 - 2.0 mils per coat
  - 3. Sherwin-Williams; PrepRite Wall and Wood Primer B49W200 Series: Applied at a dry film thickness of not less than 1.6 mils.

4. Dunn-Edwards; Interkote, Interior Acrylic Enamel Undercoater (IKPR00): Applied at a dry film thickness of not less than 1.5 mils.
- F. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive alkyd-based metal primer.
1. Glidden Professional; Devco Coatings Devflex 4020PF DTM Primer/Finish. Applied at a dry film thickness of not less than 2.0 mils.
  2. ICI Dulux Paints; 4141-Devguard Multi-Purpose Tank & Structural Primer: Applied at a dry film thickness of not less than 2.0 mils.
  3. Kelly-Moore; 1711 Kel-Guard Alkyd White Rust-Preventative Primer: Applied at a dry film thickness of 1.5 - 2.0 mils per coat
  4. Sherwin-Williams; ProCryl Universal Metal Primer B66: Applied at a dry film thickness of not less than 3.0 mils.
  5. Dunn-Edwards; Galv-Alum, Epoxy Galvanized/Aluminum Metal Primer (GAPR00): Applied at a dry film thickness of not less than 2.0 mils.
- G. Interior Zinc-Coated Metal Primer: Factory-formulated galvanized metal primer.
1. Glidden Professional; Devco Coatings Devflex 4020PF DTM Primer/Finish. Applied at a dry film thickness of not less than 2.0 mils.
  2. Kelly-Moore; 1725 Acry-Shield 100% Acrylic Metal Primer: Applied at a dry film thickness of 1.5 - 2.0 mils per coat
  3. Sherwin-Williams; ProCryl Universal Metal Primer B66.
  4. Sherwin-Williams; ProCryl Universal Metal Primer B66: Applied at a dry film thickness of not less than 3.0 mils.
  5. Dunn-Edwards; Ultra-Grip, Acrylic Multi-Purpose Primer (UGPR00): Applied at a dry film thickness of not less than 1.5 mils.

#### **4.02 INTERIOR FINISH COATS**

- A. Interior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for interior application.
1. Glidden Professional; 1209 Ultra-Hide No VOC Interior Latex Flat Paint: Applied at a dry film thickness of not less than 1.3 mils.
  2. Kelly-Moore; 1500 Enviro-Coat Interior Acrylic Flat Wall Paint: Applied at a dry film thickness of 1.5 - 2.0 mils per coat.
  3. Sherwin-Williams; ProMar 200 Interior Latex Flat Wall Paint B30-2600 Series: Applied at a dry film thickness of not less than 1.4 mils.
  4. Dunn-Edwards; Spartawall 10, Interior Latex Flat Paint (SWLL 10): Applied at a dry film thickness of not less than 1.5 mils.
- B. Interior Flat Latex-Emulsion Size: Factory-formulated flat latex-based interior paint.
1. Glidden Professional; 1209 Ultra-Hide No VOC Interior Latex Flat Paint: Applied at a dry film thickness of not less than 1.3 mils.
  2. Kelly-Moore; 1500 Enviro-Coat Interior Flat Acrylic Flat Wall Paint: Applied at a dry film thickness of 1.5 - 2.0 mils per coat..
  3. Sherwin-Williams; ProMar 200 Interior Latex Flat Wall Paint B30-2600 Series: Applied at a dry film thickness of not less than 1.4 mils.
  4. Dunn-Edwards; Spartawall 10, Interior Latex Flat Paint (SWLL 10): Applied at a dry film thickness of not less than 1.5 mils.
- C. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel.
1. Glidden Professional; 1411 Ultra-Hide No VOC Interior Latex Eggshell Paint: Applied at a dry film thickness of not less than 1.3 mils.
  2. Kelly-Moore; 1686 Dura-Poxy + 100% Acrylic Eggshell Enamel: Applied at a dry film thickness of 1.7 - 2.2 mils per coat.
  3. Sherwin-Williams; ProMar 200 Interior Latex Egg-Shell Enamel B20-2600 Series: Applied at a dry film thickness of not less than 1.6 mils.
  4. Dunn-Edwards; Suprema 20, Interior Latex Velvet Paint (SPMA20): Applied at a dry film thickness of not less than 1.5 mils.



- D. Interior Semi-gloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.
1. Glidden Professional; 1415 Ultra-Hide No VOC Interior Latex Semi-Gloss: Applied at a dry film thickness of not less than 1.5 mils.
  2. Kelly-Moore; 1650 Acry-Plex 100% Acrylic Interior Semi-Gloss Enamel: Applied at a dry film thickness of not less than 1.7 mils.
  3. Kelly-Moore; 1685 + Dura-Poxy Semi-Gloss Acrylic Enamel: Applied at a dry film thickness of not less than 1.5 mils.
  4. Sherwin-Williams; ProMar 200 Interior Latex Semi-Gloss Enamel B31-2600 Series: Applied at a dry film thickness of not less than 1.3 mils.
  5. Dunn-Edwards; Evershield 50, Int./Ext. 100% Acrylic Semi-Gloss Paint (EVSH50): Applied at a dry film thickness of not less than 1.5 mils.
- E. Interior Full-Gloss Acrylic Enamel: Factory-formulated full-gloss acrylic-latex interior enamel.
1. Glidden Professional; 3028N Ultra-Hide 250 100% Acrylic Interior/Exterior Gloss Paint: Applied at a dry film thickness of not less than 1.4 mils.
  2. Kelly-Moore; 1680 + Dura-Poxy Gloss Acrylic Enamel: Applied at a dry film thickness of 1.7 - 2.2 mils per coat.
  3. Sherwin-Williams; ProMar 200 Interior Latex Gloss Enamel B21W201: Applied at a dry film thickness of not less than 1.5 mils.
  4. Dunn-Edwards; Evershield 60, Int./Ext. 100% Acrylic Gloss Paint (EVSH60): Applied at a dry film thickness of not less than 1.5 mils.
- F. Interior Semigloss Acrylic Enamel: Factory-formulated semigloss enamel for interior application.
1. Glidden Professional; 1506 Lifemaster Oil Interior/Exterior Semi-Gloss Enamel: Applied at a dry film thickness of not less than 1.5 mils.
  2. Kelly-Moore; 1685 Dura-Poxy + 100% Acrylic Semi-Gloss Enamel: Applied at a dry film thickness of 1.7 - 2.2 mils per coat.
  3. Sherwin-Williams; ProMar 200 Interior Alkyd Semi-Gloss Enamel B31-2600 Series: Applied at a dry film thickness of not less than 1.7 mils.
  4. Dunn-Edwards; Evershield 50, Int./Ext. 100% Acrylic Semi-Gloss Paint (EVSH50): Applied at a dry film thickness of not less than 1.5 mils.
- G. Interior Full-Gloss Acrylic Enamel for Gypsum Board and Plaster: Factory-formulated full-gloss interior enamel.
1. Glidden Professional; 3028N Ultra-Hide 250 100% Acrylic Interior/Exterior Gloss Paint: Applied at a dry film thickness of not less than 1.4 mils.
  2. Kelly-Moore; 1680 Dura-Poxy + 100% Acrylic Gloss Enamel: Applied at a dry film thickness of 1.7 - 2.2 mils per coat.
  3. Sherwin-Williams; ProMar 200 Gloss Enamel B35W200 Series: Applied at a dry film thickness of not less than 1.6 mils.
  4. Dunn-Edwards; Evershield 60, Int./Ext. 100% Acrylic Gloss Paint (EVSH60) Applied at a dry film thickness of not less than 1.5 mils.
- H. Interior Full-Gloss Acrylic Enamel for Wood and Metal Surfaces: Factory-formulated full-gloss interior enamel.
1. Glidden Professional; 3028N Ultra-Hide 250 100% Acrylic Interior/Exterior Gloss Paint: Applied at a dry film thickness of not less than 1.4 mils.
  2. Kelly-Moore; 1680 Dura-Poxy + 100% Acrylic Gloss Enamel: Applied at a dry film thickness of 1.7 - 2.2 mils per coat.
  3. Sherwin-Williams; ProMar 200 Gloss Enamel B35W200 Series: Applied at a dry film thickness of not less than 1.6 mils.
  4. Dunn-Edwards; Evershield 60, Int./Ext. 100% Acrylic Gloss Paint (EVSH60) (for wood): Applied at a dry film thickness of not less than 1.5 mils.

#### 4.03 INTERIOR WOOD STAINS AND VARNISHES

- A. Open-Grain Wood Filler: Factory-formulated paste wood filler applied at spreading rate recommended by manufacturer.
  - 1. Glidden Professional; use manufacturer's recommended product.
  - 2. Kelly-Moore - Jasco Wood Filler as recommended by manufacturer.
  - 3. Sherwin-Williams; Sher-Wood Fast-Dry Filler.
  - 4. Dunn-Edwards; Cabot (VSP1019) Paste Wood Filler.
  - 5. Sherwin-Williams; none recommended.
- B. Interior Wood Stain: Factory-formulated alkyd-based penetrating wood stain for interior application applied at spreading rate recommended by manufacturer.
  - 1. Glidden Professional; 1700 Wood Pride Interior Oil Wood Finishing Stain.
  - 2. Kelly-Moore; Woodcraft 2900 Series Q.D. Alkyd Stain
  - 3. Sherwin-Williams; Wood Classics Interior Oil Stain A-48 Series.
  - 4. Dunn-Edwards; Oil Wiping Stain (VQYB series)
- C. Clear Sanding Sealer: Factory-formulated fast-drying alkyd-based clear wood sealer applied at spreading rate recommended by manufacturer.
  - 1. Glidden Professional; 1916 Wood Pride Interior QD Clear Sanding Sealer.
  - 2. Kelly-Moore; 2164 E Z Sand Alkyd Q. D. Sanding Sealer.
  - 3. Sherwin-Williams; Wood Classics Fast Dry Sanding Sealer B26V43.
  - 4. Dunn-Edwards; Sanding sealer not necessary as per manufacturer
- D. Interior Polyurethane-Based Clear Satin Polyurethane Factory-formulated alkyd- or polyurethane-based clear varnish.
  - 1. Glidden Professional; 1902 Wood Pride Interior Satin Polyurethane Varnish.
  - 2. Kelly-Moore; 2097 Kel-Thane II Interior Clear Satin Finish
  - 3. Sherwin-Williams; Wood Classics Waterborne Polyurethane A68V91.
  - 4. Dunn-Edwards; Defthane Semi-Gloss Polyurethane (3 finish coats as per manufacturers recommendations)
- E. Interior Waterborne Clear Satin Varnish: Factory-formulated clear satin acrylic-based polyurethane varnish applied at spreading rate recommended by manufacturer.
  - 1. Glidden Professional; 1802 Wood Pride Interior Waterborne Satin Varnish.
  - 2. Kelly-Moore; 2097 Kel-Thane II Clear Acrylic Urethane--Satin.
  - 3. Sherwin-Williams; Wood Classics Waterborne Polyurethane Satin, A68 Series.
  - 4. Dunn-Edwards; Defthane Satin Polyurethane (3 finish coats as per manufacturers recommendations).
- F. Interior Waterborne Clear Gloss Varnish: Factory-formulated clear gloss acrylic-based polyurethane varnish applied at spreading rate recommended by manufacturer.
  - 1. Glidden Professional; 1808 Wood Pride Interior Waterborne Gloss Varnish.
  - 2. Kelly-Moore; 2096 Kel-Thane II Clear Acrylic Urethane--Gloss.
  - 3. Sherwin-Williams; Wood Classics Waterborne Polyurethane Gloss, A68 Series.
  - 4. Dunn-Edwards; Defthane Gloss Polyurethane (3 finish coats as per manufacturers recommendations)
- G. Paste Wax: As recommended by manufacturer.

#### 4.04 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

## **PART 3 EXECUTION**

### **5.01 EXAMINATION**

- A. Do not begin application of coatings until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work, with applicator present. Report any condition that may potentially affect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. 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. Gypsum Wallboard: 12 percent.
  - 2. Plaster and Stucco: 12 percent.
  - 3. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
  - 4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
  - 5. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
  - 6. Concrete Floors and Traffic Surfaces: 8 percent.

### **5.02 PREPARATION**

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing. If removal is impractical or impossible because of size or weight of the item, provide surface applied protection before surface preparation and painting. After painting operations, reinstall items removed using workers skilled in the trades involved.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- G. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- H. Plaster Surfaces to be Painted: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- I. Concrete Floors and Traffic Surfaces to be Painted: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- J. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- K. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-SP 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).
- L. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand or power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.

- M. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
- N. Interior Wood Surfaces to Receive Opaque Finish: 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. Back prime concealed surfaces before installation.
- O. Interior Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.
- P. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.
- Q. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.
- R. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.
- S. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.
- T. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.
- U. **Remove any and all staples, tacks, tape, wires or other devices previously used for demonstration or display. Patch and repair all holes or deficiencies left behind for a "like new" finished surface.**
- V. *Patch and repair any deficient or blemished surface with appropriate filler, prep, prime and paint rough edges for a new smooth final appearance*

### 5.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.
- C. Apply products in accordance with manufacturer's instructions. Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- D. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
- E. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
- F. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
- G. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
- H. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
- I. Where indicated, finish interior of mill built wall and base cabinets and similar field-finished casework to match exterior.
- J. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- K. Apply each coat to uniform appearance.

- L. Dark Colors and Deep Clear Colors: **Regardless of number of coats specified, apply as many coats as necessary for complete hide.**
- M. Sand wood and metal surfaces lightly between coats to achieve required finish.
- N. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- O. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- P. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
- Q. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- R. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- S. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
  - 1. Provide satin finish for final coats.
- T. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.
- U. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

#### **5.04 APPLICATION PROCEDURES:**

- A. APPLY PAINTS AND COATINGS BY BRUSH, ROLLER, SPRAY, OR OTHER APPLICATORS ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.
  - 1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
  - 2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
  - 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

#### **5.05 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.
- B. Owner will provide field inspection.

#### **5.06 CLEANING**

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

#### **5.07 PROTECTION**

- A. Protect finished coatings until completion of project.
- B. Touch-up damaged coatings after Substantial Completion.

## SCHEDULE - PAINT SYSTEMS

### 6.01 EXTERIOR PAINT SCHEDULE

- A. Concrete, Stucco, and Masonry (Other Than Concrete Unit Masonry): Provide the following finish systems over exterior concrete, stucco, and brick masonry substrates:
  - 1. Flat Acrylic Finish: Two finish coats over a primer. (Total dry film thickness not less than 2.5 mils.)
    - a. Primer: Exterior concrete and masonry primer.
    - b. Finish Coats: Exterior flat acrylic paint.
  - 2. Low-Luster Acrylic Finish: Two finish coats over a primer. (Total dry film thickness not less than 2.5 mils.)
    - a. Primer: Exterior concrete and masonry primer.
    - b. Finish Coats: Exterior low-luster acrylic paint.
  - 3. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer. (Total dry film thickness not less than 2.5 mils.)
    - a. Primer: Exterior concrete and masonry primer.
    - b. Finish Coats: Exterior semigloss acrylic enamel.
- B. Concrete Unit Masonry: Provide the following finish systems over exterior concrete unit masonry:
  - 1. Flat Acrylic Finish: Two finish coats over a block filler. (Total dry film thickness not less than 2.5 mils.)
    - a. Block Filler: Concrete unit masonry block filler.
    - b. Finish Coats: Exterior flat acrylic paint.
  - 2. Low-Luster Acrylic Finish: Two finish coats over a block filler. (Total dry film thickness not less than 2.5 mils.)
    - a. Block Filler: Concrete unit masonry block filler.
    - b. Finish Coats: Exterior low-luster acrylic paint.
  - 3. Semigloss Acrylic-Enamel Finish: Two finish coats over a block filler. (Total dry film thickness not less than 2.5 mils.)
    - a. Block Filler: Concrete unit masonry block filler.
    - b. Finish Coats: Exterior semigloss acrylic enamel.
- C. Mineral-Fiber-Reinforced Cement Panels: Provide the following finish systems over exterior, mineral-fiber-reinforced cement panels:
  - 1. Flat Acrylic Finish: Two finish coats over a primer.
    - a. Primer: Exterior concrete and masonry primer.
    - b. Finish Coats: Exterior flat acrylic paint.
- D. Exterior Gypsum Soffit Board: Provide the following finish systems over exterior gypsum soffit board:
  - 1. Flat Acrylic Finish: Two finish coats over an exterior alkyd- or alkali-resistant primer.
    - a. Primer: Exterior gypsum soffit board primer.
    - b. Finish Coats: Exterior flat acrylic paint.
  - 2. Low-Luster Acrylic Finish: Two finish coats over a primer.
    - a. Primer: Exterior gypsum soffit board primer.
    - b. Finish Coats: Exterior low-luster acrylic paint.
  - 3. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Exterior gypsum soffit board primer.
    - b. Finish Coats: Exterior semigloss acrylic enamel.
- E. Smooth Wood: Provide the following finish systems over smooth wood siding, wood trim, and other smooth exterior wood surfaces:
  - 1. Flat Acrylic Finish: Two finish coats over a primer.
    - a. Primer: Exterior wood primer for acrylic enamels.
    - b. Finish Coats: Exterior flat acrylic paint.
  - 2. Low-Luster Acrylic Finish: Two finish coats over a primer.

- a. Primer: Exterior wood primer for acrylic enamels.
  - b. Finish Coats: Exterior low-luster acrylic paint.
- F. Wood Trim: Provide the following finish systems over exterior wood trim:
  - 1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Exterior wood primer for acrylic enamels.
    - b. Finish Coats: Exterior semigloss acrylic enamel.
- G. Plywood: Provide the following finish systems over exterior plywood:
  - 1. Flat Acrylic Finish: Two finish coats over a primer.
    - a. Primer: Exterior wood primer for acrylic enamels.
    - b. Finish Coats: Exterior flat acrylic paint.
  - 2. Low-Luster Finish: Two finish coats over a primer.
    - a. Primer: Exterior wood primer for acrylic enamels.
    - b. Finish Coats: Exterior low-luster acrylic paint.
- H. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
  - 1. Low-Luster Acrylic Finish: Two finish coats over a rust-inhibitive primer.
    - a. Primer: Exterior ferrous-metal primer.
    - b. Finish Coat: Exterior low-luster acrylic paint.
  - 2. Semigloss Acrylic-Enamel Finish: Two finish coats over a rust-inhibitive primer.
    - a. Primer: Exterior ferrous-metal primer.
    - b. Finish Coats: Exterior semigloss acrylic enamel.
  - 3. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a rust-inhibitive primer.
    - a. Primer: Exterior ferrous-metal primer.
    - b. Finish Coats: Exterior full-gloss acrylic enamel for ferrous and other metals.
  - 4. Full-Gloss Alkyd-Enamel Finish: Two finish coats over a rust-inhibitive primer.
    - a. Primer: Exterior ferrous-metal primer.
    - b. Finish Coats: Exterior full-gloss alkyd enamel.
- I. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces:
  - 1. Low-Luster Finish: Two finish coats over a galvanized metal primer.
    - a. Primer: Exterior galvanized metal primer.
    - b. Finish Coat: Exterior low-luster acrylic paint.
  - 2. Semigloss Acrylic-Enamel Finish: Two finish coats over a galvanized metal primer.
    - a. Primer: Exterior galvanized metal primer.
    - b. Finish Coats: Exterior semigloss acrylic enamel.
  - 3. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a galvanized metal primer.
    - a. Primer: Exterior galvanized metal primer.
    - b. Finish Coats: Exterior full-gloss acrylic enamel for ferrous and other metals.
- J. Aluminum: Provide the following finish systems over exterior aluminum surfaces:
  - 1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Exterior aluminum primer under acrylic finishes.
    - b. Finish Coats: Exterior semigloss acrylic enamel.
  - 2. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Exterior aluminum primer under acrylic finishes.
    - b. Finish Coats: Exterior full-gloss acrylic enamel for ferrous and other metals.

## 6.02 INTERIOR PAINT SCHEDULE

- A. Concrete and Masonry (Other Than Concrete Unit Masonry): Provide the following paint systems over interior concrete and brick masonry substrates:
  - 1. Flat Acrylic Finish: Two finish coats over a primer.
    - a. Primer: Interior concrete and masonry primer.
    - b. Finish Coats: Interior flat acrylic paint.
  - 2. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.

- a. Primer: Interior concrete and masonry primer.
  - b. Finish Coats: Interior low-luster acrylic enamel.
- 3. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
  - a. Primer: Interior concrete and masonry primer.
  - b. Finish Coats: Interior semigloss acrylic enamel.
- B. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry:
  - 1. Flat Acrylic Finish: Two finish coats over a block filler.
    - a. Block Filler: Concrete unit masonry block filler.
    - b. Finish Coats: Interior flat acrylic paint.
  - 2. Low-Luster Acrylic-Enamel Finish: Two finish coats over a block filler.
    - a. Block Filler: Concrete unit masonry block filler.
    - b. Finish Coats: Interior low-luster acrylic enamel.
  - 3. Semigloss Acrylic-Enamel Finish: Two finish coats over a block filler.
    - a. Block Filler: Concrete unit masonry block filler.
    - b. Finish Coats: Interior semigloss acrylic enamel.
- C. Mineral-Fiber-Reinforced Cement Panels: Provide the following finish systems over interior mineral-fiber-reinforced cement panels:
  - 1. Flat Acrylic Finish: Two finish coats.
    - a. Finish Coats: Interior flat acrylic paint.
- D. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
  - 1. Flat Acrylic Finish: Three finish coats over a primer.
    - a. Primer: Interior gypsum board primer.
    - b. Finish Coats: Interior flat acrylic paint.
  - 2. Low-Luster Acrylic-Enamel Finish: Three finish coats over a primer.
    - a. Primer: Interior gypsum board primer.
    - b. Finish Coats: Interior low-luster acrylic enamel.
  - 3. Semigloss Acrylic-Enamel Finish: Three finish coats over a primer.
    - a. Primer: Interior gypsum board primer.
    - b. Finish Coats: Interior semigloss acrylic enamel.
- E. Wood and Hardboard: Provide the following paint finish systems over new interior wood surfaces:
  - 1. Low-Luster Acrylic-Enamel Finish: Three finish coats over a primer.
    - a. Primer: Interior wood primer for acrylic-enamel and semigloss alkyd-enamel finishes.
    - b. Finish Coats: Interior low-luster acrylic enamel.
  - 2. Semigloss Acrylic-Enamel Finish: Three finish coats over a wood undercoater.
    - a. Primer: Interior wood primer for acrylic-enamel and semigloss alkyd-enamel finishes.
    - b. Finish Coats: Interior semigloss acrylic enamel.
- F. Ferrous Metal: Provide the following finish systems over ferrous metal:
  - 1. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Interior ferrous-metal primer.
    - b. Finish Coats: Interior low-luster acrylic enamel.
  - 2. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Interior ferrous-metal primer.
    - b. Finish Coats: Interior semigloss acrylic enamel.
- G. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:
  - 1. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Interior zinc-coated metal primer.
    - b. Finish Coats: Interior low-luster acrylic enamel.
  - 2. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Interior zinc-coated metal primer.
    - b. Finish Coats: Interior semigloss acrylic enamel.



- H. All-Service Jacket over Insulation: Provide the following finish system on cotton or canvas insulation covering:
  - 1. Flat Acrylic Finish: Two finish coats. Add fungicidal agent to render fabric mildew proof.
    - a. Finish Coats: Interior flat latex-emulsion size.

### **6.03 INTERIOR STAIN AND NATURAL-FINISH WOODWORK SCHEDULE**

- A. Stained Woodwork: Provide the following stained finishes over new interior woodwork:
  - 1. Alkyd-Based Stain Satin-Varnish Finish: Three finish coats of alkyd-based clear satin varnish over a sealer coat and interior wood stain. Wipe wood filler before applying stain.
    - a. Filler Coat: Open-grain wood filler.
    - b. Stain Coat: Interior wood stain.
    - c. Sealer Coat: Clear sanding sealer.
    - d. Finish Coats: Interior alkyd- or polyurethane-based clear satin varnish.
  - 2. Waterborne Stain Satin-Varnish Finish: Three finish coats of waterborne clear satin varnish over a sealer coat and waterborne interior wood stain. Wipe wood filler before applying stain.
    - a. Filler Coat: Open-grain wood filler.
    - b. Stain Coat: Interior wood stain.
    - c. Sealer Coat: Clear sanding sealer.
    - d. Finish Coats: Interior waterborne clear satin varnish.
  - 3. Waterborne Stain Full-Gloss Varnish Finish: Three finish coats of waterborne clear full-gloss varnish over a sealer coat and interior wood stain. Wipe filler before applying stain.
    - a. Filler Coat: Open-grain wood filler.
    - b. Stain Coat: Interior wood stain.
    - c. Sealer Coat: Clear sanding
  - 4. Alkyd-Based Stain Wax-Polished Finish: Three finish coats of paste wax over a sealer coat and alkyd-based interior wood stain.
    - a. Stain Coat: Interior wood stain.
    - b. Sealer Coat: Clear sanding sealer.
    - c. Finish Coats: Paste wax.
- B. Natural-Finish Woodwork: Provide the following natural finishes over new interior woodwork:
  - 1. Alkyd-Based Satin-Varnish Finish: Three finish coats of alkyd-based clear satin varnish over a sanding sealer. Provide wood filler on open-grain wood before applying first varnish coat.
    - a. Filler Coat: Open-grain wood filler.
    - b. Sealer Coat: Clear sanding sealer.
    - c. Finish Coats: Interior alkyd- or polyurethane-based clear satin varnish.
  - 2. Waterborne Satin-Varnish Finish: Three finish coats of waterborne clear satin varnish over a sanding sealer. Wipe wood filler before applying stain.
    - a. Filler Coat: Open-grain wood filler.
    - b. Sealer Coat: Clear sanding sealer.
    - c. Finish Coats: Interior waterborne clear satin varnish.
  - 3. Waterborne Full-Gloss Varnish Finish: Three finish coats of waterborne clear full-gloss varnish over a sealer coat. Wipe filler before applying stain.
    - a. Filler Coat: Open-grain wood filler.
    - b. Sealer Coat: Clear sanding sealer.
    - c. Finish Coats: Interior waterborne clear gloss varnish.
  - 4. Wax-Polished Finish: Three finish coats of paste wax over a sanding-sealer first coat.
    - a. Sealer Coat: Clear sanding sealer.
    - b. Finish Coats: Paste wax.

**END OF SECTION 09 9000**

**SECTION 10 1400**  
**SIGNAGE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Room and door signs.

**1.02 RELATED REQUIREMENTS**

- A. Section 22 0553 - Identification for Plumbing Piping and Equipment.
- B. Section 26 0553 - Identification for Electrical Systems.
- C. Section 26 5100 - Interior Lighting: Exit signs required by code.

**1.03 REFERENCE STANDARDS**

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
  - 1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
  - 2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
  - 3. Submit for approval by Owner through Architect prior to fabrication.
- D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.
- E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.
- F. Verification Samples: Submit samples showing colors specified.

**1.05 QUALITY ASSURANCE**

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

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

**1.07 FIELD CONDITIONS**

- A. Maintain this minimum temperature during and after installation of signs.
- B. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

- C. A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Flat Signs:
  - 1. Garnet Sign Studio (San Francisco, CA)
  - 2. Classic Signs & Awards (Concord, CA)
  - 3. Designer Sign Systems (San Jose, CA)
  - 4. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

### **2.02 SIGNAGE APPLICATIONS**

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 \_\_\_\_\_, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
  - 1. Sign Type: Flat signs with engraved panel media as specified.
    - a. Engraved Plastic Laminate: Engrave through exposed face ply of plastic-laminate sheet to expose contrasting core ply. Sign inserts shall be routed from Rowmark "Ultramattes" reverse engravable laminate acrylic plastic, colors to be selected from Rowmark's standard color chart. Letters, numbers and symbols shall be either laser cut or machine profile cut from Rowmark "ADA Alternative Appliqué" material and applied to the surface using 3M 467MP Hi Performance Adhesive Sheeting.
  - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille. Dots shall be 1/10 inch on centers in each cell with 2/10 inch spacing between cells.
  - 3. Character Height: 1 inch.
  - 4. Sign Height: 4 inches, unless otherwise indicated.
  - 5. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.
- C. Other Dimensional Letter Signs: Wall-mounted.
  - 1. Exterior: Allow for total of 50 letters, 6 inches high, metal.
- D. Traffic Signs: To match campus standards; locate where indicated on drawings.

### **2.03 SIGN TYPES**

- A. Flat Signs: Signage media in aluminum frame. Include room signs, identifications signs, room capacity, toilet room signs, symbol for accessibility signs, etc.
  - 1. Corners: Square.
  - 2. Frame Finish: Natural (clear) anodized.
  - 3. Wall Mounting of One-Sided Signs: Vandal Proof Exposed Fasteners through the face of the sign.
- B. Color and Font: Unless otherwise indicated:
  - 1. Character Font: Helvetica, Arial, or other sans serif font.
  - 2. Character Case: Upper case only.
  - 3. Background Color: As selected from manufacturer's full range of available colors.
  - 4. Character Color: Contrasting color.
- C. Toilet Room Signs:
  - 1. Material: Cast-acrylic sheet, ¼ inch thick.
  - 2. Perimeter: Unframed at door mounted signs. Aluminum framed at ADA signs.
  - 3. Copy: Raised. (Grade 2 Braille)
  - 4. Character Style: Univers 55.
  - 5. Text: According to requirements in the ADA or of authorities having jurisdiction, whichever are more stringent.

- 6. Message: Fixed.
  - 7. Sizes:
    - a. Sign:
      - 1) "Men" or "Boys" - Equilateral triangle, 12 inches on a side. Door mounted.
      - 2) "Women" or "Girls" - Circle, 12 inches diameter. Door mounted.
      - 3) "Unisex": Equilateral triangle superimposed over a 12 inch circle.
      - 4) ADA signage: 4 inches by 6 inches or 10 inches by 12 inches. Mounted at plus 5 feet, on wall, on latch side of door.
    - b. Character: Minimum 1-inch high characters. Grade 2 Braille at accessible facilities.
  - 8. Colors:
    - a. Frame at ADA signage: Aluminum.
    - b. Character: Contrasting color to door as selected by Architect.
    - c. Background: Contrasting color to door as selected by Architect.
- D. Accessible Parking Signs:
- 1. Material: 0.080-inch aluminum or other noncorrosive material.
  - 2. Size: Minimum of 70 square inches in area. Provide additional sign at bottom for Van Accessible spaces.
  - 3. Background Color: Blue.
  - 4. Copy Material: White silk-screen, with reflective white border.
  - 5. Mounting: Pole mounted at each accessible parking space.
  - 6. Spaces complying with CCR 1129B shall have an additional sign stating "Van Accessible" mounted below the symbol of accessibility.
- E. Symbols of Accessibility: Provide 6-inch by 6 inch by ¼ inch reverse silk screen international symbol of accessibility in white on blue background. Provide aluminum frame.

## 2.04 TACTILE SIGNAGE MEDIA

- A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
  - 1. Total Thickness: 1/16 inch.

## 2.05 ACCESSORIES

- A. Exposed Mechanical Fasteners: Use nonremovable exposed stainless steel vandelproof mechanical fasteners placed through predrilled holes in aluminum frames and through face of sign into solid backing.
- B. Where panel signs are scheduled or indicated to be mounted on glass, provide matching plate on opposite side of glass to conceal mounting materials.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls, on the right side if possible. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.
- D. Protect from damage until Substantial Completion; repair or replace damaged items.

**END OF SECTION 10 1400**

**SECTION 10 2113.19**  
**PLASTIC TOILET COMPARTMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Solid plastic toilet compartments. Floor anchored and overhead braced.
- B. Urinal and Vestibule screens. Wall Hung with floor to ceiling post.
- C. Institutional Grade Hardware.

**1.02 RELATED REQUIREMENTS**

- A. Section 06 1000 - Rough Carpentry: Blocking and supports.
- B. Section 10 2800 - Toilet, Bath, and Laundry Accessories.

**1.03 REFERENCE STANDARDS**

- A. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.
- B. Smoke and Flame Spread: Comply with Section 803, 2010 CBC, Part 9 (CFC).

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- C. Samples: Submit two samples of partition panels, \_\_\_\_by\_\_\_\_ inch in size illustrating panel finish, color, and sheen.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Solid Plastic Toilet Compartments (HDPE):
  - 1. Acceptable Manufacturer: Scranton Products, which is located at: 801 E. Corey St. ; Scranton, PA 18507; Toll Free Tel: 800-445-5148; Email: request info (info@scrantonproducts.com); Web: www.scrantonproducts.com
    - a. Fabricator: Santana Toilet Partitions.
    - b. Fabricator: Comtec Toilet Partitions.
    - c. Fabricator: Capitol Toilet Partitions.
  - 1. Requests for substitutions will be considered in accordance with provisions of Section 01600.

**2.02 PLASTIC TOILET COMPARTMENTS**

- A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted unbraced.
- B. Doors:
  - 1. Thickness: 1 inch.
  - 2. Width: 24 inch.
  - 3. Width for Handicapped Use: 36 inch, out-swinging.
  - 4. Height: 55 inch.
- C. Panels:
  - 1. Thickness: 1 inch.
  - 2. Height: 55 inch.

- D. Pilasters:
  - 1. Thickness: 1 inch.
  - 2. Width: As required to fit space; minimum 3 inch.

### 2.03 COMPONENTS

- A. Plastic Toilet Compartments(HDPE): Solid molded high density polyethylene (HDPE) plastic panels, doors, and pilasters, floor-mounted headrail-braced. **Foaming agent polymers not allowed.**
  - 1. Color: . From manufacturer's full range of colors and patterns
  - 2. Door and Panel Dimensions:
    - a. Thickness: 1 inch.
    - b. Door Width for Handicapped Use: 36 inch, out-swinging.
    - c. Panel Height: 58 inch., Pilasters to be 82" High
    - d. Thickness of Pilasters: 1 inch.
- B. Urinal Screens: Wall mounted with continuous panel brackets, and floor-to-ceiling vertical upright consisting of pilaster anchored to floor and ceiling.

### 2.04 ACCESSORIES - INSTITUTIONAL HEAVY DUTY

- A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor fastenings.
- B. Head Rails: Hollow chrome plated steel tube, 1 x 1-5/8 inch size, with anti-grip strips and cast socket wall brackets.
- C. Pilaster Brackets: Satin stainless steel.
- D. Wall Brackets: Continuous type, satin stainless steel.
- E. Hardware: Polished stainless steel: **Institutional Heavy Duty Type**
  - 1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
  - 2. Door Latch: Slide type with exterior emergency access feature.
  - 3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
  - 4. Coat hook with rubber bumper; one per compartment, mounted on door.
  - 5. Provide door pull for outswinging doors. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

### 3.02 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.
- C. Attach institutional heavy duty panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to institutional heavy duty brackets. Locate head rail joints at pilaster center lines.
- E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

### 3.03 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

### **3.04 ADJUSTING**

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
- C. Adjust adjacent components for consistency of line or plane.

**END OF SECTION 10 2113.19**

## SECTION: 10 22 33 – ACCORDION FOLDING FIRE PARTITIONS – MOVABLE FIRE WALL

### PART 1 – GENERAL

#### 1.01 SUMMARY OF WORK

- A. Division 0 and 1, as indexed, apply to this section.
- B. Furnish and install all horizontal sliding, accordion folding fire partitions shown on the drawings and specified herein.

#### 1.02 RELATED SECTIONS

- A. All headers, support structures, fire protection of support structures, surrounding insulation, jambs, storage pockets, pocket doors, access doors, blocking and trim shall be furnished and installed by other sections.
- B. All electrical wire, wiring, conduit and electrical boxes shall be furnished and installed by electrical section including connections to smoke detectors and building fire alarm panels.
- C. Drilling/placement of anchorage points into pre or post tensioned decks, welding/punching/drilling steel members and all drywall work.
- D. **OPTION:** All track, soffit, chain guide and wall mounted striker posts shall be painted by Section 09 90 00. Color shall be selected by the architect.
- E. **OPTION:** *If Section 2.03 E, Individual LCD Partition Status Display, is selected as an option, the following paragraph should be included:* Wiring for Individual LCD Door Status Display at fire partition-One (1) USOC RJ14-6POS 4 wire jack shall be supplied at the back of the storage pocket and shall be tied to the 4 square junction box adjacent to the partition with CAT 5 twisted 2 pair cable. The junction box, RJ14 jack and wire shall be furnished and installed by the electrical section. Termination to the LCD panel shall be by punch down block and shall be by the electrical section as per the manufacturer's instructions.
- F. **OPTION:** *If Section 2.03 H, Remote Operation and Monitoring, is selected as an option, the following paragraph should be included:* Interface to the fire partition shall be accomplished using a MODBUS gateway (by others) configured for RS485 communications. Use 18-gauge single twisted pair communication wire from the MODBUS gateway and daisy chain connections to each fire partition (maximum of 32 partitions per gateway). Terminate the end-of-line with a load resistor as specified by the MODBUS gateway manufacturer.

Communication lines are daisy chained from the MODBUS gateway to each fire partition. The communications line is connected to a USOC RJ11, 6 Position, 4 Contact wall plate at each door. The [COM+]/[COM-] wires are connected to the center pins (Red and Green wires respectively). The plate is then mounted to a j-box centrally located on the back wall of the fire door pocket. All wiring, conduit, j-boxes and wall plates are provided by the Electrical Contractor. Connection from the wall plate to the fire door controller is accomplished by a modular plug data cable provided by the manufacturer.

#### 1.03 QUALITY ASSURANCE

- A. Installation shall be performed by factory trained and certified installers with a minimum of three years' experience installing electrically operated accordion folding fire partition.



- B. Fire partitions shall be listed by Underwriters Laboratories for ratings as indicated, when tested in accordance with the requirements of UL 263 and ASTM E-119.
- C. Automatic closing system shall be listed by Underwriters Laboratories in accordance with the requirements of UL 864 and be listed for use with assembly in compliance with NFPA 80.

#### 1.04 SUBMITTALS

- A. Refer to Section 01 30 00 – Administrative requirements for shop drawings and submittals.
- B. Product Data: Provide manufacturer's technical literature, include UL listing data.
- C. Shop Drawings: Indicate construction and installation details and dimensions, including layout, electrical requirements, required stacking depth, height of header above finished floor, and requirements for anchorage and support of each fire partition.
- D. Operation and Maintenance Data: Operating procedures, troubleshooting and repair methods, and wiring diagrams.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver to the job site in manufacturer's original, unopened package.

#### 1.06 COORDINATION BY GENERAL CONTRACTOR

- A. Coordinate with the following:
  - 1. Fire Alarm System.
  - 2. Electrical.
  - 3. Pocket cover door (if required).
  - 4. Floor and ceiling finish.
- B. Assure accurate installation of header, jamb, and trim. Provide "As-Built" dimensions for opening and storage pocket. Supervise unloading and handling of materials.
- C. Store boxes flat (not more than three high) in a dry area and protect from elements that may damage materials.
- D. Permanent power shall be in-place and ready for final connection when fire partitions are erected. Assure access to and proper clearance for motor operators.
- E. After testing the fire alarm system, automatic-closing fire partitions shall be re-set to the original position.

#### 1.07 WARRANTY

- A. Materials and installation shall be warranted against defects in workmanship for a period of one (1) year from the date of substantial completion.

### PART 2 – PRODUCTS

#### 2.01 MANUFACTURER AND MODEL

- A. Accordion folding fire partition shall be Won-Door FireGuard Moveable Fire Wall model MFW\_\_\_\_ (select one: 1 or 2 – number designates hours of fire rating) as manufactured by Won-Door Corporation, Salt Lake City, UT.
- B. No substitutions allowed.

## 2.02 ACCORDION FIRE PARTITIONS - GENERAL

- A. Provide power operated self-closing fire partitions of configurations indicated on the drawings.
  - 1. Fire rating as required.
- B. Fire Rating: Fire partitions shall be listed by Underwriters Laboratory as special purpose fire partitions having a (*select one: 1 or 2*) hour fire protection rating in accordance with the requirements of UL 263 and ASTM E-119.
- C. Closing and Opening Operation: Automatic Closing System including motor operator and releasing devices shall be a Microprocessor-based system rated to UL864 (Releasing Device Control Unit) and shall commence closing upon activation by fire alarm system and/or by low battery voltage.
  - 1. Obstruction Detection: Contact with an obstruction shall cause the partition to stop, reverse enough to remove pressure on the leading edge, pause, and then re-close when in an alarm condition.
  - 2. Constant pressure to the leading edge while not under motor power shall prevent motor operation and allow the partition to be opened manually.

## 2.03 COMPONENTS

- A. Partition Construction: Two parallel, accordion-type walls of panels independently suspended with no floor tracks, pantographs, or interconnections except at the lead-post.
  - 1. Panels: 24 gauge steel; V-grooved; modular design; capable of in-place repair.
  - 2. Perimeter Seals: shall consist of continuous extruded sweeps attached to the top and bottom of the fire partition to form a smoke and draft seal.
  - 3. Hanging weight shall be 6.5 pounds per square foot when extended across the opening.
  - 4. Finish: All steel panels shall have factory applied protective coatings.
  - 5. Color: Manufacturer's standard platinum.
- B. Suspension System: Two tracks, on 8 inch centers, attached to overhead structural support.
  - 1. Tracks: 14 gauge cold rolled steel.
  - 2. Panel hangers: Each panel suspended from a steel hanger pin and a ball bearing roller.
  - 3. Lead post hangers: 8 wheel ball bearing trolley.
- C. Power Supply: 120 volt power source to power supply for main power. On loss of AC power, the 12v/24v secondary power source shall provide full operation capability.
- D. Automatic Closing System shall be listed to UL864 including capability to send and receive signals from the Fire Control Panel and shall consist of the following:
  - 1. Microprocessor based Electronic Control box with the ability to:
    - a. Monitor dual power sources continually for peak performance including:
      - 1) Detect a missing battery, bad battery, or low battery condition.
      - 2) Detect if the charging circuit is bad.

- 3) Detect fuse failures.
  - 4) Detect high or low AC conditions.
  - b. Monitor the health of the drive train.
  - c. Monitor inputs including faults associated with: door block, exit hardware, patron hardware, and key switches.
  - d. Run a “watch dog” monitoring circuit which will force a software restart in the event the software hangs, including tracking the number of resets that occur for diagnostic purposes.
  - e. Withstand voltages up to 120 volts AC on the fire alarm input circuit without damage including the ability to indicate that the alarm circuit has not been wired as a dry contact, “no voltage” circuit when errant voltages are applied to the circuit.
  - f. Communicate with other microprocessors in the assembly via an internal bus system.
  - g. Indicate faults or supervised information both locally and at a remote location.
2. Motor Operator Assembly including a DC gear-motor, drive sprocket, clutch, and position sensors. The motor shall drive the fire partition by means of a chain attached to a stabilizer bar trolley.
  3. A partition control momentary rocker switch shall be mounted on one side of the partition and shall function as follows:
    - a. Pressing the upper portion of the switch shall close the partition and/or clear fault conditions.
    - b. Pressing the lower portion of the switch shall open the partition and/or temporarily mute the local horn.
    - c. For partitions using wall mounted key switches, Section 2.03 K, a color coordinated cover plate shall be provided to fill the hole left when the rocker switch is removed.
  4. Leading Edge shall be pressure sensitive such that contact with an obstruction shall cause the partition to stop, pause for 3 seconds, and then re-close when in an alarm mode.
- E. **OPTION:** An Individual LCD Door Status Display panel shall be provided adjacent to the partition to indicate in the English language the status of the partition, i.e. door position and trouble conditions. It shall have a port that allows easy access to a diagnostic tool for the purposes of field programming the partition to customized settings. (*Note: Electrical requirements for the Individual LCD Partition Status Display panel can be found in Section 1.02 E*)
- F. **OPTION:** An infrared light beam shall be provided to monitor the opening path. In the event that an object is placed in the path of the partition for more than 4 minutes, the beam shall cause the door to sound an alarm indicating a path obstruction.
- G. **OPTION:** Level 1 Access Control: A rigid jamb stop and key switch shall be provided for authorized operation of the partition assembly. A signal from the smoke detector or fire

alarm will automatically override the access control feature. (*Note: at least one key-switch required.*)

- H. **OPTION:** Remote Operation and Monitoring. Fire partitions shall be remotely monitored and controlled through a building monitoring system (BMS) and interface with the BMS using MODBUS communication.

MODBUS Partition Controls shall Include: Open, Close, Set Fire Mode for Testing, Reset, Lock (with Access Control Option), Unlock (with Access Control Option).

MODBUS Monitor Status: Partition position across opening width, Partition Status (OPEN, CLOSED, OPENING, CLOSING), Errors, Battery Voltage, AC Voltage.

- I. **OPTION:** An additional auxiliary relay module (XRM) can be provided with two additional relays to indicate specific status and fault conditions including any two of the following: Open, Opening, Closed, Closing, Stopped, Locked, Exit Hardware Access, Secure Access, Forced Entry, TLS Failure, Key Switch Failures, Stuck switches, Power Failures, Communication Errors.
- J. **OPTION:** A key switch module shall be provided.
- K. **OPTION:** Provide fire exit hardware on both sides of partition.

## 2.04 RELATED CONSTRUCTION

- A. Track Support Construction: Provide supports attached to structure and mounting surface for track including drilling/placement of anchorage points into pre or post tensioned decks, welding/punching/drilling steel members, and all drywall work; comply with partition manufacturer's instructions and recommendations. Headers furnished & installed by the general contractor or other sections, shall be parallel with the finished floor within +/- 1/8" tolerance over the entire length of the opening.
- B. Pocket Construction: Provide rated pocket as specified for storage of accordion folding fire partition when open; comply with partition manufacturer's instructions and recommendations.
- C. Pocket Door: Maintain full pocket clear width when pocket door is open.
- D. Striker Recess: mount 16 gauge steel striker in wall recess deep enough to prevent striker from protruding beyond face of wall; construct recess to maintain fire rating of wall.
- E. Protection: Protect installed work from damage.

## PART 3 – EXECUTION

### 3.01 EXAMINATION

- A. Verify that adjacent construction is suitable for installation of partition.
- B. Verify that electrical utilities have been installed and are accessible.
- C. Verify that partition opening is plumb and header is parallel with the finished floor.
- D. Verify clear opening dimensions.
- E. Notify Architect of any unacceptable conditions or varying dimensions.

### 3.02 INSTALLATION

- A. Install fire partitions in accordance with manufacturer's instructions, shop drawings, and NFPA 80.
- B. Install fire partitions plumb and parallel with the finished floor.
- C. Installation shall be performed by factory trained and certified installers with a minimum of three years' experience installing electrically operated accordion folding fire products.

### 3.03 ADJUSTING

- A. Adjust door installation to provide uniform clearances and smooth, quiet, non-binding operation.
- B. Test that all operations are functional and meet the requirements of local codes.

### 3.04 CLEANING

- A. Clean surfaces using manufacturer's recommended means and methods.

### 3.05 STORAGE OF WASTE AND RECYCLING

- A. Store and recycle waste in accordance with Section 01 74 19 Construction Waste Management and Disposal.

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END OF SECTION

**SECTION 10 2800**  
**TOILET, BATH, AND LAUNDRY ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Commercial toilet accessories.
- B. Under-lavatory pipe supply covers.
- C. Utility room accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 10 2113.19 - Plastic Toilet Compartments.
- B. Section 22 4000 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

**1.03 REFERENCE STANDARDS**

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- D. ASTM C1036 - Standard Specification for Flat Glass; 2011.
- E. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008 (Reapproved 2013).

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Commercial Toilet Accessories:
  - 1. Bobrick.
  - 2. Substitutions: Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- B. Under-Lavatory Pipe Supply Covers:
  - 1. Plumberex Specialty Products, Inc; \_\_\_\_\_: [www.plumberex.com/#sle](http://www.plumberex.com/#sle).
  - 2. Substitutions: Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.
- C. Provide products of each category type by single manufacturer.

**2.02 MATERIALS**

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
  - 1. Grind welded joints smooth.
  - 2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
- B. Keys: Provide 5 keys for each accessory to Owner; master key lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

- E. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- F. Adhesive: Two component epoxy type, waterproof.
- G. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

### **2.03 FINISHES**

- A. Stainless Steel: Satin finish, unless otherwise noted.
- B. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.
- C. Back paint components where contact is made with building finishes to prevent electrolysis.

### **2.04 COMMERCIAL TOILET ACCESSORIES**

- A. Toilet Paper Dispenser: B-4288 Double roll, surface mounted, stainless steel unit with pivot hinge, tumbler lock..
- B. ADA Toilet Paper Dispenser: B-4388 Double roll, semi-recessed, stainless steel unit with pivot hinge, tumbler lock.
- C. Paper Towel Dispenser: B-72860 Roll paper type, plastic, surface mounted, translucent cover as refill indicator, pull towel mechanism w/12" feed, and tumbler lock.
- D. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.
  - 1. Bobrick 818615.
- E. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036. Bobrick B-165 1836.
  - 1. Size: 18x36.
  - 2. Frame: 9.5mm channel, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
  - 3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
- F. Seat Cover Dispenser: Bobrick B-301 Stainless steel, recessed, tumbler lock.
  - 1. Minimum capacity: 500 seat covers.
- G. Combination Sanitary Napkin/Tampon Dispenser: Bobrick B-47064C Stainless steel, semi-recessed.
  - 1. Door: Seamless door with returned edges and tumbler lock.
  - 2. Cabinet: Fully welded
  - 3. Operation: Convertable coin operated dispenser. Provide locked coin box, separately keyed.
  - 4. Identify dispensers slots without using brand names.
  - 5. Minimum capacity: 20 napkins and 30 tampons.
- H. Sanitary Napkin Disposal Unit: Bobrick B-270 Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
- I. Underlavatory Guard: Provide underlavatory guards at all exposed sink areas.
  - 1. Insulating Piping Coverings: White, antimicrobial, molded-vinyl covering for supply and drain piping assemblies intended for use at accessible lavatories to prevent direct contact with and burns from piping. Provide components as required for applications indicated with flip tops at valves that allow service access without removing coverings.
  - 2. Manufacturers:
    - a. Borcar Products, Inc.
    - b. Truebro, Inc.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.

### **3.02 PREPARATION**

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

### **3.03 INSTALLATION**

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
- D. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings
- E. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged and defective items.
- F. Remove temporary labels and protective coatings.
- G. Clean and polish exposed surfaces according to manufacturer's written recommendations.

**END OF SECTION 10 2800**



**SECTION 11 5213  
PROJECTION SCREENS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Rear projection screen assemblies.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 5000 - Metal Fabrications: Supports for suspended projection screens.
- B. Section 06 1000 - Rough Carpentry: Wood blocking in walls and ceilings.
- C. Section 09 2116 - Gypsum Board Assemblies: Suspended gypsum board ceilings for recessed screens, and openings in gypsum board partitions for fixed and rear projection screens.
- D. Section 09 5100 - Acoustical Ceilings: Suspended panel ceilings for recessed screens.
- E. Section 09 9123 - Interior Painting: Field painting.
- F. Section 26 0583 - Wiring Connections: Electrical supply, conduit, and wiring for electric motor operated projection screens.

**1.03 DEFINITIONS**

- A. Gain of Front-Projection Screens: Ratio of light reflected from screen material to that reflected perpendicularly from a magnesium carbonate surface as determined per SMPTE RP 94.
- B. Half-Gain Angle: The angle, measured from the axis of the screen surface, to the most central position on a perpendicular plane through the horizontal centerline of the screen where the gain is half of the peak gain.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's catalog cuts and descriptive information on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
  - 4. Wiring diagrams for motor operators and actuators, and controls and switches.
- C. Shop Drawings: For custom installations, indicate dimensions, verified field measurements, mounting details, and interface with adjacent construction.
- D. Samples: For screen fabrics, submit two samples 6 x 6 inch in size.
- E. Samples: For case and frame finishes, submit two samples 6 x 6 inch in size, illustrating color and texture of finish.
- F. Operation and Maintenance Data: Provide manufacturer's operation and maintenance instructions.
- G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- C. Source Limitations: Obtain each type of projection screen through one source from a single manufacturer. Obtain each screen as a complete unit, including necessary mounting hardware and accessories.

- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use. PA/PM OMIT IF NO ELECT.
- E. Fire Performance Characteristics: Provide projection screen fabrics identical to those materials which have undergone testing and passed requirements for flame resistance as indicated below:
  - 1. NFPA 701 per small scale test.
  - 2. Federal Standard 191A/5903 for test method. FS GG-S-00172D(1) for flame resistance.
- F. Mildew Resistance: Provide mildew resistant screen fabrics as determined by Federal Standard 191A/5760.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver projection screens to project site in manufacturer's original unopened packaging, and inspect for damage and proper size before accepting delivery.
- B. Store in a protected, clean, dry area with temperature maintained above 50 degrees F, and stack in accordance with manufacturer's recommendations.
- C. Acclimate screens to building temperatures for 24 hours prior to installation, in accordance with manufacturer's recommendations.

#### **1.07 COORDINATION**

- A. Coordinate layout and installation of projection screens with adjacent construction, including ceiling framing, light fixtures, HVAC equipment, fire-suppression system, and partitions.

#### **1.08 FIELD CONDITIONS**

- A. Maintain interior of building between 60 degrees F and \_\_\_ degrees F during and after installation of projection screens.

#### **1.09 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide \_\_\_ year manufacturer warranty for projection screen assembly.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Da-Lite Screen Company; \_\_\_\_: [www.da-lite.com/#sle](http://www.da-lite.com/#sle).
- B. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

#### **2.02 FABRIC REAR PROJECTION SCREENS**

- A. Screen:
  - 1. Da-Lite Screen Company; [www.da-lite.com/](http://www.da-lite.com/)
  - 2. Tensioned Cosmopolitan Electrol Projection Screen.
  - 3. Screen Operation: Electrically operated, UL and ULC listed, retractable, with rigid metal roller and tab guide cable screen tensioning system.
  - 4. Motor: Housed inside metal roller. Includes automatic thermal overload protection, integral gears, capacitor and electric brake to prevent coasting, and preset, adjustable limit switches to automatically stop viewing surface in the UP or DOWN positions.
    - a. Type: 3-wire, permanently lubricated, reversal type designed for mounting inside roller and to suit project requirements.
    - b. Voltage, Frequency: [115 V, 60 Hz] [220/240 V, 50 Hz].
    - c. Amperage: 2.4 amps maximum.
  - 5. Electric Controls: Wall mounted switch with integral junction box incorporated into screen housing.
    - a. Voltage, Frequency: 115 V, 60 Hz.
    - b. Switch: 3 position type with cover plate for UP, DOWN and STOP functions.
  - 6. Screen Mounting: Wall.
    - a. Include mounting hardware.

7. Screen Case: Designed to receive mounting hardware and sized to suit projection screen.
  - a. Material: 21 gage (0.8 mm) steel.
  - b. Design: Hexagonal flat-backed style with heavy-duty end caps concealing roller ends.
  - c. Length: 138 inches ([351] mm).
  - d. Finish: Powder coated black
8. Screen Size: Viewing Area: H 72.5 inches × W 116 inches (H 184 × W 295 mm).
9. Acceptable Material: Da-Lite Screen Company, Inc. Tensioned Cosmopolitan Electrol Projection Screen.
  - a. Tab Guide Cable Tensioned Screen Material:
    - 1) Front projection, flame retardant, mildew resistant vinyl, without and with standard black borders, easily cleaned with mild soap and water solution.
    - 2) Include tab and cable guide on each side of fabric to maintain even, lateral tension and hold viewing surface flat.
    - 3) Bottom end of fabric to be inserted into a custom aluminum slat bar with added weight to provide vertical tension on the screen surface.
    - 4) Slat ends to be protected by heavy-duty plastic caps enclosing a preset adjustable mechanism for screen tensioning.
    - 5) Seamless in all sizes.
  - b. Gain: To SMPTE RP 94-2000, 1.3
  - c. Viewing Angle: 30
  - d. Format: 16:10 Wide - 1.60:1
  - e. Acceptable Viewing Surface: Da-Lite Screen Company, Inc.: Da-TeX
10. Substitutions: See Section 01 6000 - PRODUCTS AND SUBSTITUTIONS.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrate is finished and ready to accept screen installation.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that openings for recessed screens are correctly sized.
- D. Verify that entrances to installation area are sized to permit entry of rigid screen.
- E. Verify type and location of electrical connections.
- F. Do not install projection screens until climate control systems are in place and interior painting and other finishes are completed.

### **3.02 PREPARATION**

- A. Coordinate screen installation with installation of projection systems.
- B. Coordinate installation with adjacent construction and fixtures, including ceilings, walls, lighting, fire suppression, and registers and grilles.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions, using manufacturer's recommended hardware for relevant substrates.
- B. Do not field cut screens.
- C. Install screens in mountings as specified and as indicated on drawings.
- D. Install multiple screens in accordance with drawings and manufacturer's instructions. Verify that screens are aligned horizontally and vertically, and that spacing between screens is uniform and of minimum size.
- E. Install plumb and level.

- F. Install electrically operated screens ready for connection to power and control systems by others.
- G. Adjust projection screens and related hardware in accordance with manufacturer's instructions for proper placement and operation.
- H. Test electrical screens for proper working condition. Adjust as needed.

**3.04 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch up, repair, or replace damaged products before Date of Substantial Completion.

**END OF SECTION 11 5213**

**SECTION 11 6143  
STAGE CURTAINS**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.02 SUMMARY**

- A. This Section includes stage curtain rigging and the following types of stage curtains:
  - 1. Front-setting curtains including front curtain, valance, and tormentors.
- B. Related Sections include the following: **PA/PM EDIT**
  - 1. Division 5 Section "Metal Fabrications" for supplementary members supporting stage curtain systems to structure.

**1.03 SUBMITTALS PA/PM EDIT FOR ELECT ITEMS IF NOT USED**

- A. Product Data: Include types, styles, materials, operating instructions, and maintenance recommendations.
  - 1. Setting Drawings, and templates for built-in or embedded anchor devices.
- B. Shop Drawings: Include plans, elevations, and detail sections of typical track and rigging elements. Show anchors, hardware, operating equipment, and other components not included in manufacturer's Product Data. Include the following:
  - 1. Locations for blocking to be provided by others.
  - 2. Extent of required operating clearances.
  - 3. Locations of equipment components, switches, and controls.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors, textures, and patterns available, together with 12-inch- square sample (any color) of each type fabric.
- D. Product Certificates: Signed by manufacturers of stage curtains certifying that products furnished comply with requirements. Give name of flame-retardant chemical used, identification of applicator, treatment method, application date, allowable life span for treatment, and details of any restrictions and limitations. (Project Close-Out Item)
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

**1.04 QUALITY ASSURANCE**

**PA/PM EDIT FOR ELECT ITEMS IF NOT USED**

- A. Installer Qualifications: An experienced installer who has completed installation of stage curtains similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Fire-Test-Response Characteristics: Provide stage curtains with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or a testing and inspecting agency acceptable to authorities having jurisdiction. Permanently attach label to each fabric of curtain assembly indicating whether fabric is inherently and permanently flame resistant, or treated with flame-retardant chemicals, and whether it will require retreatment after designated time period or cleaning.
  - 1. Flame-Resistance Ratings: Passes NFPA 701.
  - 2. Section 3.08, Title 19, C.C.R.

**1.05 PROJECT CONDITIONS**

- A. Field Measurements: Verify stage curtain openings and dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

## **PART 2 PRODUCTS**

### **2.01 CURTAIN FABRICS**

- A. General: Provide fabrics inherently and permanently flame resistant or chemically flame resistant by immersion treatment to comply with requirements indicated. Provide fabrics from the same dye lot.
- B. Colors, Textures, and Patterns: As selected by Architect from manufacturer's full range for these characteristics.
- C. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Woven Cotton Velour: (Heavy Weight, Front setting curtains)
    - a. #2703 Overture; JB Martin Ltd.
    - b. #31010 Metro; J. L. de Ball America, Inc.
    - c. Memorable; KM Fabrics, Inc.

### **2.02 FRONT-SETTING CURTAIN FABRIC**

- A. Woven Cotton Velour: Napped fabric of 100 percent cotton; 54-inch minimum width; and other characteristics as follows:
  - 1. Heavyweight: Fabric weighing not less than 25 oz./linear yard before flame-retardant treatment, with pile height not less than 79 mils.
- B. Lining: Yarn-dyed denim cloth of 100 percent cotton; woven in a warp-faced twill; 54-inch minimum width.

### **2.03 METAL**

- A. Steel Pipe: ASTM A 53, Grade A, standard weight (Schedule 40), black, 1-1/2-inch nominal diameter, unless otherwise indicated.
- B. Galvanized Steel Sheet: Commercial-quality, zinc-coated, carbon-steel sheet; complying with ASTM A 653/A 653M, G60 coating designation. 0.074 inches minimum thickness.
- C. Aluminum: Alloy and temper recommended by manufacturer for strength and corrosion resistance; mill finish; ASTM B 221 for extrusions.
- D. Supports, Clamps, and Anchors: Sheet steel in manufacturer's standard thicknesses, galvanized after fabrication according to ASTM A 153/A 153M, Class B.
- E. Trim and Support Cable: 1/4-inch- diameter, 7x19 galvanized steel aircraft cable with a breaking strength of 7000 lb. Provide fittings complying with cable manufacturer's written recommendations for size, number, and method of installation, including a drop-forged galvanized turnbuckle to allow for leveling.
- F. Inserts, Bolts, Rivets, and Fasteners: Manufacturer's standard corrosion-resistant units.

### **2.04 CURTAIN FABRICATION**

- A. General: Affix permanent label, stating compliance with requirements of authorities having jurisdiction, in accessible location on curtain not visible to audience. Provide vertical seams, unless otherwise indicated. Arrange vertical seams so they do not fall on faces of pleats. Do not use fabric cuts less than half width.
  - 1. Vertical Hems: Provide vertical hems not less than 3 inches wide, with not less than a 1-inch tuck, and double stitched, machine-sewn with no selvage material visible from front of curtain. Sew open ends of hems closed.
  - 2. Leading Edge Turnbacks: Provide turnbacks formed by folding not less than 24 inches of face fabric back at each end of panel and securing by sewing across top hem and grommeting through both layers of fabric. Do not sew turnbacks vertically.
  - 3. Top Hems: Reinforce top hems by double-stitching 3-1/2-inch- wide, heavy jute webbing to top edge with not less than 2 inches of face fabric turned under.
  - 4. Pleats: Provide 50 percent fullness in curtains, exclusive of turnbacks and hems, by sewing additional material into 3-inch double-stitched box pleats spaced at 12 inches o.c. along top hem reinforcement.

5. Grommets: Brass, centered on box pleats and 1 inch from corner of curtain, for snaps or S-hooks.
    - a. Provide not less than No. 2 grommets except, for velour curtains, provide not less than No. 3 grommets.
    - b. For black curtains, provide brass or aluminum grommets with a black finish.
  6. Bottom Hems: For curtains that do not hang to the floor, provide hems not less than 3 inches deep with 3/4-inch weight tape. For floor-length curtains, provide hems not less than 6 inches deep with separate, interior, 100 percent cotton, heavy canvas chain pocket equipped with No. 8 plated jack chain. Stitch chain pockets so chain will ride 2 inches above finished bottom edge of curtain.
  7. Lining: Provide lining for each curtain in same fullness as face fabric, and finished 2 inches shorter than face fabric. Attach lining to face fabric along bottom and side seams with 4-inch- long strips of heavy woven cotton tape.
- B. Curtain Battens: Fabricate battens from steel pipe with a minimum number of joints. As necessary for required lengths, connect pipe with a drive-fit pipe sleeve not less than 18 inches long, and secure with four flush rivets, plug welds, threaded couplings, or another equally secure method. Shop-paint completed pipe battens with black paint with 1-inch- wide yellow stripe at the center of each batten.
  - C. "S" Hooks: Track manufacturer's heavy-duty hooks.
  - D. Snap Hooks: Track manufacturer's heavy-duty hooks.
  - E. Tie Lines: Braided soft cotton, black or white to best match curtain; not less than 5/8 inch wide by 36 inches long.

## 2.05 STRAIGHT CURTAIN TRACK FABRICATION

- A. Heavy-Duty Track System: Equip track with heavy-duty, live-end, double-wheel pulley; heavy-duty, dead-end, single-wheel pulley; and adjustable, heavy-duty floor block; each with not less than 5-inch molded-nylon- or glass-filled-nylon-tired ball-bearing wheels, enclosed in steel housings. Provide single curtain carriers of molded nylon with a pair of neoprene-tired ball-bearing wheels riveted parallel to body. Provide one master carrier, for each leading curtain edge, of plated steel with two pairs of nylon-tired ball-bearing wheels and with two line guides per carrier. Equip carriers with neoprene or rubber bumper to reduce noise, and heavy-duty, plated-steel swivel eye and manufacturer's standard trim chain for attaching curtain snap or S-hook. Provide end stops for track. Design adjustable floor block to maintain proper tension on operating line.
  1. Operating Line: Manufacturer's standard 3/8-inch stretch-resistant operating cord consisting of braided synthetic-fiber jacket over solid, synthetic-fiber, linear, center filaments.
  2. Operating Line: Manufacturer's standard 3/16-inch stretch-resistant operating cable consisting of braided synthetic-fiber jacket over center wires.
- B. Products: Subject to compliance with requirements, provide one of the following:
  1. Heavy-duty steel tracks:
    - a. Silent Steel Model No. 281 with No. 2863, No. 2864, and No. 2866 pulleys; Automatic Devices Company.
    - b. Atlas Silk Model No. 418S; H & H Specialties, Inc.
    - c. Tru-Roll Model No. 1000; Tru-Roll, Inc.
  2. Medium-duty steel tracks
    - a. Besteel Model No. 170; Automatic Devices Company.
    - b. Atlas Silk Model No. 101S; H & H Specialties, Inc.
    - c. Tru-Roll Model No. 1200; Tru-Roll, Inc.
    - d. Besteel Model No. 173; Automatic Devices Company.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine areas and conditions, with Installer present, for compliance with requirements for supporting members, blocking, installation tolerances, clearances, and other conditions affecting performance of stage curtain work. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Examine inserts, clips, blocking, or other supports required to be installed by others to support tracks and battens. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.03 INSTALLATION, GENERAL**

- A. Install stage curtain system according to track manufacturer's and curtain fabricator's written instructions.

### **3.04 BATTEN INSTALLATION**

- A. Install battens by suspending at heights indicated with steel cables spaced to support load, but do not exceed 10 feet o.c. between cables.
- B. Secure cables either directly to structures or to inserts, eye screws, or other devices that are secure and appropriate to substrate and that will not deteriorate or fail with age or elevated temperatures. Attach other cable end to pipe clamps with turnbuckles, moused or fixed with nuts after adjustment, to prevent loosening.

### **3.05 TRACK INSTALLATION**

- A. Batten-Hung Tracks: Install track by suspending from pipe batten with manufacturer's track clamp hangers attached to batten pipe clamps at spacing, according to manufacturer's written instructions.
  - 1. Heavy-Duty Track: Do not exceed 72 inches between supports.
- B. Install track for center-parting curtains with not less than 24-inch overlap of track sections at center, supported by special lap clamps.

### **3.06 CURTAIN INSTALLATION**

- A. Track Hung: Secure curtains to track carriers with track manufacturer's special heavy-duty S-hooks or snap hooks.
- B. Batten Hung: Secure curtains to pipe battens with tie lines.

**END OF SECTION 11 6143**



**SECTION 12 3200**  
**MANUFACTURED WOOD CASEWORK**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Manufactured standard and custom casework, with cabinet hardware.
- B. Countertops.
- C. Magnetic Marker Wall

**1.02 RELATED REQUIREMENTS**

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: VOC limitations for adhesives and sealants.
- B. Section 06 1000 - Rough Carpentry: Blocking and nailers for anchoring casework.
- C. Section 07 9200 - Joint Sealants: Sealing joints between casework and countertops and adjacent walls, floors, and ceilings.
- D. Section 09 2116 - Gypsum Board Assemblies: Reinforcements in metal-framed partitions for anchoring casework.
- E. Section 09 6500 - Resilient Flooring: Resilient wall base.
- F. Section 22 4000 - Plumbing Fixtures: Sinks and fittings installed in casework.

**1.03 DEFINITIONS**

- A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.
- B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.
- C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

**1.04 REFERENCE STANDARDS**

- A. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- D. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.
- E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- F. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.
- G. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.
- H. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2009.
- I. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- J. WI (CCP) - Certified Compliance Program (CCP); current edition at [www.woodworkinstitute.com/certification](http://www.woodworkinstitute.com/certification).
- K. WI (CSIP) - Certified Seismic Installation Program (CSIP); current edition at [www.woodworkinstitute.com](http://www.woodworkinstitute.com).
- L. WI (MCP) - Monitored Compliance Program (MCP); current edition at [www.woodworkinstitute.com/certification](http://www.woodworkinstitute.com/certification).

### **1.05 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- B. Keying Conference: Conduct conference prior to ordering keys. Incorporate conference decisions into keying submittal.

### **1.06 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Component dimensions, configurations, construction details, joint details, attachments.
- C. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements, placement dimensions and tolerances, clearances required, and keying information.
- D. Samples for Finish Selection: Fully finished, for color selection. Minimum sample size: 2 inches by 3 inches.
  - 1. Plastic laminate samples, for color, texture, and finish selection.
  - 2. Thermally fused laminate samples, for color, texture, and finish selection.
- E. Manufacturer's Installation Instructions.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.
- H. Maintenance Data: Manufacturer's recommendations for care and cleaning.
- I. Finish touch-up kit for each type and color of materials provided.

### **1.07 QUALITY ASSURANCE**

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

### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.
- B. Acceptance at Site:
  - 1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.
- C. Storage:
  - 1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" Article of this section.

### **1.09 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion, at no additional cost to Owner. Defects include, but are not limited to:
  - 1. Ruptured, cracked, or stained finish coating.
  - 2. Discoloration or lack of finish integrity.
  - 3. Cracking or peeling of finish.
  - 4. Delamination of components.

5. Failure of adhesives.
6. Failure of hardware.

## **PART 2 PRODUCTS**

### **2.01 CASEWORK, GENERAL**

- A. Quality Standard: AWI/AWMAC/WI (AWS), unless noted otherwise.
- B. Types: More than one type is required. See drawings for location of each type of casework.
- C. Plastic Laminate Faced Cabinets: Custom Grade.

### **2.02 FABRICATION**

- A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.
- B. Construction: As required for selected grade.
- C. Structural Performance: Safely support the following minimum loads:
  1. Base Units: 500 pounds per linear foot across the cabinet ends.
  2. Suspended Units: 300 pounds static load.
  3. Drawers: 125 pounds, minimum.
  4. Hanging Wall Cases: 300 pounds.
  5. Shelves: 100 pounds, minimum.
- D. Seismic Performance: Casework, including attachments to other work, able to withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  1. See drawings for design earthquake spectral response acceleration, short period (Sds), for Project.
  2. Component Importance Factor: 1.0.
- E. Fittings and Fixture Locations: Cut and drill components for fittings and fixtures.
- F. Hardware Application: Factory-machine casework members for hardware that is not surface applied.
- G. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- H. Scribes and Fillers: Panels of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.
- I. Apron Frames: Construction similar to other cabinets, with modifications.
- J. Countertop Panel-Type Supports: Materials similar to adjacent casework, 1-1/2 inch in width, with front-to-back and toe space dimensions matching base cabinet. Designed to be secured in a concealed fashion to countertop material. Include two leveling devices per support panel.

### **2.03 PLASTIC-LAMINATE-CLAD CASEWORK**

- A. Plastic-Laminate-Clad Casework: Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base cabinets.
  1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
  2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:
    - a. Base Cabinets: 22 inches.
    - b. Tall Cabinets: 22 inches.
    - c. Wall Cabinets: 16 inches.
  3. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline.
    - a. Finish: Matte or suede, gloss rating of 5 to 20.

## 2.04 COUNTERTOPS

- A. Types: More than one type is required. See drawings for location of each type of countertop.
- B. Fabricate in accordance with AWI/AWMA/WI (AWS) or AWMA/WI (NAAWS), Section 11 - Countertops, Custom Grade, unless otherwise noted.
- C. Plastic Laminate Countertops: High pressure decorative laminate sheet bonded to substrate.
  - 1. Manufacturer's standard configuration for exposed edges, back and end splashes.

## 2.05 CABINET HARDWARE

- A. Comply with BHMA A156.9 requirements.
  - 1. Acceptable base materials for plated finishes include steel.
- B. Locks: Provide locks on casework drawers and doors where indicated. Lock with 5 pin cylinder and 2 keys per lock.
  - 1. Hinged Doors: Cam type lock, bright chromium plated over nickel on base material.
  - 2. Tall Hinged Doors: Three-point latching system.
  - 3. Keying: Key locks alike within a space; key each room separately.
  - 4. Master Key System: All locks operable by master key.
- C. Shelves in Cabinets:
  - 1. Shelf Standards and Rests: Vertical standards with rubber button fitted rests, satin chromium plated over nickel on base material.
- D. Swinging Doors: Hinges, pulls, and catches.
  - 1. Hinges: Semi-concealed, number as required by referenced standards for width, height, and weight of door.
    - a. Semi-Concealed Hinges: Installed as required by hinge design, bright chromium plated over nickel on base material.
  - 2. Pulls: Chrome wire pulls, 4 inches wide.
    - a. Pull design to comply with project's referenced accessibility requirements.
  - 3. Catches: Magnetic.
- E. Drawers: Pulls and slides.
  - 1. Pulls: Chrome wire pulls, 4 inches wide.
    - a. Pull design to comply with project's referenced accessibility requirements.
  - 2. Slides: Steel, full extension arms, ball bearings; self-closing; capacity as recommended by manufacturer for drawer height and width.

## 2.06 MATERIALS

- A. Adhesives Used for Assembly: Comply with VOC requirements for adhesives and sealants as specified in Section 01 6116.
- B. Wood-Based Materials:
  - 1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.
  - 2. Composite Wood Panels: Containing no urea-formaldehyde resin binders.
- C. Solid Wood: Clear, dry, sound, plain sawn, selected for compatible species, grain and color, no defects.
- D. Semi-Exposed Solid Wood: Dry, sound, plain sawn, no appearance defects, any species similar in color and grain to exposed portions.
- E. Hardwood Plywood: Veneer core; HPVA HP-1 Grade as indicated; same species as exposed solid wood, clear, compatible grain and color, no defects. Band exposed edges with solid wood of same species as veneer.
- F. Concealed Solid Wood or Plywood: Any species and without defects affecting strength or utility.
- G. Hardboard: ANSI A135.4, Class 1, tempered.

- H. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications complying with Grade requirements, and standard with the manufacturer.
  - 1. Wilsonart RE-COVER self-adhesive HPL for cabinets noted on plans to be re-laminated.

## **2.07 ACCESSORIES**

- A. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self-locking serrated tongue; of width to match component thickness.
  - 1. Color: As selected by Architect from manufacturer's full range.
  - 2. Use at exposed edges.
  - 3. Use at exposed shelf edges.
- B. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- C. Concealed Joint Fasteners: Corrosion-resistant, standard with manufacturer.
- D. Sealant for Use in Casework Installation:
  - 1. One component, clear silicone base sealant, chemical curing complying with ASTM C920, Type S, Grade NS, Class 25, Use NT, when tested to glass and aluminum, anti-fungus composition.

## **2.08 MAGNETIC MARKER WALL**

- A. Magnetic Marker Wall: By Claridge Products
  - 1. Description: Claridge LCS3 Porcelain Marker Walls
  - 2. Size: 4' panels to 8' high as shown on plans
  - 3. Color: White
  - 4. Mounting and Orientation: Portrait. Mounted flush with adjacent finish w/ clear anodized narrow face trim at interface.
  - 5. Field measure and provide cutouts as required.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

### **3.02 EXAMINATION**

- A. Site Verification of Environmental Conditions:
  - 1. Do not deliver casework until the following conditions have been met:
    - a. Building has been enclosed (windows and doors sealed and weather-tight).
    - b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
    - c. Ceiling, overhead ductwork, piping, and lighting have been installed.
    - d. Installation areas do not require further "wet work" construction.
- B. For Base Cabinets Installation: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 1/2 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.
- C. For Wall Cabinets Installation: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
  - 1. Maximum Variation of finished gypsum board surface from true flatness: 1/8 inch in 10 feet in any direction.
- D. Verify adequacy of support framing and anchors.
- E. Verify that service connections are correctly located and of proper characteristics.

### **3.03 INSTALLATION**

- A. Perform installation in accordance with manufacturer's instructions.
- B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.
- C. Set casework items plumb and square, securely anchored to building structure.
- D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.
- E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
  - 1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
  - 2. Variation of Bottoms of Wall Cabinets from Level: 1/8 inch in 10 feet.
  - 3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
  - 4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
  - 5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.
- F. Secure wall and floor cabinets to concealed reinforcement at gypsum board assemblies.
- G. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.
- H. Wall Cabinets: Fasten to hanging strips, and/or wall substrates. Fasten each cabinet through back, near top, at not less than 16 inches on center.
- I. Install hardware uniformly and precisely.
- J. Countertops: Install countertops intended and furnished for field installation in one true plane, with ends abutting at hairline joints, and no raised edges.
- K. Replace units that are damaged, including those that have damaged finishes.

### **3.04 ADJUSTING**

- A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

### **3.05 CLEANING**

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- B. Clean casework and other installed surfaces thoroughly.

### **3.06 PROTECTION**

- A. Do not permit finished casework to be exposed to continued construction activity.
- B. Protect casework and countertops from ongoing construction activities. Prevent workmen from standing on, or storing tools and materials on casework or countertops.
- C. Repair damage, including to finishes, that occurs prior to Date of Substantial Completion, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

**END OF SECTION 12 3200**

## **SECTION 22 01 00 – OPERATION AND MAINTENANCE OF PLUMBING**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. All levels of 22 00 00
- B. Preparations.
  - 1. Prior to data collection and compilation, prepare and submit in duplicate an outline of the proposed organization and content.
  - 2. Compilation: Prepare and collect data concurrently with construction progress. Compile per submitted outline.

### **PART 2 - PRODUCTS**

#### **2.01 OPERATION AND MAINTENANCE MANUALS**

- A. Form of Submittals
  - 1. Prepare data in form of an instructional manual for use by Owner's personnel.
  - 2. Cover: Identify each volume with typed or printed title, "OPERATING AND MAINTENANCE INSTRUCTION". List:
    - a. Title of Project.
    - b. Provide indexed tabs.
    - c. Identify of separate structure as applicable.
    - d. Identity of general subject matter covered in the manual.
  - 3. Format:
    - a. Size: 8-1/2" x 11".
    - b. Paper: 20 pound minimum, white, for typed pages.
    - c. Text: Manufacturer's printed data, or neatly typewritten.
    - d. Drawings:
      - 1.) Provide reinforced punched binder tab, bind in with text.
      - 2.) Fold larger drawings to size of text pages.
    - e. Provide fly-leaf for each separate product, or each piece of operating equipment.
      - 1.) Provide typed description of product and major component parts of equipment.
      - 2.) Provide indexed tabs.
  - 4. Binders:
    - a. Commercial quality three-ring binders with durable and cleanable plastic covers.
    - b. Maximum ring size: 1".
    - c. When multiple binders are used, correlate the data into related consistent groupings.

### **PART 3 - EXECUTION**

#### **3.01 OPERATION AND MAINTENANCE DATA**

- A. General: Record data and operation and maintenance data are complimentary. Submittal items which may be required under both categories may be included only under one submittal if a statement to that effect is included in the other submittal.
- B. Quality Assurance
  - 1. Preparation of data shall be done by personnel.
    - a. Trained and experienced in maintenance and operation of described products.
    - b. Familiar with requirements of this Section.
    - c. Skilled as technical writer to the extent required to communicate essential data.

- d. Skilled as draftsman competent to prepare required drawings.
- C. Content of Manual
  - 1. Neatly typewritten table of contents for each volume, arranged in systematic order.
    - a. A list of each product required to be included, indexed to content of the volume.
    - b. List, with each product, name, address and telephone number of:
      - 1) Subcontractor or installer.
      - 2) Maintenance contractor, as appropriate.
      - 3) Identify area of responsibility of each.
      - 4) Local source of supply for parts and replacement
    - c. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
  - 2. Product Data:
    - a. Include only those sheets which are pertinent to the specific product.
    - b. Annotate each sheet to:
      - 1) Clearly identify specific product or part installed.
      - 2) Clearly identify data applicable to installation.
      - 3) Delete references to inapplicable information.
  - 3. Drawings:
    - a. Supplement product data with drawings as necessary to clearly illustrate.
      - 1) Relations of component parts of equipment and systems.
      - 2) Control and flow diagrams.
    - b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation
    - c. Do not use Project Record Documents as maintenance drawings.
  - 4. Written text, as required to supplement product data for the particular installation.
    - a. Organize in consistent format under separate headings for different procedures.
    - b. Provide logical sequence of instructions for each procedure.
  - 5. Factory Authorized Start-Up Report.
    - a. Provide a factory start-up report for each piece of equipment. Contractor start-up reports, unless contractor is a factory authorized representative will not be allowed.
  - 6. Copy of each warranty, bond and service contract issued.
    - a. Provide information sheet for Owner's personnel, give:
      - 1) Proper procedures in event of failure.
      - 2) Instances which might affect validity of warranties or bonds.
- D. Manual for Equipment and Systems:
  - 1. Submit one copy of complete manual in final form in PDF format.
  - 2. Content, for each unit of equipment and system, as appropriate.
    - a. Description of unit and component parts.
      - 1) Function normal operating characteristics, and limiting conditions
      - 2) Performance curves, engineering data and tests.
      - 3) Complete nomenclature and commercial number of replaceable parts.
    - b. Operating procedures:
      - 1) Start-up, break-in, routing and normal operating instructions.
      - 2) Regulation, control, stopping, shut-down and emergency instructions.



- 3) Summer and winter operating instructions.
    - 4) Special operating instructions.
  - c. Maintenance Procedures:
    - 1) Routing operations.
    - 2) Guide to “trouble-shooting”
    - 3) Disassembly, repair and reassemble.
    - 4) Alignment, adjusting and checking.
  - d. Servicing and lubrication schedule.
    - 1) List lubricants required.
  - e. Manufacturer’s printed operating and maintenance instructions.
  - f. Description of sequence of operation by control manufacturer.
  - g. Original manufacture’s parts list, illustrations, assembly drawings and diagrams required for maintenance.
    - 1) Predicted life of parts subject to wear.
    - 2) Items recommended to be stocked as spare parts.
  - h. As-installed control diagrams by controls manufacturer.
  - i. Each contractor’s coordination drawings:
    - 1) As-installed color-coded piping diagrams.
  - j. Charts of valve tag numbers, with location and function of each valve.
  - k. List of original manufacturer’s spare parts, manufacturer’s current prices, and recommended quantities to be maintained in storage.
  - l. Other data as required under pertinent sections of specifications.
3. Content for each electric and electronic system, as appropriate.
  - a. Description of system and component parts.
    - 1) Function, normal operating characteristics, and limiting conditions.
    - 2) Performance curves, engineering data and tests.
    - 3) Complete nomenclature and commercial number of replaceable parts.
  - b. Circuit directories of panel boards.
    - 1) Electric service.
    - 2) Controls.
    - 3) Communications
  - c. As-installed color coded wiring diagrams.
  - d. Operating procedures.
    - 1) Routing and normal operating instructions.
    - 2) Sequences required.
    - 3) Special operating instructions.
  - e. Maintenance procedures.
    - 1) Routine operations.
    - 2) Guide to “trouble shooting”.
    - 3) Disassembly, repair and reassembly.
    - 4) Adjustment and checking.
  - f. Manufacturer’s printed operating and maintenance instructions.
  - g. List of original manufacturer’s spare parts, manufacturer’s current prices, and recommended quantities to be maintained in storage.

- h. Other data as required under pertinent sections of specifications.
      - i. Additional requirements for operating and maintenance data: Respective sections of Specifications.
- E. Submittal Schedule
  - 1. Submit two copies of preliminary draft of proposed formats and outlines of contents prior to start of work.
    - a. Architect will review draft and return one copy with comments.
  - 2. Submit one copy of complete data in final form fifteen days prior to final inspection or acceptance.
    - a. Copy will be returned after final inspection or acceptance, with comments.
  - 3. Submit specified number of copies of approved data in final form 10 days after final inspection or acceptance.
- F. Instruction of Owner's Personnel.
  - 1. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems
  - 2. Operating and maintenance manual shall constitute the basis of instruction.
    - a. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

**END OF SECTION**

**SECTION 22 05 00 – COMMON WORK RESULTS FOR PLUMBING**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

- A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 01 GENERAL REQUIREMENTS, apply to the work of this section.
- B. This section applies to all Division 22 Plumbing Sections.

**1.02 SUMMARY**

- A. This section includes all plumbing (equipment, fixtures, pipe and fittings, specialties) inside the building(s) and outside the building(s) to the point of connection to site plumbing systems.
- B. Provide complete plumbing systems including:
  - 1. Service connections to existing on-site utilities, and stubs for future connection to equipment provided under the work of this Section or other Sections of the Specifications.
  - 2. All piping systems for conduction of cold water, heated water, soil, waste, fuel gas, and other fluids or gases as shown or specified for plumbing work.
  - 3. All valves, piping supports, piping penetration auxiliaries, piping protective coverings, piping, and other piping accessories as shown or specified for plumbing work.
  - 4. All plumbing equipment and auxiliary items as specified herein or shown on the drawings.
  - 5. All low voltage wiring for automatic fixtures as required.
- C. All chemicals utilized on site as part of coating, sealant, and other products shall not contain any chemical that is listed as part of Proposition 65 known carcinogens that are identified by NTP, IARC, and the USEPA California Proposition 65 chemical repository contractors are not allowed to bring these chemicals on any California Intel site.

**1.03 RELATED SECTIONS**

- A. Division 23 - HVAC
- B. Division 26 - Electrical Work

**1.04 DRAWINGS AND SPECIFICATIONS**

- A. For purposes of clearness and legibility, drawings are essentially diagrammatic and, although size and location of equipment are drawn to scale wherever possible, the Contractor shall make use of all data in all the contract documents and shall verify this information at building site.
- B. Information presented on Drawings and in the Specifications is based upon latest data available during their preparation. The Drawings and Specifications are for the assistance and guidance of the Contractor and exact locations, distances, levels, etc. will be governed by the structures and the site the contractor shall accept same with this understanding.
- C. The drawings indicate required size and points of termination of pipes, and suggest proper routes to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets, and it shall be the work of the Contractor to make the installation in such a manner as to conform to structure, avoid obstruction, preserve headroom and keep openings and passageways clear.

**1.05 DELIVERY, STORAGE AND HANDLING**

- A. Contractor shall be responsible for delivery, storage, protection and placing of all equipment and materials.
- B. Equipment stored and installed at the job site shall be protected from dust, water or other damage. Cover all equipment stored exposed to weather.

**1.06 STRUCTURAL REQUIREMENTS**

- A. Structural members shall not be cut or modified in any manner without specific instructions from the structural engineer.

### **1.07 CODES AND SAFETY ORDERS**

- A. All work and materials shall be in full accordance with the latest rules and regulations of the State Fire Marshall; the Safety Orders of the Division of Industrial Safety; the I.S.O. codes; latest edition of California Code of Regulations, 2016 Title 24, Part 6; the 2016 California Plumbing Code, Title 24, Part 5; the 2016 California Mechanical Code, Title 24, Part 4; the 2016 California Building Code, Title 24, Part 2, NFPA Codes, and other applicable laws and regulations. Nothing in the Drawings or Specifications shall be construed to permit work not conforming to these codes. Drawings and Specifications take precedence when work and materials called for exceed Code requirements.

### **1.08 INSTALLATION**

- A. Manufacturer's Instructions:
1. When specifications require that installation comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation.
  2. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by specifications.
  3. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.
  4. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with the Engineer for further instructions.
  5. Do not proceed with work without clear understanding.

### **1.09 PERMITS AND FEES**

- A. Obtain all permits and pay all required fees for permits and/or utility services. Inspections required during the course of construction shall be arranged as required. On completion of the work furnish the owners representative with certificates of inspection.
- B. Include in bid all costs for gas service including meter, regulators and service line installed by a gas utility company or a gas utility company approved contractor.

### **1.10 SITE CONDITIONS**

- A. Assume all responsibility for damage to adjoining properties; and restore property to its original condition, should damage occur as a result of the work of this section. Contractor shall thoroughly familiarize himself with all site conditions. Should utilities not shown on the drawings be found during excavations, promptly notify the Architect for instructions as to further action. Failure to do so will make the Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities not shown on plans.

### **1.11 SUBMITTALS**

- A. General
1. A submittal schedule shall be issued by the contractor within 15 days of award of the contract. This schedule shall allow for timely review and approval as required by the contract documents.
  2. These requirements apply only to substitutions, submittals, and shop drawings.
  3. The contractor shall review all submittals prior to submission to the Architect. Submittals not reviewed by the contractor will be returned to the contractor and will not be reviewed.
  4. Any deviations from specified requirements shall be clearly indicated in submittals.
  5. Any errors in or omissions from submittals and any consequences of these are the responsibility of the Contractor.
  6. Partial or incomplete submittals may be rejected as not complying with requirements; the Contractor shall be liable for any resultant consequences.
  7. Delayed submittals may be rejected as not complying with requirements. Whether accepted or rejected, delayed submittals will not be considered justification for extension of contract time or similar relief.

8. Submittals not required or permitted by the Specifications but made at the option of the Contractor, will be returned without review unless accompanied with written valid justification.
9. Submittal items improperly included with those of another category (such as a proposed substitution included with shop drawing submittal) are not valid and will be returned without review.
10. Within 35 calendar days after award of the contract, and before fabrications and installation of any material or ordering of any materials, submit for approval one copy in PDF format of complete submittal data on specified and proposed substituted equipment and materials. Submittals shall list all materials proposed identified with drawing symbols and specific data on equipment such as arrangements, performance curves, sizes, capacity, motor locations, and other pertinent data. Check all submittals for conformance to the requirements of the Construction Documents before forwarding to the architect for each item. No consideration will be given to substitutions submitted past 35 day limit. The contractor shall be responsible for all quantities and errors and omissions of submittals. Furnish samples when requested.
11. Equipment and materials specified as part of the specifications and drawings are listed by two manufacturer's names. The first named manufacturer is the basis of design. The second named manufacturer has been determined to be an equivalent in quality or utility. The second named has not been specifically determined to conform to the first named in size, layout, electrical power, voltage, or impacts to building structure. The contractor is bound by all requirements for substitutes, as described below, for all second named manufacturers and equivalent equipment or products.
12. Each reviewed submittal will be marked to indicate review and directions as stated below.
13. Acceptance of a submittal does not relieve the Contractor of responsibility for omissions from the submittal or errors in the submittal.

**B. Review**

1. Submittals will be reviewed for general acceptability, not necessarily including all details. The engineers review is for general conformance with the design concept of the project and the information given in the contract documents. The contractor is solely responsible for confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating the work with that of other trades and performing all work in a safe and satisfactory manner. Corrections of comments made on this submittal during this review do not relieve contractor from compliance with the requirements of the contract documents or with its responsibilities listed herein.
  - a. Proposed substitutes will be judged not only for the acceptability of the items themselves, but also how they will be used under the conditions of the particular project.
  - b. Proposed substitutions will be judged also for compliance with qualifications and conditions stipulated in paragraph 1.13.
2. Each reviewed submittal will be marked to indicate review and directions as stated below.
  - a. Acceptance of a substitute does not waive the specified requirements.
  - b. Once a substitution is accepted, no revision or re-submittal may be made except for pressing and valid reason and after receipts of approval to do so.

**C. Review Directions**

1. The notation "No Exceptions Taken" indicates that no further submittal on the particular matter is required and that the Contractor may proceed with normally ensuing action. The notation may be applied to submittals on substitutions, shop drawings, record data, or operation and maintenance data. The submittal has only been reviewed for general conformance with the design concept of the Contract Documents. The contractor is responsible for the dimensions to be confirmed and correlated at the job site; information that pertains solely to the fabrication process or to the means and methods of construction; coordination of the work of

all trades; and performing all work in a safe and satisfactory manner. This notation does not modify the contractor's duty to comply with the contract documents.

2. The notation "Make Corrections Noted" indicates that no further submittal on the particular matter is required, but the Contractor shall make all changes or corrections noted (but no others) before proceeding with normally ensuing action. The notation may be applied to submittals on substitutions or shop drawings (but usually not record data or operation and maintenance data).
3. The notation "Amend and Resubmit" indicates that the submittal is not accepted and must be revised, resubmitted, and reviewed again. In the case of submittal on substitutions and shop drawings so noted, the Contractor shall not proceed with any normally ensuing action until the resubmittal is reviewed. The notation may be applied to submittals on substitutions, shop drawings, record data, or operation and maintenance data.
4. The notation "Rejected - See Remarks" indicates that the submittal is not accepted and that resubmittal on the same subject matter is not allowed and will not be considered. The notation will be applied normally only to submittals on substitutions (usually not on shop drawings, record data, or operation and maintenance data).
5. The notation "Returned Without Review" indicates that the submittal or item has not been considered officially because it is either not proper, valid, required, or permitted by the Specifications and has no status or effect.

#### **1.12 SHOP DRAWINGS**

- A. The contractor is responsible for providing all shop drawings as described below so that the design professional has the opportunity to determine if the contractor understands the contract documents. It is not the purpose of shop drawings to assure that the contractor is meeting the requirements of the contract documents. Review and approval of a submittal neither extends nor alters any contractual obligation.
- B. Accompany all substituted equipment with shop drawings showing revised piping layouts in order to ascertain that substituted equipment does not adversely affect layout or work of others. Shop Drawings: The following conditions apply to shop drawings:
  1. Shop drawings are not and do not become Contract Documents.
  2. Processed shop drawing submittals and any instructions or requirements noted thereon are a part of the work, but they may not be used as a means of increasing the scope of the work.
  3. If deviations, discrepancies, or conflicts between shop drawing submittals and the Contract Documents are discovered either prior to or after the submittals are processed, the Contract Document requirements shall govern.

#### **1.13 SUBSTITUTIONS**

- A. Whenever any equipment, material, or process is indicated or specified by patent of proprietary name and/or name of Manufacturer, in the Specifications and/or on the Drawings, it is understood that such specification is used to facilitate the description of the material and/or process and deemed to be followed by the words "or equal" unless noted "no substitute".
- B. Substitute equipment and materials shall be equal in all respects including quality, arrangement, utility, physical size, capacity, and performance to those specified. Approval of substitute material will not relieve the contractor from complying with the requirement of the Drawings and Specifications. The contractor shall be responsible and at his own expense, for any changes caused by proposed substitutions which affect other parts of his own work or the work of other contractors.
- C. The submittal of a proposed substitution shall clearly establish the following:
  1. The item can be transported into and installed in the intended space and in the manner shown.
  2. Required connections (electrical, piping, and other) can be properly made and adjoining work can be properly accomplished.

3. The proposed substitute is similar to and of substance equal to that specified, is suited to the same use as that specified, and will perform the functions required by the design.
  4. Motors for proposed substitute equipment will have the same minimum differential between motor brake horsepower and motor nameplate horsepower as the specified equipment.
  5. All performance requirements shall be at least equal to the specified product or equipment including noise levels, cooling capacity, heating capacity, air flow quantity, etc.
- D. By submitting a proposed substitution, the Contractor agrees to the following:
1. He will assume full responsibility for any and all modifications and necessary alterations arising from the use of the substitute item or material including all cost incurred by all other trades.
  2. He will assume full responsibility for any delay in the construction schedule resulting from the use of the substitution.
  3. He will prove harmless and indemnify the Owner and the Owner's design consultants from real or alleged damages that may result from the installation, use, or performance of a substitute material or product.
- E. The following conditions apply to substitutions:
1. Submittals of substitutions are not and do not become part of the Contract Documents.
  2. Contractor shall not order, fabricate, use, or install any substitute product or procedure unless he has received acceptance of the substitute from the Engineer.
  3. Should the Contractor install any substitute product in violation of the above he shall remove it and install the specified product at his own expense.
  4. The Contractor shall provide a letter stating that all the above items shall apply to all substituted products and equipment.
  5. Any submittal for substituted equipment or product that does not clearly show that the substituted item is equal shall be marked rejected and no further submittal shall be allowed on the substituted item. Provide in submittal format documentation that the proposed item is exactly as specified in the contract documents.

#### **1.14 GUARANTEE**

- A. Guarantee all work for one year from date of acceptance, against all defects in material, equipment and workmanship including repair of damage to any part of the premises resulting from leaks or other defects in material, equipment and workmanship. Guarantee shall be on form supplied by the owner's representative.

#### **1.15 RECORD DRAWINGS**

- A. Indicate on reproducible drawings the actual location of all piping and equipment as the work progresses. Dimension locations of underground service mains and branches. Deliver the drawings to the architect at the completion of the job.

### **PART 2 - PRODUCTS**

#### **2.01 GENERAL REQUIREMENTS**

- A. Shop drawings:
1. Make all drawings to an appropriate scale, large enough to show all pertinent aspects of the item and the method of its connection into the work.
  2. Make each drawing sheet in a reproducible form such a tracing, sepia, or Mylar transparency.
- B. Grouping: Combine submittals in logical groupings; for example, submit Shop Drawings grouped by Sections of the Specifications, arranged in the specified sequence.
- C. Shop Drawings: Four blue or black line prints of each for the Engineer.
- D. Content:
1. Shop drawings may be:
    - a. Drawings or diagrams prepared by the Contractor, a supplier, a manufacturer, or other.

- b. Typewritten data or descriptions.
- c. Manufacturer's printed brochures, descriptions, charts, instructions, or data sheets.

E. Timing: Submit all shop drawings prior to installation of any items included in submittal.

## **2.02 CORROSION PROOFING**

- A. Corrosion Proofing / U.V. Protection: Products which will be installed outdoors, exposed to the weather, exposed to moisture, or other potentially damaging conditions shall be constructed to resist the effects of such exposure.
- B. Exterior casings shall have lapped or gasketed joints effectively sealed to prevent intrusion of moisture or other injurious substances.
- C. Casings, pipes, or product items shall be constructed of materials which are fully resistant to harmful substances they may normally contact, or (if ferrous) shall be galvanized after fabrication, or shall be fully protected from such substances by paint or other coating in appropriate thickness or number of coats.
- D. All bolts, nuts, screws, and washers shall be galvanized unless specified to be plated or unprotected.
- E. Any exposed plastic pipe must have a U.V. inhibitor.

## **2.03 MATERIAL AND EQUIPMENT**

- A. All material and equipment shall be new, of the type, capacity and quality specified and free from defects. All materials and equipment shall be of the same brand or manufacturer throughout for each class of material or equipment wherever possible.

## **2.04 ACCESS DOORS**

- A. Unless specified otherwise by the Architect, provide access doors of the following type:
  - 1. Concealed hinges, prime coated with rust-inhibitive paint, style of door to suit wall, ceiling, floor or roof construction and fire rating.
    - a. Milcor Type M
    - b. Milcor Type UFR, fire resistive type Underwriters Laboratory Class B, 1-1/2 hour rating meets UBC, IBCO and BOCA codes for two hour rated walls self latching with key lock, Elmdor/Stonman Type FR or equal.
  - 2. Minimum size; 18" by 18".
  - 3. Wall and ceiling access doors: Furnish as required for access to valves, etc.; coordinate size and location to obtain access.
  - 4. See architectural drawings for further requirements.

## **2.05 IDENTIFICATION**

- A. Equipment: Black Phenolic Plates engraved with 1/2" high white letters. The equipment shall be identified by the equipment schedule tag numbers shown on the plans (ie. GWH-1). Coordinate identification numbers with electrical contractor to ensure that the disconnect switches and other electrical/mechanical equipment has consistent identification numbers.
- B. Controls: Same as equipment above except 1/4" high letters.

## **1.02 MISCELLANEOUS EQUIPMENT AND MATERIALS**

- A. Furnish and install miscellaneous equipment and materials required for the systems described whether or not specifically shown or specified.

## **PART 2 - EXECUTION**

### **2.01 ACCESSIBILITY**

- A. Do not install any equipment, valve, control, motor, filter, or any other device requiring maintenance or service in an inaccessible location or position. Install access doors as specified herein to render all such equipment serviceable whether specifically shown on the plans or not. Maintain code clearance to all equipment. Coordinate location of doors with lights, etc., and locate symmetrically with same.



## **2.02 PREPARATION**

- A. Observations: Check all project drawings and specifications; report any discrepancies before proceeding with the work and in time to avoid unnecessary rework.
- B. Investigation: Examine the areas, conditions, and status of other work contiguous or connecting to the work to be performed; ensure that the time of installation is coordinated with other work.
- C. Interruptions of Service: Portions of this work may involve connection to existing work, facilities, or utilities ties and may require interrupting shutdowns of same. Carefully plan, coordinate and execute such work so that any interruptions will be kept to a minimum in time and occurrence. Submit request for shutdowns and make shutdowns only after receiving written approval from the Owner.
- D. Other: Correct any unsatisfactory conditions that may impede proper execution of the work. Ensure that all arrangements, personnel, materials, and tools are appropriate and adequate before proceeding.

## **2.03 INSTALLATION**

- A. General:
  - 1. Material and equipment incorporated in the work shall be used or applied only for the purpose intended or specified.
  - 2. Install piping and all equipment that requires access with minimum vertical and horizontal clearances required by OSHA for service.
  - 3. All pipes and all other equipment shall have 2 inches minimum clearance.
  - 4. Do not proceed with work without clear understanding.
- B. Manufacturer's Instructions:
  - 1. When specifications require that installation comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation.
  - 2. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by specifications.
  - 3. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.
  - 4. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with the Engineer for further instructions.
  - 5. Do not proceed with work without clear understanding.

## **2.04 DEMOLITION**

- A. General
  - 1. Procedures shall be determined by the contractor.
  - 2. Demolition work shall not be commenced until all temporary work such as fences, barricades, and any required warning lights and apparatus are furnished and installed and as required by law, regulation, or ordinance, or elsewhere in this specification.
  - 3. Demolition work shall proceed in such a manner as to minimize the spread of dust and flying particles and to provide safe working conditions for personnel.
  - 4. Fires and explosives shall not be permitted.
- B. Protection
  - 1. Contractor shall conform to all Federal, State, and local ordinances related to the protection of the public and Contractor's personnel and the flow of traffic. Provide protection for persons and property throughout the progress of the work.
  - 2. Existing work damaged by the contractor in the execution of this Contract shall be restored to former condition by the contractor to the satisfaction of the Owner without an increase in the Contract Sum and without an extension of the Contract Time.
- C. Disposition of Materials

1. All materials and equipment not scheduled to be salvaged, including debris and all rejected salvaged materials, shall become the property of the Contractor and shall be disposed of off site in a legal manner. Location of dump and length of haul shall be the contractor's responsibility.

**2.05 LOCATION OF EQUIPMENT AND PIPING**

- A. Where job conditions do not permit the installation of piping, etc. in the location shown, it shall be brought to the engineer's attention immediately before fabrication of piping, etc. and the relocation required shall be determined in a joint conference.
- B. The contractor will be held responsible for the relocating of any items installed without first obtaining the architect's or engineer's approval. Remove and relocate such items at the contractor's expense as so directed by the architect or engineer.
- C. Where piping is left exposed within a room, run in vertical or horizontal planes. Maintain uniform spacing between parallel lines and/or adjacent wall, floor or ceiling surfaces.
- D. Horizontal runs of plumbing and/or electrical conduit suspended from ceilings shall provide for maximum clearance.
- E. Make minor changes in locations of equipment, piping, etc. from locations shown including minor offsets when directed by the engineer, at no additional cost to the owner.

**2.06 CARE AND CLEANING**

- A. Clean and adjust all equipment at completion of installation to provide operating conditions satisfactory to the engineer. Remove broken, damaged or defective parts; repair or replace as directed by engineer. Remove surface material and debris resulting from this work when directed.

**2.07 EQUIPMENT AND CONTROL IDENTIFICATION**

- A. Identify all equipment with permanently attached plates.
- B. Identify all controls and controllers except thermostats in finished areas.

**2.08 FLASHINGS**

- A. Furnish and install a waterproof flashing for each pipe or other penetration through roof or wall. Flashings shall be 4 lb. seamless lead flashings Semco 1100 series with counter flashing as detailed, except in metal roofs flashing for pipes through roof shall be furnished by the roofing contractor. Where details are not specifically delineated, submit details for review.

**2.09 PAINTING**

- A. Painting is included under the Painting and Finishing Section. It shall be the responsibility of the Contractor to properly protect all equipment and controls during painting operations and the Contractor shall repair and/or replace any item damaged due to painting that was not properly protected.

**2.10 ACCESS DOORS**

- A. Provide access doors to all concealed equipment, valves, controls, etc. Locate doors where shown or to be coordinated and symmetrically located with lights, diffusers, etc. Access doors furnished by the contractor shall be installed by the general contractor.

**2.11 OPERATION AND MAINTENANCE DATA**

- A. General: Record data and operation and maintenance data are complementary. Submittal items which may be required under both categories may be included only under one submittal if a statement to that effect is included in the other submittal.
- B. Quality Assurance
  1. Preparation of data shall be done by personnel
    - a. Trained and experienced in maintenance and operation of described products.
    - b. Familiar with requirements of this Section.
    - c. Skilled as technical writer to the extent required to communicate essential data.
    - d. Skilled as draftsman competent to prepare required drawings.

C. Form of Submittals

1. Prepare data in form of an instructional manual for use by Owner's personnel.
  - a. Cover: Identify each volume with typed or printed title, "OPERATING AND MAINTENANCE INSTRUCTION". List:
  - b. Title of Project
  - c. Provide indexed tabs.
  - d. Identity of separate structure as applicable.
  - e. Identity of general subject matter covered in the manual.
2. Format
  - a. Size: 8-1/2 in. x 11 in.
  - b. Paper: 20 pound minimum, white, for typed pages.
  - c. Text: Manufacturer's printed data, or neatly typewritten.
3. Drawings
  - a. Provide reinforced punched binder tab, bind in with text.
  - b. Fold larger drawings to size of text pages.
4. Provide fly-leaf for each separate product, or each piece of operating equipment.
  - a. Provide typed description of product, and major component parts of equipment.
  - b. Provide indexed tabs.
5. Binders
  - a. Commercial quality three-ring binders with durable and cleanable plastic covers.
  - b. Maximum ring size: 1 inch.
  - c. When multiple binders are used, correlate the data into related consistent groupings.

D. Content of Manual

1. Neatly typewritten table of contents for each volume, arranged in systematic order.
  - a. Contractor, name of responsible principal, address and telephone number.
  - b. A list of each product required to be included, indexed to content of the volume.
  - c. List, with each product, name, address and telephone number of:
    - 1) Subcontractor or installer.
    - 2) Maintenance contractor, as appropriate.
    - 3) Identify area of responsibility of each.
    - 4) Local source of supply for parts and replacement.
    - 5) Identify each product by product name and other identifying symbols as set forth in Contract Documents.
2. Product Data
  - a. Include only those sheets which are pertinent to the specific product.
  - b. Annotate each sheet to:
    - 1) Clearly identify specific product or part installed.
    - 2) Clearly identify data applicable to installation.
    - 3) Delete references to inapplicable information.
3. Drawings
  - a. Supplement product data with drawings as necessary to clearly illustrate.
    - 1) Relations of component parts of equipment and systems.
    - 2) Control and flow diagrams.

- b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
      - c. Do not use Project Record Documents as maintenance drawings.
    - 4. Written text, as required to supplement product data for the particular installation.
      - a. Organize in consistent format under separate headings for different procedures.
      - b. Provide logical sequence of instructions for each procedure.
    - 5. Factory Authorized Start-Up Report.
      - a. Provide a factory start-up report for each piece of equipment. Contractor start-up reports, unless contractor is a factory authorized representative will not be allowed.
    - 6. Copy of each warranty, bond and service contract issued.
      - a. Provide information sheet for Owner's personnel, give:
        - 1) Proper procedures in event of failure.
        - 2) Instances which might affect validity of warranties or bonds.
- E. Manual for Equipment and Systems
  - 1. Submit three copies of complete manual in final form.
    - a. Content, for each unit of equipment and system, as appropriate.
      - 1) Description of unit and component parts.
      - 2) Function, normal operating characteristics, and limiting conditions.
      - 3) Performance curves, engineering data and tests.
      - 4) Complete nomenclature and commercial number of replaceable parts.
      - 5) Operating procedures
      - 6) Start-up, break-in, routing and normal operating instructions.
      - 7) Regulation, control, stopping, shut-down and emergency instructions.
      - 8) Summer and winter operating instructions.
      - 9) Special operating instructions.
      - 10) Maintenance Procedures
      - 11) Routing operations
      - 12) Guide to "trouble-shooting".
      - 13) Disassembly, repair and reassembly.
      - 14) Alignment, adjusting and checking
      - 15) Servicing and lubrication schedule.
      - 16) List of lubricants required.
      - 17) Manufacturer's printed operating and maintenance instructions.
      - 18) Description of sequence of operation by control manufacturer.
      - 19) Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
      - 20) Predicted life of parts subject to wear.
      - 21) Items recommended to be stocked as spare parts.
      - 22) As-installed control diagrams by controls manufacturer.
      - 23) Each contractor's coordination drawings.
      - 24) As-installed color coded piping diagrams.
      - 25) Charts of valve tag numbers, with location and function of each valve.
      - 26) List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

- 27) Other data as required under pertinent sections of specifications.
- 28) Content, for each electric and electronic system, as appropriate.
- 29) Description of system and component parts.
- 30) Function, normal operating characteristics, and limiting conditions.
- 31) Performance curves, engineering data and tests.
- 32) Complete nomenclature and commercial number of replaceable parts.
- 33) Circuit directories of panel boards.
- 34) Electrical service.
- 35) Controls.
- 36) Communications
- 37) As-installed color coded wiring diagrams.
- 38) Operating procedures:
- 39) Routing and normal operating instructions.
- 40) Sequences required
- 41) Special operating instructions
- 42) Maintenance procedures
- 43) Routine operations
- 44) Guide to "trouble-shooting".
- 45) Disassembly, repair and reassembly.
- 46) Adjustment and checking.
- 47) Manufacturer's printed operating and maintenance instructions.
- 48) List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
- 49) Other data as required under pertinent sections of specifications.
- 50) Additional requirements for operating and maintenance data: Respective sections of Specifications.

F. Submittal Schedule

1. Submit two copies of preliminary draft of proposed formats and outlines of contents prior to start of work.
  - a. Architect will review draft and return one copy with comments.
2. Submit one copy of complete data in final form fifteen days prior to final inspection or acceptance.
  - a. Copy will be returned after final inspection or acceptance, with comments.
3. Submit specified number of copies of approved data in final form 10 days after final inspection or acceptance.

G. Instruction of Owner's Personnel

1. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems.
2. Operating and maintenance manual shall constitute the basis of instruction.
  - a. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

## **2.12 RECORD DATA**

### **A. Compilation**

1. Record and collect information concurrently with construction progress and date all entries; make drawing entries within 24 hours after occurrence of change or installation requiring recording. Any concealed work covered before recording data shall be uncovered as directed or as necessary to obtain data.
  - a. Record information on drawing prints using an erasable colored pencil (not ink or indelible pencil); describe clearly by note or graphic line as appropriate.
2. Locate any concealed work adequately to allow future access with reasonable ease and accuracy.
  - a. Identify the plan location of all stub outs, pipe lines, etc., which are buried or concealed in the structure, whether installed where shown on the contract drawings or in a different location; show actual field dimensions from column lines, wall lines, or other permanent reference lines or points.
  - b. In many cases on the contract drawings, the arrangement of conduits, pipes, and similar items is shown schematically rather than as a precise scaled layout. Identify the actual location of these with horizontal and vertical dimensions. If such lines are exposed or readily accessible, omit dimensional identification.
  - c. When any work is installed of size, dimension, slope, or location different from that shown on the contract drawings, note the deviation on the Project Record set. If the variations are substantial or cannot be shown clearly on the record drawings, make a new drawing and attach to the Record set.
3. On other documents
  - a. Where changes occur in specifications, clearly indicate same in ink, colored pencil, or rubber stamp.
  - b. Where installed equipment differs from that specified (e.g., by accepted substitution or change order) note in the specifications and include complete data on same.

## **2.13 OPERATION AND MAINTENANCE DATA**

- A. Preparations: Prior to data collection and compilation, prepare and submit in duplicate an outline of the proposed organization and content.
- B. Compilation: Prepare and collect data concurrently with construction progress. Compile per submitted outline.
- C. See Section 22 01 00 Operation and Maintenance of Plumbing.

**END OF SECTION**

## **SECTION 22 02 23 – GENERAL DUTY VALVES FOR PLUMBING**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.
- B. All Division 22 Mechanical Sections.

#### **1.02 SUMMARY**

- A. See Section 22 05 00

#### **1.03 RELATED SECTIONS**

- A. Division 23: HVAC

### **PART 2 - PRODUCTS**

#### **2.01 GENERAL**

- A. Furnish two tee handle operators for each size to suit all valves which are installed below grade in access boxes and which are not fitted with integral handles; hub end valves shall be used where required.
  - 1. Valves on systems operating over 100 psi shall be rated for 150 psi or higher as required.
- B. Shut-off service, domestic water
  - 1. Ball Valves:
    - a. Sizes 2" and smaller: Nibco T-685-80-LF, 600 psi rated, threaded or sweat ends, full port, teflon seat, quarter turn handle with stops, two piece bronze body.
    - b. Sizes 2-1/2 to 4": Nibco T-FP-600A-LF, 400 psi rated, soldered ends, full port, teflon seat, quarter turn handle with stops, two piece bronze body.

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. Valves shall be full size of line in which installed. Furnish discs suitable for service intended. All valves shall be properly packed and lubricated. Unions shall be placed adjacent to each threaded or soldered valve or equipment connection 2" and smaller. Install flanges at all valves with stems vertical wherever possible. Stems shall not be placed below horizontal.
- B. Install unions adjacent to each valve and at final connection to each piece of equipment.
- C. All shutoff valves in water lines shall be or ball valves, unless otherwise shown.
- D. Valves shall be provided with brass identification tags indicating service controlled. Tags may be omitted on lines exposed in equipment rooms where service is obvious.

**END OF SECTION**

**SECTION 22 05 29 – HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

- A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

**1.02 SUMMARY**

- A. Furnish and install all mechanical work shown on the drawings, specified herein, and as required for a complete and functional installation.
- B. This section includes materials and methods applicable to the work described. Specific work requirements of individual Mechanical Sections take precedence if in conflict with requirements of this Section.

**1.03 SUBMITTALS**

- A. Submit proposed alternative methods of attachment for review and approval by the Engineer, prior to deviating from the requirements given below.
- B. For all seismic bracing systems, submit structural calculations and details prepared and signed by the Contractors licensed engineer which include all resultant forces applied to the building structure. Do not overstress building structure. The maximum allowable loads are as indicated in 3.01 of this specification. The submittal data required does not require an analysis of the building structural numbers and their reaction to the loads of the piping. The submittal data needs to address attachment methods and shall include calculations indicating the forces that are applied to the building structure at the point of attachment. Calculations will be reviewed for compliance with design criteria, not for arithmetic.

**1.04 RELATED SECTIONS**

- A. Division 26: Electrical Work

**1.05 DRAWINGS AND SPECIFICATIONS**

- A. Information presented on Drawings and in the Specifications is based upon latest data available during their preparation. The Drawings and Specifications are for the assistance and guidance of the Contractor and exact locations, distances, levels, etc. will be governed by the structures and the site the contractor shall accept same with this understanding.

**PART 2 - PRODUCTS**

**2.01 HANGERS AND SUPPORTS**

- A. B-Line, Superstrut, Tolco, Grinnell, or equal. Numbers are B-line.
- B. Finish: Electro-Chromate or hot dipped galvanized.
- C. Individual: See Contract Documents.
- D. Trapeze Suspension, for three or more pipes B-Line 1-5/8" width channel or a size suitable for load in accordance with manufacturer's published load ratings. No deflection to exceed 1/180 of a span.
- E. Trapeze Supporting Rods: Diameter sufficient to support the load with a safety factor of 5. Anchor rods securely to building structure. See part three for minimum sizes.
- F. Pipe Straps: See Contract Documents.
- G. Size: For insulated pipe - pipe hangers sized to allow pipe insulation to pass continuously through the hanger.
- H. Insulated Pipe Shields: Utilize isolated pipe supports at all insulated pipe hanger locations.
- I. Isolators: 319CT or Trisolator isolators at all hangers and clamps supporting un-insulated piping and tubing and at all points that pipe comes in contact with structure or other pipes.



**PART 3 - EXECUTION**

**3.01 HANGERS AND SUPPORTS**

- A. General: Support all piping so that it is firmly held in place by approved iron hangers and supports and special hangers as required or as scheduled on the drawings.
  - 1. Rigidly fasten hose faucets, and similar items at ends of pipe branches to the building construction near point of connection.
- B. Hanger Installation: On all insulated pipes, install the hangers on the outside of the pipe covering and not in contact with the pipe. Burning, welding, cutting, or drilling on any structural member may only be done if approved by the structural engineer. No valve or piece of equipment shall be used to support the weight of any pipe. Provide a hanger close to the point of change of direction of pipe run in either horizontal or vertical plane. Place supports and hangers for cast iron soil pipe as close as possible to joints; when hangers or supports do not come within one foot of a branch line fitting, install an additional hanger or support at the fitting. Protect insulation, when pipe is insulated, at each hanger with 180 degree, 18 gauge, 12 inch long G.I. Saddles.
- C. Hanger rods with C-clamp type structural attachment shall be equipped with retaining straps.
- D. Metallic Pipe Hanger Spacing and Rod Size Schedule:

Type of Pipe	Spacing		
Pipe Size	1/2" – 2"	2 1/2" – 5"	6" – 8"
Steel Pipe	*8' - 0"	10' - 0"	12' - 0"
Copper Tubing	5' - 0"	8' – 0"	10' – 0"
Cast Iron	Support at 8'- 0" intervals and on each side of and within 12" of joint.		
Rod Size:	3/8"	1/2"	5/8"

\*1/2" gas piping shall be spaced 6' – 0" maximum

- E. Anchor pipe subject to expansion or contraction in a manner permitting strains to be evenly distributed.
- F. Methods of attachment and sizes shall conform to NFPA 13 and FM data sheet 2-8.
- G. All hangers and fasteners are subject to the approval of the Structural Engineer.
- H. Provide beam clamp retaining straps for all pipe supports attached to structural beams.
- I. Support fire-protection system piping independent of other piping.

**END OF SECTION**

**SECTION 22 05 48 – VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

- A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.
- B. All Division 23 Mechanical Sections.

**1.02 SUMMARY**

- A. See 22 05 00

**1.03 RELATED SECTIONS**

- A. Division 26: Electrical Work.
- B. Division 23: HVAC.

**1.04 SEISMIC RESISTANCE**

- A. Furnish and install all systems, units, equipment, and parts to meet or exceed current applicable requirements for seismic resistance specified by codes, regulations, or agencies having jurisdiction. Include all supports, anchors, braces and other restraining devices required. All seismic restraints will meet the following site specific seismic design criteria:
  - 1. Seismic Design Category D, 2) Importance Factor,  $I_p = 1.0$  except  $I_p = 1.5$  for fire sprinklers; and 3)  $SDS = 0.454g$
  - 2. Seismic restraints are the responsibility of the contractor.
- B. Design of seismic bracing shall meet requirements of CBC Chapter 16A.

**PART 2 - PRODUCTS**

**2.01 BRACING SYSTEMS**

- A. Provide approved types as manufactured by Grinnell, Hilti or Tolco.

**PART 3 - EXECUTION**

**3.01 SWAY BRACING**

- A. Provide earthquake sway bracing in accordance with NFPA 13 and FM data sheet 2-8 on all feed and cross mains for seismic Zone 3. Install exposed bracing in a neat workmanlike manner.

**END OF SECTION**

## **SECTION 22 07 00 – PLUMBING INSULATION GENERAL REQUIREMENTS**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, and DIVISION 01 00 00 GENERAL REQUIREMENTS, apply to the work of this section.

#### **1.02 SECTION INCLUDES**

- A. This Section describes insulation materials, methods, and applications for Mechanical Work, Special or specific details, applications, features, or methods may be described in work descriptions Sections or on the drawings.

#### **1.03 RELATED DIVISIONS**

- A. 22 00 00: Plumbing
- B. 23 00 00: HVAC

#### **1.04 REFERENCES**

- A. Thermal insulation materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use:
  - 1. American Society for Testing of Materials Specifications:
    - a. ASTM C 547, "Standard Specification for Mineral Fiber Pipe Insulation"
    - b. ASTM C 585, "Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)"
    - c. ASTM C 1136, "Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation"

#### **1.05 SYSTEM PERFORMANCE**

- A. Insulation materials furnished should meet the minimum thickness requirements of National Voluntary Consensus Standard 90.1 (Latest edition), "Energy Efficient Design of New Buildings," of the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE).
- B. Insulation materials furnished and installed hereunder shall meet the fire hazard requirements of applicable building codes when tested in composite form per one of the following nominally equivalent test methods:
  - 1. American Society for Testing of Materials ASTM E 84
  - 2. Underwriters Laboratories, Inc. UL 723, CAN/ULC-S102-M88
  - 3. National Fire Protection Association NFPA 255
- C. Molded pipe insulation shall be manufactured to meet ASTM C 585 for sizes required in the particular system.
- D. Molded fibrous glass pipe insulation shall comply with the requirements of ASTM C 547.

#### **1.06 QUALITY ASSURANCE**

- A. Qualifications of Installers: only a licensed firm employing installers specifically skilled and experienced in applying insulation to piping shall do Insulation work.
- B. Insulation materials and accessories furnished and installed hereunder shall, where required, be accompanied by manufacturers' current submittal or data sheets showing compliance with applicable specifications listed in above.
- C. Insulation materials, including all weather and vapor barrier materials, closures, hangers, supports, fitting covers, and other accessories, shall be furnished and installed in strict accordance with project drawings, plans, and specifications.
- D. Insulation materials and accessories shall be installed in a workmanlike manner by skilled and experienced workers who are regularly engaged in commercial insulation work.

E. Codes and Standards:

1. California Code of Regulations - Title 24.
2. National Fire Protection Association - 90A
3. Insulation applied to the exterior or interior surface of ducts, and the exterior surface of piping, shall be UL labeled with maximum flame-spread rating of 25 and maximum smoke- developed rating of 50 according to ASTM E 84, when tested as a composite installation including insulation, facing materials, and adhesives as normally applied.

**1.07 DELIVERY AND STORAGE OF MATERIALS**

- A. All of the insulation materials and accessories covered by this specification shall be delivered to the job site and stored in a safe, dry place with appropriate labels and/or other product identification.
- B. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during, and after installation. No insulation material shall be installed that has become damaged in any way.
- C. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

**PART 2 - PRODUCTS**

**2.01 PLUMBING EQUIPMENT INSULATION – SEE 22 07 16**

**2.02 PLUMBING PIPING INSULATION – SEE 22 07 19**

**PART 3 - EXECUTION**

**3.01 APPLICATION/INSTALLATION**

- A. Use the types and thickness of insulation specified in work description Sections.
- B. Apply insulations in accordance with the manufacturer's recommendations and with instructions specified herein or noted on the drawings.
- C. Install insulations only after the systems, items, and equipment have been installed and tested, inspected, and accepted. Exceptions: Slip-on piping insulation and equipment insulations installed at the factory.
- D. Fit insulation snugly to the item being insulated; butt all joints tightly with no voids, spaces, or thin spots.
- E. Seal all joints completely; where sealing tape is used, center the tape over the joint.
- F. Except where specified or necessary, do not use staples or fasteners which penetrate vapor barrier jackets or covers on cold systems or equipment; where such penetrating fasteners are used, seal each penetration completely to maintain the vapor barrier integrity. All penetrations of the ASJ and exposed ends of insulation shall be sealed with vapor barrier mastic. Vapor seals at butt joints shall be applied at every fourth pipe section joint and at each fitting to provide isolation of water incursion.
- G. Use adhesives, mastics, cements, sealants, and finishes undiluted unless specifically directed otherwise; apply per manufacturer's directions.
- H. Install outdoor jacketing or other specified weather proofing or finishing on all insulations outdoors.
- I. Install all indoor exposed insulation with extra care and finish neatly.
- J. Follow specified methods of installation unless alternative methods are submitted and approved.

**3.02 FINISHING**

- A. Finishes and Protection:
  1. Insure that the exterior finish of all insulation is applied and complete as specified.

2. Make ready for painting, or painted to match existing including color where specified for paint.
  3. Install all metal jackets or protective sheathing where specified.
- B. Repair, Touchup: Properly repair and touchup all dents, rips, tears, or other damage inflicted on jackets or exterior surfaces of insulation. Breaks or punctures in the vapor barrier of external insulation will not be accepted and must be repaired prior to project acceptance.

**END OF SECTION**

## SECTION 22 07 19 – PLUMBING PIPING INSULATION

### PART 1 - GENERAL

#### 1.01 GENERAL REQUIREMENTS

- A. A continuous intact vapor barrier is critical for all pipes conveying fluids at temperatures less than 75° F.
- B. All insulation material shall have a mold, humidity, and erosion resistant face that has met the requirements of 2016 CMC Standard No. 6-1.
- C. Insulation applied to the exterior surface of pipes located in buildings shall have a flame spread of no more than 25 and smoke developed rating of not more than 50.
- D. All requirements of Section 22 07 00 apply to this section.

### PART 2 - PRODUCTS

#### 2.01 IP-1 RIGID MOLDED SECTIONAL/INDOOR CONCEALED JACKET

- A. Regular shape (straight run).
  - 1. Molded sectional, factory fabricated of heavy density resin bonded fibrous glass, with integral factory applied all service jacket of Kraft paper/aluminum foil/glass fiber reinforcement.
  - 2. Insulation shall have a thermal conductivity k factor of 0.23 at 75° F mean temperature and be suitable for direct application and service on piping having operating surface temperatures of - 60° to 450°F.
  - 3. Jacket shall:
    - a. Extend 1-1/2" (minimum) along one edge of longitudinal joint to form a sealing lap, which shall be faced inside with a paper protected pressure sensitive adhesive.
    - b. Have a permanence rating of 0.02 perm/in. and a Beach puncture resistance of 50 units;
    - c. Have an exterior suitable for painting with latex or water base paint.
  - 4. All insulation shall have composite (insulation, jacket, tape seal and adhesive used to adhere jacket to the insulation). Fire and Smoke Hazard ratings as tested under procedure ASTM E-84, NFPA 255 and UL 723, not exceeding Flame Spread of 25 and a Smoke Developed of 50. PVC fitting covers and accessories, such as adhesives, mastics, cements and cloth for fittings shall have the same component ratings.
  - 5. Paper laminate jackets shall be permanently flame and smoke resistant. Chemicals used for treating paper in jacket laminates shall not be water soluble and shall be unaffected by water and humidity.
  - 6. Fiberglass Schuler-Manville Micro-Lok, or equal.
- B. Irregular shape (fittings, flanges, valves, etc.)
  - 1. Fibrous glass of same density, thickness, and other properties or characteristics as the adjacent regular shape insulation either pre-molded or field forged to fit the item being insulated. The pre-molded insulation shall be provided with weather protection cover.

#### 2.02 IP-2 RIGID MOLDED SECTIONAL/OUTDOOR JACKET

- A. Regular shape (straight run).
  - 1. Molded sectional, factory fabricated of heavy density resin bonded fibrous glass, with integral factory applied all service jacket of Kraft paper/aluminum foil/glass fiber reinforcement.
  - 2. Insulation shall have a thermal conductivity k factor of 0.23 at 75° F mean temperature and be suitable for direct application and service on piping having operating surface temperatures of - 60° to 450°F.
  - 3. Jacket:
    - 4. Straight runs: .016" thick smooth sheet aluminum finish.
    - 5. Irregular shapes:

- a. Amerisafe, factory molded aluminum covers, or
  - b. Mitered aluminum sheet matching straight run jacketing, or
  - c. Weather coating.
  - d. Alternative jacketing: Schuler-Manville Type ML, metal jacketing system.
6. All insulation shall have composite (insulation, jacket, tape seal and adhesive used to adhere jacket to the insulation). Fire and Smoke Hazard ratings as tested under procedure ASTM E-84, NFPA 255 and UL 723, not exceeding Flame Spread of 25 and a Smoke Developed of 50. PVC fitting covers and accessories, such as adhesives, mastics, cements and cloth for fittings shall have the same component ratings.
7. Paper laminate jackets shall be permanently flame and smoke resistant. Chemicals used for treating paper in jacket laminates shall not be water soluble and shall be unaffected by water and humidity.
8. Fiberglass Schuler-Manville Micro-Lok, or equal.
- B. Irregular shape (fittings, flanges, valves, etc.)
1. Fibrous glass of same density, thickness, and other properties or characteristics as the adjacent regular shape insulation, either pre-molded or field forged to fit the item being insulated. The pre-molded insulation shall be provided with weather protection cover.

### **2.03 IP-3 ELASTOMERIC FOAM**

- A. Insulation shall be Elastomeric Foam Insulation. Insulation should have a maximum service temperature of 210° F, a minimum service temperature of -40°F, and a “K” factor of 0.28 at 75°F. The flame spread of the insulation shall be 25 or less, and smoke density shall be 50 or less when tested in accordance with ASTM E84.
- B. Provide U.V. protective coating for all outdoor applications. Foster 30-64, Armacell WB Coating or K-Flex 374.
- C. K-Flex R-180-FS/R-1800-FS, Armacell Armaflex or equal.

### **2.04 IP-4 CLOSED CELL POLYOLEFIN**

- A. Closed cell flexible plastic foam insulation should have a “k” factor of 0.27 or less at 75°F and water vapor permeability of .2 perm-inch or less. The manufacturer shall warrant the insulation to be able to be directly buried underground without any protective jacket.
- B. Closed Cell Polyolefin in tubular form shall comply with ASTM C-534, UL 94HBF, UBC 42-1 Class I, ASTM E-84 (25/50), NFPA 255 (25/50), UL 723(25/50), FMCSS-302, CAN-ULC-S102.2-M88 (25/50) Flammability Classification, MEA#267-92-M, New York.
- C. Provide U.V. protective coating for all outdoor applications.
- D. IMCOA Imcolock or equal.

### **2.05 IP-5 RIGID MOLDED SECTIONAL/INDOOR EXPOSED JACKET**

- A. Regular shape (straight run)
  1. Molded sectional, factory fabricated of heavy density resin bonded fibrous glass, with integral factory applied all service jacket of Kraft paper/aluminum foil/glass fiber reinforcement.
  2. Insulation shall have a thermal conductivity k factor of 0.23 at 75°F mean temperature and be suitable for direct application and service on piping having operating surface temperatures of -60° to 450°F.
  3. Jacket:
    - a. Straight runs: PVC fitting covers with vapor barrier.
    - b. Irregular shapes:
      - c. Zeston, Snap-Form, factory molded PVC covers, or
      - d. Mitered aluminum sheet matching straight run jacketing, or
      - e. Alternative jacketing: Schuler-Manville Type ML, metal jacketing system.

4. All insulation shall have composite (insulation, jacket, tape seal and adhesive used to adhere jacket to the insulation). Fire and Smoke Hazard ratings as tested under procedure ASTM E-84, NFPA 255 and UL 723, not exceeding Flame Spread of 25 and a Smoke Developed of 50. PVC fitting covers and accessories, such as adhesives, mastics, cements and cloth for fittings shall have the same component ratings.
  5. Paper laminate jackets shall be permanently flame and smoke resistant. Chemicals used for treating paper in jacket laminates shall not be water soluble and shall be unaffected by water and humidity.
  6. Fiberglass Schuler-Manville Mico-Lok, or equal.
- B. Irregular shape (fittings, flanges, valves, etc.)
1. Fibrous glass of same density, thickness, and other properties or characteristics as the adjacent regular shape insulation, either pre-molded or field forged to fit the item being insulated. The pre-molded insulation shall be provided with PVC protection cover.

### **PART 3 - EXECUTION**

#### **3.01 PIPING APPLICATIONS**

Note: Where multiple systems are listed, contractor has the option to choose.

- A. Domestic cold water (CW) piping above grade/outdoors
1. Use System IP-2. (Rigid Molded Sectional/Outdoor Jacket) with vapor barrier.
    - a. 1 ½" thickness for all sizes
    - b. All piping shall have heat trace installed to protect from freezing. Coordinate with the electrical contractor.
- B. Domestic tempered water (TW) above grade/indoors
1. Use System IP-1. (Rigid Molded Sectional/Indoor Jacket) with vapor barrier.
    - a. For temperatures 105 to 140° F, 1" thickness for pipes smaller than 1" diameter, 1-1/2" thickness for 1" diameter less than 1-1/2" diameter and 1 ½" thickness for 1-1/2" to 3" diameter, use 1-1/2" thick for all larger piping.
- C. Domestic hot water (HW) above grade/indoors
1. Use System IP-1. (Rigid Molded Sectional/Indoor Jacket) with vapor barrier.
    - a. For temperatures 105 to 140° F, 1" thickness for pipes smaller than 1" diameter, 1-1/2" thickness for 1" diameter less than 1-1/2" diameter and 1 ½" thickness for 1-1/2" to 3" diameter, use 1-1/2" thick for all larger piping.

#### **3.02 INSTALLATION**

- A. Unless specifically excluded herein or on the drawings, insulate all parts of hot piping systems, steam piping, and condensate drains including fittings, flanges, valves, and pipe-mounted devices, except do not cover nameplates on devices.
- B. Install insulation in removable sections over unions, flanges, and line components or devices requiring periodic maintenance.
- C. Install insulation butted tightly to transitions such as insulated pipe shields, insulated pipe sleeves, equipment connections, etc.
- D. Install insulation on piping systems so that condensation will not occur. Insulate pipe supports where hanger is directly in contact with pipe up to the point of connection to the building structure. All piping shall be supported in such a manner that neither the insulation nor the vapor/weather barrier is compromised by the hanger or the effects of the hanger. In all cases, hanger spacing shall be such that the circumferential joint may be made outside the hanger. On cold systems, vapor barrier shall be continuous, including material covered by the hanger saddle.
- E. Treat equipment face piping as follows:



1. Where piping is subject to condensation (domestic water systems, rain water leaders, condensate drains) and where installed above grade outdoors (either hot or cold systems) insulate piping completely to the point of equipment connection.
  2. Where not subject to condensation (hot systems) terminate insulation at the outlet side of the equipment shut-off valve, leaving the face piping un-insulated, 24" max, unless noted otherwise, except where exposed to outdoors.
- F. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other. Butt insulation joints firmly to ensure complete, tight fit over all piping surfaces.
- G. Maintain the integrity of factory-applied vapor barrier jacketing on all pipe insulation, protecting it against puncture, tears or other damage. All staples used on cold pipe insulation shall be coated with Foster 30-65 or Childers CP-34 vapor barrier coating to maintain vapor barrier integrity.
- H. Rigid Molded Sectional/Jacketed:
1. Comply with applicable general instructions above.
  2. Apply to all hot water and piping (except where specified or noted otherwise) installed above grade indoors and outdoors, concealed or exposed.
  3. Seal all transverse joints (except at PVC fitting jackets) with circumferentially applied 3" (minimum) width tape of same material as the jacket, faced with the same adhesive as the longitudinal lap, or seal with Hardcast 4" wide Type DT490-C mineral impregnated woven fiber tape (synthetic fiber indoors, cotton fiber outdoors) using Hardcast FTA-20 activator/adhesive applied by brush or roller. Seal transverse joints at PVC fittings jackets with color matching PVC tape and vapor barrier mastic adhesive.
  4. Fittings and valves shall be insulated with pre-formed fiberglass fittings, fabricated sections of fiberglass pipe insulation, blanket insulation, or insulating cement. Thickness shall be equal to adjacent pipe insulation. Finish shall be with pre-formed PVC fitting covers or as otherwise specified on contract drawings.
  5. Flanges, couplings and valve bonnets shall be covered with an oversized pipe insulation section sized to provide the same insulation thickness as on the main pipe section. An oversized insulation section shall be used to form a collar between the two insulation sections with low-density blanket insulation being used to fill gaps. Jacketing shall match that used on straight pipe sections. Rough-cut ends shall be coated with suitable weather or vapor resistant mastic as dictated by the system location and service.
  6. On hot systems where fittings are to be left exposed, insulation ends should be beveled away from bolts for easy access.
  7. On cold systems, particular care must be given to vapor sealing the fitting cover or finish to the pipe insulation vapor barrier. All valve stems shall be sealed with caulking to allow free movement of the stem but provide a seal against moisture incursion.
  8. Fit insulation terminations with Zeston, Snap Form, end cap jackets, or seal with Hardcast tape as specified above for joints.
  9. On all piping (except equipment face piping) installed outdoors, install outdoor jacketing. Install aluminum sheet jacket with all joints turned down at 45° below horizontal; secure in place with non-corroding bands and/or blind rivets (do not puncture vapor barrier insulation jacket). On equipment face piping (including equipment shut-off valve) coat the insulation with ¼" thick Foster 46-50 or Childers CP-10/11 (weatherproofing) mastic reinforced with glass fabric and finished with two (2) coats of aluminum paint.
  10. Penetrations
    - a. Extend piping insulation without interruption through walls, floors, and similar piping penetrations, except where otherwise specified.
- I. Closed Cell Polyolefin:

1. Install pre slit, pre-glued closed cell polyolefin foam pipe insulation as per manufacturer's recommendations. Seal all joints and seams with Fuse-Seal Gun or with Armstrong 520 adhesive or equal in accordance with manufacturer's written instructions. Fabricate fitting covers from polyolefin foam insulation using same procedure.
  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.
  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.
- J. Install insulation in accordance with insulation manufacturer's instructions and as specified.
- K. Install faced insulation with facing to occupied room side. Install non-rated facing in contact with unexposed surface of finish materials.
- L. Do not install insulation over recessed light fixtures.
- M. Trim insulation neatly to fit spaces. Fit insulation into crevices, spaces at outlet boxes and similar penetrations.
- N. Maintain continuous foil faced vapor barrier. Provide fire resistive tape at all edges or penetrations of foil faced insulation, including batt ends.
- O. Where wall insulation cavity exceeds 8 feet high, provide blocking or other approved support at 8 feet on center.

**END OF SECTION**

## **SECTION 22 11 16 – DOMESTIC WATER PIPING**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.
- B. Section 22 11 00, Facility Water Distribution applies to this section.

#### **1.02 SUMMARY**

- A. This section includes all plumbing (equipment, fixtures, pipe and fittings, specialties) inside the building(s) and outside the building(s) to the point of connection to site plumbing systems.
- B. Provide complete plumbing systems including:
  - 1. Service connections to existing on-site utilities, and stubs for future connection to equipment provided under the work of this Section or other Sections of the Specifications.
  - 2. All piping systems for conduction of cold water, heated water, soil, waste, fuel gas, and other fluids or gases as shown or specified for plumbing work.
  - 3. All valves, piping supports, piping penetration auxiliaries, piping protective coverings, piping, and other piping accessories as shown or specified for plumbing work.
  - 4. All plumbing equipment and auxiliary items as specified herein or shown on the drawings.

#### **1.03 RELATED SECTIONS**

- A. Section 22 05 00 - Plumbing
- B. Section 22 07 00 - Insulation
- C. Section 23 00 00 - Heating, Ventilating, & Air Conditioning

#### **1.04 QUALITY ASSURANCE**

- A. All plumbing fixtures and equipment shall comply with California Code of Regulations, Title 24, Part 6, latest edition.

#### **1.05 REFERENCES**

- A. Pipes and Tubes
  - 1. Hard Copper Tube: ASTM B88, Types K, L and M, water tube, drawn temper.
  - 2. Soft Copper Tube: ASTM B88, Types K and L, water tube, annealed temper.
  - 3. Fittings
    - a. Wrought-Copper, Solder-Joint Pressure Fittings: ANSI B16.22.
    - b. Cast-Copper-Alloy, Solder-Joint Pressure Fittings: ASME B16.18, ASTM B584.
    - c. Cast-Copper-Alloy, Threaded -Joint Pressure Fittings: ANSI/ASME B16.15, ASTM B584.
    - d. Bronze Flanges: ASME B16.24, Classes 150 and 300.
    - e. Copper Unions: ASME B16.18, cast-copper-alloy body, hexagonal stock, with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends. Threads complying with ASME B1.20.1.
- B. Joining Materials
  - 1. Solder Filler Metal: ASTM B32, alloys to suit system requirements.
  - 2. Brazing Filler Metals: AWS A5.8, alloys to suit system requirements.

#### **1.06 STRUCTURAL REQUIREMENTS**

- A. Structural members shall not be cut or modified in any manner without specific instructions from the structural engineer and approval from DSA. Where possible, offset vents and pipes rising in walls, concealed above ceilings, below plates and rise through roof. Where this is not possible, install vents and pipes through plates as detailed on structural drawings.

### **1.07 SUBMITTALS**

- A. Submit a general statement of materials and methods along with manufacturer's technical data and installation instructions for all equipment, fixtures, pipe and fittings, and plumbing specialties to be installed.
- B. Record Drawings: Per specification section 22 05 00 requirements.
- C. Operation and Maintenance Manuals: Per specification section 22 01 00 requirements.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL**

- A. Adapters: Wrought copper male adapters shall be used wherever it is necessary to connect copper tubing to a valve or "tee" having threaded connections.

### **2.02 PIPE, FITTING, AND JOINING MATERIALS**

- A. Copper Water Pipe
  - 1. Pipe: Above grade, Type M, L, or K hard drawn copper tubing per ASTM B-88, plain ends.
  - 2. Fittings: Solder type, wrought copper per ANSI Standard B16.22 or cast red bronze per ANSI Standard B16.18. Do not use T-drill.
  - 3. Unions: Solder type, cast red bronze.
  - 4. Joining Materials/Methods
    - a. Canfield, Silvabrite or equal lead free solder with a non-corrosive water based flux.
    - b. 15% silver brazing alloy, water based silver brazing flux. Silver content must be clearly identified on the brazing rod.
  - 5. Connections
    - a. Copper to dissimilar metals: dielectric connector.
    - b. Copper to threaded connections: cast brass adapters.

### **2.03 PIPE AND FITTING APPLICATIONS**

- A. Inside Building (to 5'-0" outside building line and as shown on the Contract Documents).
  - 1. Water Piping: Above grade, Type L drawn temper, joining methods, soldered connections, below grade, Type K drawn temper copper tubing, joining methods, brazed connections.
  - 2. Plastic pipe and fittings shall not be used inside of buildings.

## **PART 3 - EXECUTION**

### **3.01 PIPING**

- A. Water piping
  - 1. Run water piping generally level. No piping shall be installed to cause an unusual noise from the flow of water under normal conditions.
  - 2. All water branches as single fixtures shall be provided with air chambers at least 12" long and of the same diameter pipe as the branches. Where two or more fixtures are located in a row or battery, the supply heads shall be continued full-size of the branch outlet and an air chamber same pipe size as the header and a minimum of 24" long shall be installed on the end of the header.
  - 3. Adapters: Wrought copper male adapters shall be used wherever it is necessary to connect copper tubing to a valve or tee having threaded connections.
  - 4. Install Bare Metal Pipe Isolators: Stoneman "Trisolator", Superstrut "Cush-a-strip", Unistrut on all hot and cold domestic water piping.

### **3.02 FIELD QUALITY CONTROL**

- A. Water Sterilization

1. After installation and before installing valves or making final connections, flush or purge piping systems clean of foreign substances; use water to flush piping conducting liquids and compressed air to clear piping conducting gases.
2. After completing cold and heated water systems, disinfect in accordance with current requirements of U.S. Public Health Department. Use 50 parts per million of chlorine with 8 hour retention and flush to leave a residual no greater than supply source. Submit written certification of disinfecting completion by independent laboratory. After sterilization take at least one (1) water sample per floor and have analyzed for "E-coli" to submit test results.

**3.03 PIPING TESTING: TESTING CRITERIA**

System	Medium	Pressure	Duration
Water	Water	150 psig	4 hours

**END OF SECTION**

## **SECTION 22 11 19 – DOMESTIC WATER PIPING SPECIALTIES**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.
- B. Section 22 05 00 applies to this section.

#### **1.02 SUMMARY**

- A. This section includes all plumbing (equipment, fixtures, pipe and fittings, specialties) inside the building(s) and outside the building(s) to the point of connection to site plumbing systems.
- B. Provide complete plumbing systems including:
  - 1. Service connections to existing on-site utilities, and stubs for future connection to equipment provided under the work of this Section or other Sections of the Specifications.
  - 2. All piping systems for conduction of water as shown or specified for plumbing work.
  - 3. All valves, piping supports, piping penetration auxiliaries, piping protective coverings, piping, and other piping accessories as shown or specified for plumbing work.
  - 4. All plumbing equipment and auxiliary items as specified herein or shown on the drawings.

#### **1.03 RELATED SECTIONS**

- A. Section 22 05 00 - Plumbing
- B. Section 22 07 00 - Insulation
- C. Section 23 00 00 - Heating, Ventilating, & Air Conditioning

### **PART 2 - PRODUCTS**

#### **2.01 PIPING ACCESSORIES**

- A. Unions
  - 1. Shall have the same pressure rating as pipe fittings.
- B. Piping Penetration Auxiliaries
  - 1. Escutcheons: Polished chrome plated brass or painted metal.

### **PART 3 - EXECUTION**

#### **3.01 EQUIPMENT**

- A. Install equipment in accordance with the manufacturer's installation instructions, as specified herein, and as detailed on the drawings.

#### **3.02 EXTERIOR HOSE BIBBS**

- A. Install at 18 inches above finished grade and be non-freeze type.

#### **3.03 VALVES, UNIONS AND FLANGES**

- A. Valves shall be full size of line in which installed. Furnish discs suitable for service intended. All valves shall be properly packed and lubricated. Unions shall be placed adjacent to each threaded or soldered valve or equipment connection 2" and smaller. Install flanges at all valves with stems vertical wherever possible. Stems shall not be placed below horizontal.
- B. Install unions adjacent to each valve and at final connection to each piece of equipment.
- C. Valves shall be provided with brass identification tags indicating service controlled. Tags may be omitted on lines exposed in equipment rooms where service is obvious.
- D. Cathodic Protection: Install insulated flanges or dielectric unions at points of connection between pipes and equipment as follows: (1) between copper or brass piping and steel or cast iron pipe. (2) Between copper or brass piping and any steel material. (3) Buried connections of copper or brass piping to steel or cast iron piping shall be protected with a polyvinyl tape wrap 10 mils thick, extending 5' each way from connection.

- E. Expansion: Install piping with sufficient offsets, loops, and/or swing-joints to allow for expansion and contraction. Anchor piping at equipment to restrain movement at those locations.
- F. Freeze Protection: Piping shall not be installed in a location subject to freezing conditions. All piping shall and must be installed on the "warm" side of building envelope insulation without exception. Where risers occur in outside walls, ensure that building insulation is adequate and intact. All piping must be drainable; provide drains required. All piping shall be run in or above heated portion of the building.

**3.04 FIELD QUALITY CONTROL**

A. Water Sterilization

- 1. After installation and before installing valves or making final connections, flush or purge piping systems clean of foreign substances; use water to flush piping conducting liquids and compressed air to clear piping conducting gases.
- 2. After completing cold and heated water systems, disinfect in accordance with current requirements of U.S. Public Health Department. Use 50 parts per million of chlorine with 8 hour retention and flush to leave a residual no greater than supply source. Submit written certification of disinfecting completion by independent laboratory. After sterilization take at least one (1) water sample per floor and have analyzed for "E-coli" to submit test results.

B. Piping Testing: Testing Criteria

System	Medium	Pressure	Duration
Water	Water	150 psig	4 hours

**END OF SECTION**

## **SECTION 22 13 16 – SANITARY WASTE AND VENT PIPING**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.
- B. Section 22 05 00 applies to this section.

#### **1.02 SUMMARY**

- A. This section includes all plumbing (equipment, fixtures, pipe and fittings, specialties) inside the building(s) and outside the building(s) to the point of connection to site plumbing systems.
- B. Provide complete plumbing systems including:
  - 1. Service connections to existing on-site utilities, and stubs for future connection to equipment provided under the work of this Section or other Sections of the Specifications.
  - 2. All piping systems for conduction of soil, waste, and other fluids or gases as shown or specified for plumbing work.
  - 3. All valves, piping supports, piping penetration auxiliaries, piping protective coverings, piping, and other piping accessories as shown or specified for plumbing work.
  - 4. All plumbing equipment and auxiliary items as specified herein or shown on the drawings.

#### **1.03 RELATED SECTIONS**

- A. Section 22 05 00 - Plumbing
- B. Section 22 07 00 - Insulation
- C. Section 23 00 00 - Heating, Ventilating, & Air Conditioning

#### **1.04 QUALITY ASSURANCE**

- A. All plumbing fixtures and equipment shall comply with California Code of Regulations, Title 24, Part 6, latest edition.

#### **1.05 REFERENCES**

- A. Pipes and Tubes
  - 1. Steel Pipe: ASTM A53, Type S, Grade A, Schedule 40, seamless, black or galvanized, plain ends.
  - 2. Copper Drainage Tube: ASTM B306, Type DWV, drawn temper.
  - 3. Hubless, Cast-Iron Soil Pipe: CISPI 301.
  - 4. PVC Plastic, DWV Pipe: ASTM D2665, Schedule 40, plain ends.
  - 5. Polypropylene Pipe: ASTM D4101, NSF listed, Schedule 40.
  - 6. Polyethylene Pipe: ASTM D2513 produced to APWA/ULCC standards for color coding of gas distribution systems.
- B. Fittings
  - 1. Wrought-Copper, Solder-Joint Pressure Fittings: ANSI B16.22.
  - 2. Cast-Copper-Alloy, Solder-Joint Pressure Fittings: ASME B16.18, ASTM B584.
  - 3. Cast-Copper-Alloy, Threaded -Joint Pressure Fittings: ANSI/ASME B16.15, ASTM B584.
  - 4. Bronze Flanges: ASME B16.24, Classes 150 and 300.
  - 5. Copper Unions: ASME B16.18, cast-copper-alloy body, hexagonal stock, with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends. Threads complying with ASME B1.20.1.
  - 6. Steel Pipe Nipples: ASTM A733, made of ASTM A53 or ASTM A106, Schedule 40, seamless, galvanized, carbon-steel pipe.



7. Malleable-Iron Unions: ASME B16.39, Classes 150 and 300; hexagonal stock; with ball-and-socket joint; metal-to-metal bronze seating surfaces; and female threaded ends with threads complying with ASME B1.20.1.
8. Galvanized, Cast-Iron Threaded Fittings: ASME B16.4, Classes 125 and 250; standard pattern; with threads complying with ASME B1.20.1.
9. Wrought-Copper, Solder-Joint, DWV Drainage Fittings: ASME B16.29.
10. Cast-Copper-Alloy, Solder-Joint, DWV Drainage Fittings: ASME B16.23.
11. PVC Plastic, DWV Pipe Fittings: ASTM D2665, made to ASTM D3311; socket-type; drain, waste, and vent pipe patterns.
12. Plastic Pipe Sleeves: ASTM C564 rubber for cast-iron soil pipe and ASTM F477 elastomeric seal.
13. Polypropylene Plastic, NSF listed, plain and grooved ends.
14. Polyethylene Plastic: ASTM D2683 and D3261, socket or butt fusion fittings.

C. Joining Materials

1. CISPI Couplings for Hubless, Cast-Iron Soil Pipe and Fittings: CISPI 310, having ASTM C564 neoprene sealing sleeve, with 300 series stainless-steel, corrugated shield-and-clamp assembly.
2. Solder Filler Metal: ASTM B32, alloys to suit system requirements.
3. Brazing Filler Metals: AWS A5.8, alloys to suit system requirements.
4. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

D. Plastic Pipe Seals: ASTM F477, elastomeric gasket.

**1.06 STRUCTURAL REQUIREMENTS**

- A. Structural members shall not be cut or modified in any manner without specific instructions from the structural engineer and approval from DSA. Where possible, offset vents and pipes rising in walls, concealed above ceilings, below plates and rise through roof. Where this is not possible, install vents and pipes through plates as detailed on structural drawings.

**1.07 SUBMITTALS**

- A. Submit a general statement of materials and methods along with manufacturer's technical data and installation instructions for all equipment, fixtures, pipe and fittings, and plumbing specialties to be installed.
- B. Record Drawings: Per specification section 22 05 00 requirements.
- C. Operation and Maintenance Manuals: Per specification section 22 05 00 requirements.

**PART 2 - PRODUCTS**

**2.01 GENERAL**

- A. Adapters: Wrought copper male adapters shall be used wherever it is necessary to connect copper tubing to a valve or "tee" having threaded connections.

**2.02 PIPE, FITTING, AND JOINING MATERIALS**

A. Hubless Cast-Iron/Sleeve-Clamped Joints

1. Pipe: Service weight cast iron, hubless, with hot coal tar pitch coating inside and outside, per Cast-Iron Soil Pipe Institute Standard 301.
2. Fittings: Hubless type, Tyler No-Hub Coupling, each matched with pipe and identified with the manufacturer's name or trademark, the Cast-Iron Soil Pipe Institute symbol, and the pipe size. Those for connections to other types of piping - approved cast-iron adapter/transition type.
3. Joining Materials/Methods: Husky Series 4000 (Blue shield) or Mission Heavy Weight Orange shield) on pipes over 3", neoprene sleeve type conforming to ASTM C564 specifically designed for connecting hubless cast-iron pipe, coated with manufacturer's recommended lubricant before

installing; four type 304 stainless steel band clamps with a type 305 stainless steel worm drive screw, and corrugated shield over sleeve; use standard no-hub couplings on pipe 3" and less.

- a. "Tyler, Standard", two band stainless steel coupling, Stainless Steel screw housing, Stainless Steel shield, shall be used for vent piping.
  4. Wedge lock joints at rainwater leaders to underground drain.
  5. Cleanout Plugs: Use Armitte Joint Seal compound No. 411, or Enterprise Commercial Thread-Seal.
- B. Copper DWV Pipe: DWV drainage tubing per ASTM B-306-86, plain ends for pipe 1 1/2" and larger.
1. Fittings shall be solder type, wrought copper drainage fittings per ANSI Standard B16.29-86.
  2. Joining Materials/Methods: Canfield, Silvabrite or equal lead free solder with a non-corrosive water based flux.
  3. Connections:
    - a. Copper to dissimilar metals: dielectric connector.
    - b. Copper to threaded connections: cast brass adapters.

### 2.03 PIPE AND FITTING APPLICATIONS

- A. Inside Building (to 5'-0" outside building line).
1. Soil, waste and vent piping
    - a. Below slab, service weight cast iron soil pipe and fittings, asphaltic coated for sizes 2 1/2" and smaller. Above floor from 6" above slab shall be galvanized steel pipe or service weight cast iron soil pipe and fittings, asphaltic coated for sizes 2 1/2" and smaller. Urinal waste shall be service weight cast iron soil pipe and fittings, asphaltic coated. Sizes 3" and larger shall be service weight cast iron soil pipe and fittings, asphaltic coated.
    - b. Fittings
      - 1) Contractor may use "No-Hub" "Husky" joints per manufacturers published instructions for installation. No-Hub fittings for waste and soil pipe shall be four band stainless steel type. "Tyler, Standard", two band stainless steel coupling, Stainless Steel screw housing, Stainless Steel shield, shall be used for vent piping.
    - c. As an alternate use, copper DWV Pipe.
  2. Condensate Drain Piping: Type M, drawn temper copper tube, joining method, soldered connections. Connect to equipment with P-trap and clean out plug.
  3. Use PVC pipe for all condensing heating equipment condensate drains.
  4. Plastic pipe and fittings shall not be used inside of buildings, except as permitted for acid waste and vent systems.

## PART 3 - EXECUTION

### 3.01 EQUIPMENT

- A. Install equipment in accordance with the manufacturer's installation instructions, as specified herein, and as detailed on the drawings.

### 3.02 PIPING

- A. Provide trenching and backfill for buried piping and install with the following minimum cover unless shown otherwise, cover is from top of pipe to finish grade.
1. Sewer - 30"
- B. Sewer Piping: Run all horizontal sanitary piping inside of the building at a uniform grade of not less than 1/4" per foot unless otherwise noted on the drawings. Sewers shall have invert elevations as shown and slope uniformly between given elevations. All drainage piping shall be run as straight as possible and shall have long radius bends. All offsets shall be made at an angle of 45 degrees or less. All vent piping shall be graded so as to free itself quickly of any water or condensation. Where possible, groups of vent risers shall be jointed together with one enlarged outlet through roof.

1. Install clean-outs of the same diameter of pipe in all horizontal soil and waste lines where indicated and at all points of change in direction and at base of all soil or waste drops. Locate clean outs not less than 18" from building construction so as to provide sufficient space for rodding. No horizontal runs of more than 100 feet shall be without clean-out.
  2. Clean-outs in floors shall be protected with a cover taped in place and removed at completion of concrete work.
  3. Provide trap at each inlet to sanitary sewer system. Provide trap primers where shown and as required by code.
- C. Bury a No. 18 AWG insulated copper locating wire with all non metallic pipe. Copper wire shall have at least 12" above grade at each end.
- D. Condensate drain piping
1. Provide "P" trap having 2" minimum trap seal.
  2. Install trap with top of trap outlet 2" minimum below bottom of condensate collection pan, and within 12" of pan outlet.
  3. Make changes in direction in the condensate drain line using tees; fit the free leg of the tee with a screwed plug for clean-outs. Provide additional such clean-outs where required by code or where necessary for cleaning drain line.
  4. Extend condensate drain line to appropriate disposal point, receptor, or sewer as prescribed by code or shown on drawings.
  5. Insulation: Provide insulation as shown or specified (Section 22 07 00).

**3.03 VENT LOCATIONS**

- A. Plumbing fixture vents have been combined wherever possible to minimize the number of roof penetrations.
- B. Roof penetrations have been coordinated with penetrations of other trades, etc.
- C. Plumbing contractor shall not shift or relocate vents through the roof or other penetrations from the locations shown without prior approval of the Architect.

**3.04 FIELD QUALITY CONTROL**

- A. Piping Testing:
  1. Testing Criteria

System	Medium	Pressure	Duration
Drainage and Vent	Water	10 ft water	15 minutes

**END OF SECTION**

## **SECTION 22 13 19 – SANITARY WASTE PIPING SPECIALTIES**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.
- B. Section 22 01 00 applies to this section.

#### **1.02 SUMMARY**

- A. This section includes all plumbing (equipment, fixtures, pipe and fittings, specialties) inside the building(s) and outside the building(s) to the point of connection to site plumbing systems.
- B. Provide complete plumbing systems including:
  - 1. Service connections to existing on-site utilities, and stubs for future connection to equipment provided under the work of this Section or other Sections of the Specifications.
  - 2. All piping systems for conduction of cold water, heated water, soil, waste, fuel gas, and other fluids or gases as shown or specified for plumbing work.
  - 3. All valves, piping supports, piping penetration auxiliaries, piping protective coverings, piping, and other piping accessories as shown or specified for plumbing work.
  - 4. All plumbing equipment and auxiliary items as specified herein or shown on the drawings.

#### **1.03 RELATED SECTIONS**

- A. Section 22 05 00 - Plumbing
- B. Section 22 07 00 - Insulation
- C. Section 23 00 00 - Heating, Ventilating, & Air Conditioning

### **PART 2 - PRODUCTS**

#### **2.01 PIPING ACCESSORIES**

- A. Cleanouts: Model Numbers are Josam.
  - 1. Vertical: polished bronze cover.
  - 2. Floor: nickel-bronze cover with carpet clean out marker in carpeted areas.
  - 3. Grade: C.I. with brass plug set in concrete.
  - 4. Use floor clean outs where located in walks.

#### **2.02 PIPING PENETRATION AUXILLIARIES**

- A. Sleeves Below Slab or Grade: Metraseal model MS or equal with schedule 80 PVC sleeve. The seal shall be capable of withstanding a hydrostatic pressure of 20 psig. The seal shall be constructed of synthetic rubber with heavy-duty plastic pressure plates. All bolts and nuts shall be constructed of stainless steel.
  - 1. Escutcheons: Polished chrome plated brass or painted metal.

### **PART 3 - EXECUTION**

#### **3.01 EQUIPMENT**

- A. Install equipment in accordance with the manufacturer's installation instructions, as specified herein, and as detailed on the drawings.

#### **3.02 VALVES AND FLANGES**

- A. Valves shall be full size of line in which installed. Furnish discs suitable for service intended. All valves shall be properly packed and lubricated. Unions shall be placed adjacent to each threaded or soldered valve or equipment connection 2" and smaller. Install flanges at all valves with stems vertical wherever possible. Stems shall not be placed below horizontal.
- B. Valves shall be provided with brass identification tags indicating service controlled. Tags may be omitted on lines exposed in equipment rooms where service is obvious.

- C. Cathodic Protection: Install insulated flanges or dielectric unions at points of connection between pipes and equipment as follows: (1) between copper or brass piping and steel or cast iron pipe. (2) Between copper or brass piping and any steel material. (3) Buried connections of copper or brass piping to steel or cast iron piping shall be protected with a polyvinyl tape wrap 10 mils thick, extending 5' each way from connection.

**3.03 FIELD QUALITY CONTROL**

- A. Piping Testing: Testing Criteria

System	Medium	Pressure	Duration
Drainage and Vent	Water	10 feet water	15 minutes

**END OF SECTION**

## **SECTION 22 14 16 – RAINWATER LEADERS**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.
- B. Section 22 05 00 applies to this section.
- C. See 22 07 19

#### **1.02 SUMMARY**

- A. This section includes all plumbing (equipment, fixtures, pipe and fittings, specialties) inside the building(s) and outside the building(s) to the point of connection to site plumbing systems.
- B. Provide complete plumbing systems including:
  - 1. Service connections to existing on-site utilities, and stubs for future connection to equipment provided under the work of this Section or other Sections of the Specifications.
  - 2. All piping systems for conduction of soil, waste, and other fluids or gases as shown or specified for plumbing work.
  - 3. All valves, piping supports, piping penetration auxiliaries, piping protective coverings, piping, and other piping accessories as shown or specified for plumbing work.
  - 4. All plumbing equipment and auxiliary items as specified herein or shown on the drawings.

#### **1.03 RELATED SECTIONS**

- A. Section 22 05 00 - Plumbing
- B. Section 22 07 00 - Insulation
- C. Section 23 00 00 - Heating, Ventilating, & Air Conditioning

#### **1.04 QUALITY ASSURANCE**

- A. All plumbing fixtures and equipment shall comply with California Code of Regulations, Title 24, Part 6, latest edition.

#### **1.05 REFERENCES**

- A. Pipes and Tubes
  - 1. Steel Pipe: ASTM A53, Type S, Grade A, Schedule 40, seamless, black or galvanized, plain ends.
  - 2. Copper Drainage Tube: ASTM B306, Type DWV, drawn temper.
  - 3. Hubless, Cast-Iron Soil Pipe: CISPI 301.
- B. Fittings
  - 1. Wrought-Copper, Solder-Joint Pressure Fittings: ANSI B16.22.
  - 2. Cast-Copper-Alloy, Solder-Joint Pressure Fittings: ASME B16.18, ASTM B584.
  - 3. Cast-Copper-Alloy, Threaded -Joint Pressure Fittings: ANSI/ASME B16.15, ASTM B584.
  - 4. Bronze Flanges: ASME B16.24, Classes 150 and 300.
  - 5. Copper Unions: ASME B16.18, cast-copper-alloy body, hexagonal stock, with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends. Threads complying with ASME B1.20.1.
  - 6. Steel Pipe Nipples: ASTM A733, made of ASTM A53 or ASTM A106, Schedule 40, seamless, galvanized, carbon-steel pipe.
  - 7. Malleable-Iron Unions: ASME B16.39, Classes 150 and 300; hexagonal stock; with ball-and-socket joint; metal-to-metal bronze seating surfaces; and female threaded ends with threads complying with ASME B1.20.1.

8. Galvanized, Cast-Iron Threaded Fittings: ASME B16.4, Classes 125 and 250; standard pattern; with threads complying with ASME B1.20.1.
9. PVC Plastic, Schedule 40 and Schedule 80, Socket-Type Pipe Fittings: ASTM D2466.
10. Wrought-Copper, Solder-Joint, DWV Drainage Fittings: ASME B16.29.
11. Cast-Copper-Alloy, Solder-Joint, DWV Drainage Fittings: ASME B16.23.

C. Joining Materials

1. CISPI Couplings for Hubless, Cast-Iron Soil Pipe and Fittings: CISPI 310, having ASTM C564 neoprene sealing sleeve, with 300 series stainless-steel, corrugated shield-and-clamp assembly.
2. Solder Filler Metal: ASTM B32, alloys to suit system requirements.
3. Brazing Filler Metals: AWS A5.8, alloys to suit system requirements.

**1.06 STRUCTURAL REQUIREMENTS**

- A. Structural members shall not be cut or modified in any manner without specific instructions from the structural engineer and approval from DSA. Where possible, offset vents and pipes rising in walls, concealed above ceilings, below plates and rise through roof. Where this is not possible, install vents and pipes through plates as detailed on structural drawings.

**1.07 SUBMITTALS**

- A. Submit a general statement of materials and methods along with manufacturer's technical data and installation instructions for all equipment, fixtures, pipe and fittings, and plumbing specialties to be installed.
- B. Record Drawings: Per specification section 15010 requirements.
- C. Operation and Maintenance Manuals: Per specification section 15010 requirements.

**PART 2 - PRODUCTS**

**2.01 GENERAL**

- A. Adapters: Wrought copper male adapters shall be used wherever it is necessary to connect copper tubing to a valve or "tee" having threaded connections.

**2.02 PIPE, FITTING, AND JOINING MATERIALS**

- A. Hubless Cast-Iron/Sleeve-Clamped Joints
1. Pipe: Service weight cast iron, hubless, with hot coal tar pitch coating inside and outside, per Cast-Iron Soil Pipe Institute Standard 301.
  2. Fittings: Hubless type, Tyler No-Hub Coupling, each matched with pipe and identified with the manufacturer's name or trademark, the Cast-Iron Soil Pipe Institute symbol, and the pipe size. Those for connections to other types of piping - approved cast-iron adapter/transition type.
  3. Joining Materials/Methods: Husky Series 4000 (Blue shield) or Mission HeavyWeight Orange shield) on pipes over 3", neoprene sleeve type conforming to ASTM C564 specifically designed for connecting hubless cast-iron pipe, coated with manufacturer's recommended lubricant before installing; four type 304 stainless steel band clamps with a type 305 stainless steel worm drive screw, and corrugated shield over sleeve; use standard no-hub couplings on pipe 3" and less
  4. Wedge lock joints at rainwater leaders to underground drain.
  5. Cleanout Plugs: Use Armit Joint Seal compound No. 411, or Enterprise Commercial Thread-Seal.
- B. Clay Sewer Pipe: Bell and Spigot - Wedge-Lock ASTM C-425, or Band Seal Joints with sleeves, ASTM #C-700-78a with ASTM #C 425-T fittings.
- C. Steel/Cast-Iron Threaded Drainage Fittings
1. Pipe: Galvanized steel per ASTM A-120, threaded ends, standard weight Schedule 40.
  2. Fittings: Cast-iron threaded drainage type, black coated, with recessed shoulder and pitched threads, per ASTM A-126, Class B.

- D. Copper DWV Pipe: DWV drainage tubing per ASTM B-306-86, plain ends for pipe 1 1/2" and larger.
  - 1. Fittings shall be solder type, wrought copper drainage fittings per ANSI Standard B16.29-86.
  - 2. Joining Materials/Methods: Canfield, Silvabrite or equal lead free solder with a non-corrosive water based flux.
  - 3. Connections:
    - a. Copper to dissimilar metals: dielectric connector.
    - b. Copper to threaded connections: cast brass adapters.
- E. Steel/Threaded Fittings
  - 1. Pipe: Black or galvanized steel per ASTM A-53 seamless, threaded ends, standard weight Schedule 40 or Schedule 80.
  - 2. Fittings
    - a. Black or galvanized (to match pipe) banded malleable iron, threaded, ASTM A-197, 150 lb. standard or 300 lb. extra heavy per ANSI Standard B16.3 (to match pipe schedule).
    - b. Black or galvanized (to match pipe) banded cast iron, threaded, per ASTM A-126 Class B, 125 lb. standard or 250 lb. extra heavy per ANSI Standard B16.4 (to match pipe schedule).
  - 3. Unions: AAR 300 lb. malleable iron, black or galvanized (to match pipe).
  - 4. Joining Materials/Methods
    - a. Rectorseal or pure lead and graphite thread lubricant.
    - b. Permacel, P-412 1/2" wide teflon pipe joint sealant.

### **3.03 PIPE AND FITTING APPLICATIONS**

- A. Inside Building (to 5'-0" outside building line).
  - 1. Rainwater leader piping
    - a. Below slab, service weight cast iron soil pipe and fittings, asphaltic coated for sizes 2 1/2" and smaller. Above floor from 6" above slab shall be galvanized steel pipe or service weight cast iron soil pipe and fittings, asphaltic coated for sizes 2 1/2" and smaller. Sizes 3" and larger shall be service weight cast iron soil pipe and fittings, asphaltic coated.
    - b. Fittings
      - 1.) Contractor may use "No-Hub" "Husky" joints per manufacturers published instructions for installation. No-Hub fittings for waste and soil pipe shall be four band stainless steel type.
    - c. As an alternate use, copper DWV Pipe.
  - 2. Plastic pipe and fittings shall not be used inside of buildings.
- B. Outside Building (from 5'-0" outside building line)
  - 1. Rainwater leaders: Pipe shall be first quality Johns Manville Ring-Tite PVC sewer pipe. Use cast iron pipe and fittings where 12" minimum bury cannot be maintained and other locations where indicated. Use materials per utility standards off site - where applicable.
    - a. Contractors Option: first quality, extra strength, bell and spigot clay sewer pipe.

## **PART 3 - EXECUTION**

### **3.01 EQUIPMENT**

- A. Install equipment in accordance with the manufacturer's installation instructions, as specified herein, and as detailed on the drawings.

### **3.02 PIPING**

- A. For underground pipe, provide trenching and backfill for buried piping and install with the following minimum cover unless shown otherwise, cover is from top of pipe to finish grade.
  - 1. Rainwater leaders - 30"



- B. Rainwater Leader Piping: Run all horizontal piping inside of the building at a uniform grade of not less than 1/4" per foot unless otherwise noted on the drawings. Pipe shall have invert elevations as shown and slope uniformly between given elevations. All drainage piping shall be run as straight as possible and shall have long radius bends. All offsets shall be made at an angle of 45 degrees or less.
1. Install clean-outs of the same diameter of pipe in all horizontal lines where indicated and at all points of change in direction and at base of all drops. Locate-clean outs not less than 18" from building construction so as to provide sufficient space for rodding. No horizontal runs of more than 100 feet shall be without clean-out.
  2. Clean-outs in floors shall be protected with a cover taped in place and removed at completion of concrete work.
  3. Provide trap at each inlet to rainwater system.
- C. Bury a No. 18 AWG insulated copper locating wire with all non-metallic pipe. Copper wire shall have at least 12" above grade at each end.

**3.03 FIELD QUALITY CONTROL**

- A. Piping Testing:
1. Testing Criteria

System	Medium	Pressure	Duration
Rainwater Leader	Water	10 ft water	15 minutes

**END OF SECTION**

## **SECTION 22 40 00 – PLUMBING FIXTURES**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.
- B. Section 22 05 00 applies to this section.

#### **1.02 SUMMARY**

- A. This section includes all plumbing fixtures.

#### **1.03 RELATED SECTIONS**

- A. Section 22 05 00 – Common Work Results For Plumbing
- B. Section 22 07 00 - Insulation

#### **1.04 QUALITY ASSURANCE**

- A. All plumbing fixtures and equipment shall comply with California Code of Regulations, Title 24, Part 6, latest edition.

#### **1.05 SUBMITTALS**

- A. Submit a general statement of materials and methods along with manufacturer's technical data and installation instructions for all equipment, fixtures, pipe and fittings, and plumbing specialties to be installed.
- B. Record Drawings: Per specification section 22 05 00 requirements.
- C. Operation and Maintenance Manuals: Per specification section 22 05 00 requirements.

### **PART 2 - PRODUCTS**

#### **2.01 GENERAL**

- A. See fixture and equipment schedules on drawings.

### **PART 3 - EXECUTION**

#### **3.01 PLUMBING FIXTURES**

- A. All fixtures shall be furnished as scheduled. All finished plumbing shall be accurately lined up and where batteries of fixtures occur, special care shall be taken with the roughing-in and finished plumbing.
- B. The number and position of all plumbing fixtures are shown on the plumbing drawings. Consult architectural drawings for the location dimensions and mounting heights of fixtures. Heights shall comply with the C.B.C., the latest handicapped requirement, and all ADA requirements.
- C. All water supplied to fixtures shall be provided with Speedway loose key compression shut-off stops. Combination fixtures shall have compression stop on each water supply fitting. Concealed stops shall be Crane 9H-313 or equal.
- D. All finish for exposed metal trim on any fixture shall be polished chromium plated. This shall include wall flanges, nuts, and washers. Handles on all faucets and stops shall be of all metal, chromium plated. Porcelain caps secured with putty shall be provided and installed for all exposed bolt heads.
- E. All fixtures shall be properly and securely installed and supported as required and approved. Fixtures set against concrete walls shall be bolted thereto. Fixtures secured to partitions shall be securely bolted to the wall carrier fittings with foot supports, and shall be provided in types as required to suit the particular installation and fixture.
- F. Connection between fixtures and flanges on soil pipe shall be made absolutely gas tight and water tight with graphite type gaskets (wall hung fixture) or Fedar's closet setting compound (floor outlet fixtures). Rubber gaskets, or putty will not be permitted.

- G. Fixtures not having integral traps shall be provided with "P" traps of chromium plated solderless seamless brass with trap screw at bottom and connected to concealed waste in wall sanitary fittings. All trap tail pieces shall be 17 gauge minimum.
- H. Unions on waste pipes on fixture side of traps may be slip or flange joints with soft rubber or lead gaskets.
- I. All flush valves shall be tested and adjusted so that each fixture receives the proper amount of water. All faucets, hose bibbs, drinking fountains, etc., shall be properly regulated to the approval of the Architect.
- J. Comply with State handicapped requirements regarding flow control devices, fixture mounting heights, insulation of piping under fixtures, etc.
- K. Furnish and install stainless steel Hudee frames for counter mounted fixtures unless "Self-Rimming".
- L. Grout all voids between fixtures and adjacent surfaces with 100% white Dow Silicon sealant.
- M. All hot water fixtures except kitchen and janitors sinks to be provided with tempering valves set at 110F (unless served by tempered water systems).

**END OF SECTION**

**SECTION 23 01 00 – OPERATION AND MAINTENANCE OF HVAC SYSTEMS**

**PART 1 - GENERAL**

**1.01 SUBMITTALS**

- A. Preparations.
  - 1. Prior to data collection and compilation, prepare and submit in duplicate an outline of the proposed organization and content.
  - 2. Compilation: Prepare and collect data concurrently with construction progress. Compile per submitted outline.

**PART 2 - PRODUCTS**

**2.01 OPERATION AND MAINTENANCE MANUALS**

- A. Form of Submittals
  - 1. Prepare data in form of an instructional manual for use by Owner's personnel.
    - a. Cover: Identify each volume with typed or printed title, "OPERATING AND MAINTENANCE INSTRUCTION". List:
      - b. Title of Project.
      - c. Provide indexed tabs.
      - d. Identify of separate structure as applicable.
      - e. Identity of general subject matter covered in the manual.
  - 2. Format:
    - a. Size: 8 ½" x 11".
    - b. Paper: 20-pound minimum, white, for typed pages.
    - c. Text: Manufacturer's printed data, or neatly typewritten.
    - d. Drawings:
  - 3. Provide reinforced punched binder tab, bind in with text.
  - 4. Fold larger drawings to size of text pages.
    - a. Provide fly-leaf for each separate product, or each piece of operating equipment.
  - 5. Provide typed description of product and major component parts of equipment.
  - 6. Provide indexed tabs.
  - 7. Binders:
    - a. Commercial quality three-ring binders with durable and cleanable plastic covers.
    - b. Maximum ring size: 1".
    - c. When multiple binders are used, correlate the data into related consistent groupings.

**PART 3 - EXECUTION**

**3.01 OPERATION AND MAINTENANCE DATA**

- A. General: Record data and operation and maintenance data are complimentary. Submittal items which may be required under both categories may be included only under one submittal if a statement to that effect is included in the other submittal.
- B. Quality Assurance
  - 1. Preparation of data shall be done by personnel.
    - a. Trained and experienced in maintenance and operation of described products.
    - b. Familiar with requirements of this Section.

- c. Skilled as technical writer to the extent required to communicate essential data.
    - d. Skilled as draftsman competent to prepare required drawings.
- C. Content of Manual
  - 1. Neatly typewritten table of contents for each volume, arranged in systematic order.
    - a. A list of each product required to be included, indexed to content of the volume.
    - b. List, with each product, name, address and telephone number of:
      - 1) Subcontractor or installer.
      - 2) Maintenance contractor, as appropriate.
      - 3) Identify area of responsibility of each.
      - 4) Local source of supply for parts and replacement.
    - c. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
  - 2. Product Data:
    - a. Include only those sheets which are pertinent to the specific product.
    - b. Annotate each sheet to:
      - 1) Clearly identify specific product or part installed.
      - 2) Clearly identify data applicable to installation.
      - 3) Delete references to inapplicable information.
  - 3. Drawings:
    - a. Supplement product data with drawings as necessary to clearly illustrate.
      - 1) Relations of component parts of equipment and systems.
      - 2) Control and flow diagrams.
    - b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation
    - c. Do not use Project Record Documents as maintenance drawings.
  - 4. Written text, as required to supplement product data for the particular installation.
    - a. Organize in consistent format under separate headings for different procedures.
    - b. Provide logical sequence of instructions for each procedure.
  - 5. Factory Authorized Start-Up Report.
    - a. Provide a factory start-up report for each piece of equipment. Contractor start-up reports, unless contractor is a factory authorized representative will not be allowed.
  - 6. Copy of each warranty, bond and service contract issued.
    - a. Provide information sheet for Owner's personnel, give:
      - 1) Proper procedures in event of failure.
      - 2) Instances which might affect validity of warranties or bonds.
- D. Manual for Equipment and Systems:
  - 1. Submit three copies of complete manual in final form.
  - 2. Content, for each unit of equipment and system, as appropriate.
    - a. Description of unit and component parts.
      - 1) Function normal operating characteristics, and limiting conditions
      - 2) Performance curves, engineering data and tests.
      - 3) Complete nomenclature and commercial number of replaceable parts.
    - b. Operating procedures:
      - 1) Start-up, break-in, routing and normal operating instructions.

- 2) Regulation, control, stopping, shut-down and emergency instructions.
- 3) Summer and winter operating instructions.
- 4) Special operating instructions.
- c. Maintenance Procedures:
  - 1) Routing operations.
  - 2) Guide to “trouble-shooting”
  - 3) Disassembly, repair and reassemble.
  - 4) Alignment, adjusting and checking.
- d. Servicing and lubrication schedule.
  - 1) List lubricants required.
- e. Manufacturer’s printed operating and maintenance instructions.
- f. Description of sequence of operation by control manufacturer.
- g. Original manufacture’s parts list, illustrations, assembly drawings and diagrams required for maintenance.
  - 1) Predicted life of parts subject to wear.
  - 2) Items recommended to be stocked as spare parts.
- h. As-installed control diagrams by controls manufacturer.
- i. Each contractor’s coordination drawings:
  - 1) As-installed color-coded piping diagrams.
- j. Charts of valve tag numbers, with location and function of each valve.
- k. List of original manufacturer’s spare parts, manufacturer’s current prices, and recommended quantities to be maintained in storage.
- l. Other data as required under pertinent sections of specifications.
- m. Content for each electric and electronic system, as appropriate.
- n. Description of system and component parts.
  - 1) Function, normal operating characteristics, and limiting conditions.
  - 2) Performance curves, engineering data and tests.
  - 3) Complete nomenclature and commercial number of replaceable parts.
- o. Circuit directories of panel boards.
  - 1) Electric service.
  - 2) Controls.
  - 3) Communications
- p. As-installed color coded wiring diagrams.
- q. Operating procedures.
  - 1) Routing and normal operating instructions.
  - 2) Sequences required.
  - 3) Special operating instructions.
- r. Maintenance procedures.
  - 1) Routine operations.
  - 2) Guide to “trouble shooting”.
  - 3) Disassembly, repair and reassembly.
  - 4) Adjustment and checking.
- s. Manufacturer’s printed operating and maintenance instructions.

- t. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
  - u. Other data as required under pertinent sections of specifications.
  - v. Additional requirements for operating and maintenance data: Respective sections of Specifications.
- E. Submittal Schedule
- 1. Submit two copies of preliminary draft of proposed formats and outlines of contents prior to start of work.
  - 2. Architect will review draft and return one copy with comments.
  - 3. Submit one copy of complete data in final form fifteen days prior to final inspection or acceptance.
  - 4. Copy will be returned after final inspection or acceptance, with comments.
  - 5. Submit specified number of copies of approved data in final form 10 days after final inspection or acceptance.
- F. Instruction of Owner's Personnel.
- 1. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems
  - 2. Operating and maintenance manual shall constitute the basis of instruction.
    - a. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

**END OF SECTION**

## **SECTION 23 05 00 – COMMON WORK RESULTS FOR HVAC**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.
- B. This section applies to all Division 23 Mechanical Sections.

#### **1.02 SUMMARY**

- A. Furnish and install all mechanical work shown on the drawings, specified herein, and as required for a complete and functional installation.
- B. This section includes materials and methods applicable to the work described in all Division 23 Mechanical Sections. Specific work requirements of individual Mechanical Sections take precedence if in conflict with requirements of this Section.
- C. All chemicals utilized on site as part of coating, sealant, and other products shall not contain any chemical that is listed as part of Proposition 65 known carcinogens that are identified by NTP, IARC, and the USEPA California Proposition 65 chemical repository contractors are not allowed to bring these chemicals on any California Intel site.

#### **1.03 RELATED SECTIONS**

- A. Division 26 - Electrical Work
- B. Division 22 - Plumbing

#### **1.04 DRAWINGS AND SPECIFICATIONS**

- A. For purposes of clearness and legibility, drawings are essentially diagrammatic and, although size and location of equipment are drawn to scale wherever possible, the Contractor shall make use of all data in all the contract documents and shall verify this information at building site.
- B. Information presented on Drawings and in the Specifications is based upon latest data available during their preparation. The Drawings and Specifications are for the assistance and guidance of the Contractor and exact locations, distances, levels, etc. will be governed by the structures and the site the contractor shall accept same with this understanding.
- C. The drawings indicate required size and points of termination of pipes, and suggest proper routes to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets, and it shall be the work of the Contractor to make the installation in such a manner as to conform to structure, avoid obstruction, preserve headroom and keep openings and passageways clear.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Contractor shall be responsible for delivery, storage, protection and placing of all equipment and materials.
- B. Equipment stored and installed at the job site shall be protected from dust, water or other damage. Cover all equipment stored exposed to weather.
- C. STRUCTURAL REQUIREMENTS
- D. Structural members shall not be cut or modified in any manner without specific instructions from the structural engineer.

#### **1.06 SEISMIC RESISTANCE**

- A. See Section 23 05 48.

#### **1.07 CODES AND SAFETY ORDERS**

- A. All work and materials shall be in full accordance with the latest rules and regulations of the State Fire Marshall; the Safety Orders of the Division of Industrial Safety; the I.S.O. codes; the 2016 California Plumbing Code, Title 24, Part 5; the 2016 California Mechanical Code, Title 24, Part 4; the 2016 California Building Code, Title 24, Part 2, NFPA Codes, and other applicable laws and



regulations. Nothing in the Drawings or Specifications shall be construed to permit work not conforming to these codes. Drawings and Specifications take precedence when work and materials called for exceed Code requirements.

#### **1.08 INSTALLATION**

##### **A. Manufacturer's Instructions:**

1. When specifications require that installation comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation.
2. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by specifications.
3. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.
4. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with the Engineer for further instructions.
5. Do not proceed with work without clear understanding.

#### **1.09 PERMITS AND FEES**

- A. Obtain all permits and pay all required fees for permits and/or utility services. Inspections required during the course of construction shall be arranged as required. On completion of the work furnish the owners representative with certificates of inspection.
- B. Include in bid all costs for gas service including meter, regulators and service line installed by a gas utility company or a gas utility company approved contractor.

#### **1.10 SITE CONDITIONS**

- A. Assume all responsibility for damage to adjoining properties; and restore property to its original condition, should damage occur as a result of the work of this section. Contractor shall thoroughly familiarize himself with all site conditions. Should utilities not shown on the drawings be found during excavations, promptly notify the Architect for instructions as to further action. Failure to do so will make the Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities not shown on plans.

#### **1.11 SUBMITTALS**

##### **A. General**

1. A submittal schedule shall be issued by the contractor within 15 days of award of the contract. This schedule shall allow for timely review and approval as required by the contract documents.
2. These requirements apply only to substitutions, submittals, and shop drawings.
3. The contractor shall review all submittals prior to submission to the Architect. Submittals not reviewed by the contractor will be returned to the contractor and will not be reviewed.
4. Any deviations from specified requirements shall be clearly indicated in submittals.
5. Any errors in or omissions from submittals and any consequences of these are the responsibility of the Contractor.
6. Partial or incomplete submittals may be rejected as not complying with requirements; the Contractor shall be liable for any resultant consequences.
7. Delayed submittals may be rejected as not complying with requirements. Whether accepted or rejected, delayed submittals will not be considered justification for extension of contract time or similar relief.
8. Submittals not required or permitted by the Specifications but made at the option of the Contractor, will be returned without review unless accompanied with written valid justification.
9. Submittal items improperly included with those of another category (such as a proposed substitution included with shop drawing submittal) are not valid and will be returned without review.

10. Within 35 calendar days after award of the contract, and before fabrications and installation of any material or ordering of any materials, submit for approval one copy in PDF format of complete submittal data on specified and proposed substituted equipment and materials. Submittals shall list all materials proposed identified with drawing symbols and specific data on equipment such as arrangements, performance curves, sizes, capacity, motor locations, and other pertinent data. Check all submittals for conformance to the requirements of the Construction Documents before forwarding to the architect for each item. No consideration will be given to substitutions submitted past 35 day limit. The contractor shall be responsible for all quantities and errors and omissions of submittals. Furnish samples when requested.
11. Equipment and materials specified as part of the specifications and drawings are listed by two manufacturers names. The first named manufacturer is the basis of design. The second named manufacturer has been determined to be an equivalent in quality or utility. The second named has not been specifically determined to conform to the first named in size, layout, electrical power, voltage, or impacts to building structure. The contractor is bound by all requirements for substitutes, as described below, for all second named manufacturers and equivalent equipment or products.
12. Each reviewed submittal will be marked to indicate review and directions as stated below.
13. Acceptance of a submittal does not relieve the Contractor of responsibility for omissions from the submittal or errors in the submittal.

#### **1.12 REVIEW**

- A. Submittals will be reviewed for general acceptability, not necessarily including all details. The engineers review is for general conformance with the design concept of the project and the information given in the contract documents. The contractor is solely responsible for confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating the work with that of other trades and performing all work in a safe and satisfactory manner. Corrections of comments made on this submittal during this review do not relieve contractor from compliance with the requirements of the contract documents or with its responsibilities listed herein.
  1. Proposed substitutes will be judged not only for the acceptability of the items themselves, but also how they will be used under the conditions of the particular project.
  2. Proposed substitutions will be judged also for compliance with qualifications and conditions stipulated in paragraph 1.15.
- B. Each reviewed submittal will be marked to indicate review and directions as stated below.
  1. Acceptance of a substitute does not waive the specified requirements.
  2. Once a substitution is accepted, no revision or resubmittal may be made except for pressing and valid reason and after receipts of approval to do so.

#### **1.13 REVIEW DIRECTIONS**

- A. The notation "No Exceptions Taken" indicates that no further submittal on the particular matter is required and that the Contractor may proceed with normally ensuing action. The notation may be applied to submittals on substitutions, shop drawings, record data, or operation and maintenance data. The submittal has only been reviewed for general conformance with the design concept of the Contract Documents. The contractor is responsible for the dimensions to be confirmed and correlated at the job site; information that pertains solely to the fabrication process or to the means and methods of construction; coordination of the work of all trades; and performing all work in a safe and satisfactory manner. This notation does not modify the contractor's duty to comply with the contract documents.
- B. The notation "Make Corrections Noted" indicates that no further submittal on the particular matter is required, but the Contractor shall make all changes or corrections noted (but no others) before proceeding with normally ensuing action. The notation may be applied to submittals on substitutions or shop drawings (but usually not record data or operation and maintenance data).

- C. The notation "Amend and Resubmit" indicates that the submittal is not accepted and must be revised, resubmitted, and reviewed again. In the case of submittal on substitutions and shop drawings so noted, the Contractor shall not proceed with any normally ensuing action until the resubmittal is reviewed. The notation may be applied to submittals on substitutions, shop drawings, record data, or operation and maintenance data.
- D. The notation "Rejected - See Remarks" indicates that the submittal is not accepted and that resubmittal on the same subject matter is not allowed and will not be considered. The notation will be applied normally only to submittals on substitutions (usually not on shop drawings, record data, or operation and maintenance data).
- E. The notation "Returned Without Review" indicates that the submittal or item has not been considered officially because it is either not proper, valid, required, or permitted by the Specifications and has no status or effect.

#### **1.14 SHOP DRAWINGS**

- A. The contractor is responsible for providing all shop drawings as described below so that the design professional has the opportunity to determine if the contractor understands the contract documents. It is not the purpose of shop drawings to assure that the contractor is meeting the requirements of the contract documents. Review and approval of a submittal neither extends nor alters any contractual obligation.
- B. Accompany all substituted equipment with shop drawings showing revised ductwork and/or piping layouts in order to ascertain that substituted equipment does not adversely affect layout or work of others. Shop Drawings: The following conditions apply to shop drawings:
  - 1. Shop drawings are not and do not become Contract Documents.
  - 2. Processed shop drawing submittals and any instructions or requirements noted thereon are a part of the work, but they may not be used as a means of increasing the scope of the work.
  - 3. If deviations, discrepancies, or conflicts between shop drawing submittals and the Contract Documents are discovered either prior to or after the submittals are processed, the Contract Document requirements shall govern.

#### **1.15 SUBSTITUTIONS**

- A. Whenever any equipment, material, or process is indicated or specified by patent or proprietary name and/or name of Manufacturer, in the Specifications and/or on the Drawings, it is understood that such specification is used to facilitate the description of the material and/or process and deemed to be followed by the words "or equal" unless noted "no substitute".
- B. Substitute equipment and materials shall be equal in all respects including quality, arrangement, utility, physical size, capacity, and performance to those specified. Approval of substitute material will not relieve the contractor from complying with the requirement of the Drawings and Specifications. The contractor shall be responsible and at his own expense, for any changes caused by proposed substitutions which affect other parts of his own work or the work of other contractors.
- C. The submittal of a proposed substitution shall clearly establish the following:
  - 1. The item can be transported into and installed in the intended space and in the manner shown.
  - 2. Required connections (electrical, piping, and other) can be properly made and adjoining work can be properly accomplished.
  - 3. The proposed substitute is similar to and of substance equal to that specified, is suited to the same use as that specified, and will perform the functions required by the design.
  - 4. Motors for proposed substitute equipment will have the same minimum differential between motor brake horsepower and motor nameplate horsepower as the specified equipment.
  - 5. All performance requirements shall be at least equal to the specified product or equipment including noise levels, cooling capacity, heating capacity, air flow quantity, etc.
- D. By submitting a proposed substitution, the Contractor agrees to the following:
  - 1. He will assume full responsibility for any and all modifications and necessary alterations arising from the use of the substitute item or material including all cost incurred by all other trades.

2. He will assume full responsibility for any delay in the construction schedule resulting from the use of the substitution.
  3. He will prove harmless and indemnify the Owner and the Owner's design consultants from real or alleged damages that may result from the installation, use, or performance of a substitute material or product.
- E. The following conditions apply to substitutions:
1. Submittals of substitutions are not and do not become part of the Contract Documents.
  2. Contractor shall not order, fabricate, use, or install any substitute product or procedure unless he has received acceptance of the substitute from the Engineer.
  3. Should the Contractor install any substitute product in violation of the above he shall remove it and install the specified product at his own expense.
  4. The Contractor shall provide a letter stating that all the above items shall apply to all substituted products and equipment.
  5. Any submittal for substituted equipment or product that does not clearly show that the substituted item is equal shall be marked rejected and no further submittal shall be allowed on the substituted item. Provide in submittal format documentation that the proposed item is exactly as specified in the contract documents.

#### **1.16 GUARANTEE**

- A. Guarantee all work for one year from date of acceptance, against all defects in material, equipment and workmanship including repair of damage to any part of the premises resulting from leaks or other defects in material, equipment and workmanship. Guarantee shall be on form supplied by the owner's representative.

#### **1.17 RECORD DRAWINGS**

- A. Indicate on reproducible drawings the actual location of all ductwork, piping and equipment as the work progresses. Dimension locations of underground service mains and branches. Deliver the drawings to the architect at the completion of the job.

### **PART 2 - PRODUCTS**

#### **2.01 GENERAL REQUIREMENTS**

- A. Shop drawings:
1. Make all drawings to an appropriate scale, large enough to show all pertinent aspects of the item and the method of its connection into the work.
  2. Make each drawing sheet in a reproducible form such as CAD, Revit or PDF.
- B. Grouping: Combine submittals in logical groupings; for example, submit Shop Drawings grouped by Sections of the Specifications, arranged in the specified sequence.
- C. Shop Drawings: Four blue or black line prints of each for the Engineer.
- D. Content:
1. Shop drawings may be:
    - a. Drawings or diagrams prepared by the Contractor, a supplier, a manufacturer, or other.
    - b. Typewritten data or descriptions.
    - c. Manufacturer's printed brochures, descriptions, charts, instructions, or data sheets.
- E. Timing: Submit all shop drawings prior to installation of any items included in submittal.

#### **2.02 CORROSION PROOFING**

- A. Corrosion Proofing / U.V. Protection: Products which will be installed outdoors, exposed to the weather, exposed to moisture, or other potentially damaging conditions shall be constructed to resist the effects of such exposure.
- B. Exterior casings shall have lapped or gasketed joints effectively sealed to prevent intrusion of moisture or other injurious substances.

- C. Casings, ducts, pipes, or product items shall be constructed of materials which are fully resistant to harmful substances they may normally contact, or (if ferrous) shall be galvanized after fabrication, or shall be fully protected from such substances by paint or other coating in appropriate thickness or number of coats.
- D. All bolts, nuts, screws, and washers shall be galvanized unless specified to be plated or unprotected.
- E. Any exposed plastic pipe must have a U.V. inhibitor.

**2.03 MATERIAL AND EQUIPMENT**

- A. All material and equipment shall be new, of the type, capacity and quality specified and free from defects. All materials and equipment shall be of the same brand or manufacturer throughout for each class of material or equipment wherever possible.

**2.04 FILTERS**

- A. A complete set of filters shall be supplied for use during the construction period. A complete set of new filters shall be installed before testing and balancing.

**2.05 ACCESS BOXES**

- A. For below grade valves and piping devices
  - 1. Christy Concrete Products Company, Brooks, with galvanized steel checker plate recessed traffic lid flush with rim of box. Lids for boxes located in areas subject to vehicular traffic shall be constructed to withstand H2O live loading as defined by the American Association of State Highway Officials (16,000 pound maximum individual wheel load). Service identification shall be conspicuously welded on lid before galvanizing. For gas service, drill twelve 3/8" diameter vent holes through lid before galvanizing. Provide manufacturer's box extensions to bring box bottom three inches below bottom of valve and box top flush with finish grade.
  - 2. Box sizes (non traffic)

Type Valve	Valve Size	Box No.
Gas	1 1/2" and smaller	B-24
Gas	2" and 2 1/2"	B-36

**2.06 ACCESS DOORS**

- A. Unless specified otherwise by the Architect, provide access doors of the following type:
  - 1. Concealed hinges, prime coated with rust-inhibitive paint, style of door to suit wall, ceiling, floor or roof construction and fire rating.
    - a. Milcor Type M
      - 1.) Architectural grade, one-piece frame, 16 gauge frame & door panel on concealed spring hinges, grey powder coated steel, Elmdor/Stonman or equal.
    - b. Milcor Type UFR, fire resistive type Underwriters Laboratory Class B, 1-1/2 hour rating meets UBC, IBCO and BOCA codes for two hour rated walls self latching with key lock, Elmdor/Stonman Type FR or equal.
  - 2. Minimum size; 18" by 18".
  - 3. Wall and ceiling access doors: Furnish as required for access to ducts, damper operators, duct mounted access panels, etc.; coordinate size and location to obtain access.
  - 4. See architectural drawings for further requirements.

**2.07 MISCELLANEOUS EQUIPMENT AND MATERIALS**

- A. Furnish and install miscellaneous equipment and materials required for the systems described whether or not specifically shown.

**PART 3 - EXECUTION**

**3.01 PREPARATION**

- A. General:
  - 1. Do not install any equipment, valve, control, motor, filter, or any other device requiring maintenance or service in an inaccessible location or position. Install access doors as specified herein to render all such equipment serviceable whether specifically shown on the plans or not. Maintain code clearance to all equipment. Coordinate location of doors with lights, etc., and locate symmetrically with same.
- B. Observations: Check all project drawings and specifications; report any discrepancies before proceeding with the work and in time to avoid unnecessary rework.
- C. Investigation: Examine the areas, conditions, and status of other work contiguous or connecting to the work to be performed; ensure that the time of installation is coordinated with other work.
- D. Interruptions of Service: Portions of this work may involve connection to existing work, facilities, or utilities ties and may require interrupting shutdowns of same. Carefully plan, coordinate and execute such work so that any interruptions will be kept to a minimum in time and occurrence. Submit request for shutdowns and make shutdowns only after receiving written approval from the Owner.
- E. Other: Correct any unsatisfactory conditions that may impede proper execution of the work. Ensure that all arrangements, personnel, materials, and tools are appropriate and adequate before proceeding.

### **3.02 INSTALLATION**

- A. General:
  - 1. Material and equipment incorporated in the work shall be used or applied only for the purpose intended or specified.
  - 2. Install piping and ductwork and all equipment that requires access with minimum vertical and horizontal clearances required by OSHA for service.
  - 3. All mechanical systems such as ductwork, pipes and all other equipment shall have 2 inches minimum clearance.
  - 4. Do not proceed with work without clear understanding.

### **3.03 MANUFACTURER'S INSTRUCTIONS**

- A. When specifications require that installation comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation.
- B. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by specifications.
- C. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.
- D. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with the Engineer for further instructions.
- E. Do not proceed with work without clear understanding.

### **3.04 DEMOLITION**

- A. General
  - 1. Procedures shall be determined by the contractor.
  - 2. Demolition work shall not be commenced until all temporary work such as fences, barricades, and any required warning lights and apparatus are furnished and installed and as required by law, regulation, or ordinance, or elsewhere in this specification.
  - 3. Demolition work shall proceed in such a manner as to minimize the spread of dust and flying particles and to provide safe working conditions for personnel.
  - 4. Fires and explosives shall not be permitted.

### **3.05 PROTECTION**

- A. Contractor shall conform to all Federal, State, and local ordinances related to the protection of the public and Contractor's personnel and the flow of traffic/ Provide protection for persons and property throughout the progress of the work.
- B. Existing work damaged by the contractor in the execution of this Contract shall be restored to former condition by the contractor to the satisfaction of the Owner without an increase in the Contract Sum and without an extension of the Contract Time.

### **3.06 DISPOSITION OF MATERIALS**

- A. All materials and equipment not scheduled to be salvaged, including debris and all rejected salvaged materials, shall become the property of the Contractor and shall be disposed of off site in a legal manner. Location of dump and length of haul shall be the contractor's responsibility.

### **3.07 LOCATION OF EQUIPMENT, PIPING AND DUCT WORK**

- A. Where job conditions do not permit the installation of piping, ductwork, etc. in the location shown, it shall be brought to the engineer's attention immediately before fabrication of ductwork, piping, etc. and the relocation required shall be determined in a joint conference.
- B. The contractor will be held responsible for the relocating of any items installed without first obtaining the architect's or engineer's approval. Remove and relocate such items at The contractors expense as so directed by the architect or engineer.
- C. Where piping or ducting is left exposed within a room, run in vertical or horizontal planes. Maintain uniform spacing between parallel lines and/or adjacent wall, floor or ceiling surfaces.
- D. Horizontal runs of plumbing and/or electrical conduit suspended from ceilings shall provide for maximum clearance.
- E. Make minor changes in locations of equipment, piping, ducts, etc. from locations shown including minor offsets when directed by the engineer, at no additional cost to the owner.

### **3.08 CARE AND CLEANING**

- A. Clean and adjust all equipment at completion of installation to provide operating conditions satisfactory to the engineer. Remove broken, damaged or defective parts; repair or replace as directed by engineer. Remove surface material and debris resulting from this work when directed.

### **3.09 FLASHINGS**

- A. Furnish and install a waterproof flashing for each pipe, duct, or other penetration through roof or wall. Flashings shall be 4 lb. seamless lead flashings Semco 1100 series with counter flashing as detailed, except in metal roofs flashing for pipes through roof shall be furnished by the roofing contractor. Where details are not specifically delineated, submit details for review.

### **3.10 PAINTING**

- A. Painting is included under the Painting and Finishing Section. It shall be the responsibility of the Mechanical Contractor to properly protect all equipment and controls during painting operations and the Mechanical Contractor shall repair and/or replace any item damaged due to painting that was not properly protected.

### **3.11 ACCESS DOORS**

- A. Provide access doors to all concealed equipment, valves, controls, etc. Locate doors where shown or to be coordinated and symmetrically located with lights, diffusers, etc. Access doors furnished by the mechanical contractor shall be installed by the general contractor.

### **3.12 ELECTRICAL REQUIREMENTS**

- A. Provide working space around electrical equipment in compliance with the applicable Code and all Safety Orders.
- B. Coordinate the Mechanical Work with the Electrical Work to comply with the above. Furnish and set in place all motors and duct or pipe installed controls.
- C. Location of all new switches shall be verified with the architect or architect before roughing-in. Furnish necessary control diagrams and instruction for the proper installation of the controls.

- D. Assume responsibility for the proper supervision and testing of the controls for sequence of operation.
- E. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers Association.
- F. All equipment electrical characteristics shall be as noted on the drawings, or as specified. Verify before ordering any equipment.
- G. Before permitting operation of any equipment which is furnished, installed or modified under this contract, review all wiring connections that pertain to mechanical equipment or work, and verify that these connections are correct.
- H. Ascertain that the over-load protection devices installed are of the correct type, rating and setting to properly protect this equipment.

### **3.13 INSTRUCTION OF OWNER'S PERSONNEL**

- A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems.
- B. Operating and maintenance manual shall constitute the basis of instruction.
  - 1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

### **3.14 RECORD DATA**

- A. Compilation
  - 1. Record and collect information concurrently with construction progress and date all entries; make drawing entries within 24 hours after occurrence of change or installation requiring recording. Any concealed work covered before recording data shall be uncovered as directed or as necessary to obtain data.
  - 2. Record information on drawing prints using an erasable colored pencil (not ink or indelible pencil); describe clearly by note or graphic line as appropriate.
- B. Locate any concealed work adequately to allow future access with reasonable ease and accuracy.
  - 1. Identify the plan location of all stub outs, pipe lines, etc., which are buried or concealed in the structure, whether installed where shown on the contract drawings or in a different location; show actual field dimensions from column lines, wall lines, or other permanent reference lines or points.
  - 2. In many cases on the contract drawings, the arrangement of conduits, pipes, ducts, and similar items is shown schematically rather than as a precise scaled layout. Identify the actual location of these with horizontal and vertical dimensions. If such lines are exposed or readily accessible, omit dimensional identification.
  - 3. When any work is installed of size, dimension, slope, or location different from that shown on the contract drawings, note the deviation on the Project Record set. If the variations are substantial or cannot be shown clearly on the record drawings, make a new drawing and attach to the Record set.
- C. On other documents
  - 1. Where changes occur in specifications, clearly indicate same in ink, colored pencil, or rubber stamp.
  - 2. Where installed equipment differs from that specified (e.g., by accepted substitution or change order) note in the specifications and include complete data on same.

**END OF SECTION**



**SECTION 23 05 13 – COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT**

**PART 1 - GENERAL**

**1.01 SEE SECTION 23 05 00**

**PART 2 - PRODUCTS**

**2.01 MOTOR AND STARTERS**

- A. Motors furnished as part of mechanical equipment shall be of size indicated and shall have starting torque sufficient to start and drive equipment load to which they are connected.
- B. Electric motors shall be NEMA Premium efficiency, Gould "E 3Plus," or equal. Provide motors with maximum efficiency and power factor at their normal load operating point.
- C. Motor enclosures shall be:
  - 1. Open drip proof for general use.
  - 2. Totally enclosed for wet or exterior use.
  - 3. Explosion-proof for hazardous location use.
- D. Electric Motors of  $\frac{3}{4}$  HP rating and over, heavy duty, ball bearing, open (drip-proof), squirrel cage induction type, normal starting torque 60 cycle service, 40o F continuous rating, and shall conform in all respects to the latest applicable standard of NEMA and AIEE. Motors up to  $\frac{3}{4}$  HP rating shall have sleeve or ball bearing. Electric motors which are not housed within equipment they serve, shall be stamped for Quiet-Operation. Motors shall be of an Energy Efficient design meeting C.E.C., Title 24.
- E. Motor starters and contactors except those in motor control centers shall be included in the mechanical work.
- F. Starters: Starters furnished integral to, or specifically for, mechanical equipment shall be Square D, General Electric, Cutler-Hammer, or equal and shall comply with the following:
  - 1. Enclosures shall be NEMA Standard to suit location/duty:
    - a. Type 1: general purpose.
    - b. Type 3: rain tight.
    - c. Type 4: watertight.
    - d. Type 7&9: explosion proof.
  - 2. Thermal overload protection devices shall be provided as follows:
    - a. One for single-phase motors.
    - b. Three for three-phase motors.
    - c. One for each ungrounded conductor for each winding of multi-wound or multi-speed motors.
  - 3. Starters for motors up to 1/2 HP may be manual type if no interlocking is required; pilot light to indicate ON position is required.
  - 4. Starters for motors up to 30 HP shall be magnetic across-the-line type except as stipulated above.
  - 5. Starters for motors over 30 HP shall be transition-type magnetic-reduced voltage unless specified otherwise. Coordinate the characteristics to ensure adequate starting torque and to limit the starting current to a level compatible to the electrical system and acceptable to the utility company/agency.
  - 6. Magnetic starters shall be provided with:
    - a. 120 volt control circuits.
    - b. H-O-A switch in cover.
    - c. Auxiliary contacts for necessary interlocking.

- d. Integral disconnect switch or circuit breakers for branch circuit, short-circuit and ground-fault protection.
7. Short-circuit interrupting capacity of starters and disconnects shall be adequate for voltage employed and for current to be interrupted. This may require use of high interrupting capacity breakers or current limiting fuses. If fuses are used, provide three spares for each disconnect.
8. Starters shall be compatible with the motor they control.

### **PART 3 - EXECUTION**

#### **3.01 ELECTRICAL REQUIREMENTS**

- A. Provide working space around electrical equipment in compliance with the applicable Code and all Safety Orders.
- B. Coordinate the Mechanical Work with the Electrical Work to comply with the above. Furnish and set in place all motors and duct or pipe installed controls.
- C. Location of all new switches shall be verified with the architect or architect before roughing-in. Furnish necessary control diagrams and instruction for the proper installation of the controls.
- D. Assume responsibility to insure that all motors are connected with flexible conduit per Division 26 requirements.
- E. Assume responsibility for the proper supervision and testing of the controls for sequence of operation.
- F. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers Association.
- G. All equipment electrical characteristics shall be as noted on the drawings, or as specified. Verify before ordering any equipment.
- H. Before permitting operation of any equipment which is furnished, installed or modified under this contract, review all wiring connections that pertain to mechanical equipment or work, and verify that these connections are correct.
- I. Ascertain that the over-load protection devices installed are of the correct type, rating and setting to properly protect this equipment.
- J. Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize mechanical equipment wiring diagrams to coordinate with the electrical systems so that proper wiring of the equipment involved is affected.

**END OF SECTION**

**SECTION 23 05 29 – HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT**

**PART 1 - GENERAL**

**1.01 SEE SECTION 23 05 00**

**1.02 SUBMITTALS**

- A. Submit proposed alternative methods of attachment for review and approval by the Engineer, prior to deviating from the requirements given below.
- B. For all seismic bracing systems, submit structural calculations and details prepared and signed by the Contractors licensed engineer which include all resultant forces applied to the building structure. Do not overstress building structure. The maximum allowable loads are as indicated in 3.01 of this specification. The submittal data required does not require an analysis of the building structural numbers and their reaction to the loads of the piping. The submittal data needs to address attachment methods and shall include calculations indicating the forces that are applied to the building structure at the point of attachment. Calculations will be reviewed for compliance with design criteria, not for arithmetic.

**PART 2 - PRODUCTS**

**2.01 PIPE SUPPORTS**

- A. All pipes within the outer casings shall be supported at not more than 10-foot intervals. These supports shall be designed to allow for continuous airflow and drainage of the conduit in place. The straight supports shall be designed to occupy not more than 10% of the annular air space. Supports shall be of the type where insulation thermally isolates the carrier pipe from the outer conduit. The surface of the insulation shall be protected at the support by a sleeve not less than 12 inches long, fitted with traverse and, where required, rotational arresters.

**2.02 HANGERS AND SUPPORTS**

- A. Building Attachments: Powder-actuated-type, drive-pin attachments with pullout and shear capacities appropriate for supported loads and building materials, UL listing and FM approval for fire-protection systems. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Provide beam clamp retaining straps for all pipe supports where attached to steel beams.
- B. Mechanical-Anchor Fasteners: Insert-type attachments with pullout and shear capacities appropriate for supported loads and building materials.
- C. Load Distribution: Install hangers and supports so piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- D. Provide B-Line or equal.
  - a. Isolators: 319CT or Trisolator.

**PART 3 - EXECUTION**

**3.01 PIPING HANGERS AND SUPPORTS**

- A. General
  - 1. Miscellaneous: Provide all supports, anchors, concrete pads, grouting, bedding, bracing, vibration isolation, and accessories required for pumps and other equipment.
  - 2. Support all piping with appropriate manufactured devices as specified use no wire or makeshift device.
  - 3. The engineer prior to installation shall approve all hanger material.
  - 4. Size hanger rods, screws, bolts, nuts, etc., according to manufacturer's recommendations. Size hangers to fit around bare pipe, isolator, or insulated pipe shield as appropriate.
  - 5. Use cadmium plated or galvanized hangers, attachments, rods, nuts, bolts and other accessories where exposed to weather. Hot dip galvanize all items which are not factory finished. Plating for hinged movements must be done at factory.

6. Hanger rods with C-clamp type structural attachment shall be equipped with retaining straps.
7. At each support on bare copper tubing or piping system, install an isolator; at each support point on insulated piping systems, install an insulated pipe shield.
8. Burning, welding, cutting, or drilling on any structural member may only be done if approved by the structural engineer.
9. No valve or piece of equipment shall be used to support the weight of any pipe.
10. Provide a hanger close to the point of change of direction of pipe run in either horizontal or vertical plane.
11. When hangers or supports do not come within one foot of a branch line fitting, install an additional hanger or support at the fitting.

B. Pipe Supports

1. Horizontal Lines

- a. Suspend all horizontal pipes individually and not in contact with the structure except as specified below. Support each branch line with at least one hanger.

- C. Parallel pipes may be supported on trapeze type hangers. Size trapeze hangers to support weight of piping plus a surcharge of 300 pounds. For three or more pipes use a size suitable for the load in accordance with manufacturers published load ratings. No deflection to exceed 1/180 of a span. Anchor rods securely to building structure.

**3.02 LINES NEAR FLOOR**

- A. Support all piping near the floor individually by means of adjustable steel pipe stanchions with welded end plates properly secured to the pipe and to the floor. Alternate: Lines also near walls may be suspended as specified above for horizontal lines, from appropriately sized and mounted angle brackets.
- B. Hanger Spacing Schedule:

Type of Pipe	1" dia. Or under	1¼" to 2" dia	2½" dia & over
Steel Pipe	8'-0"	10'-0"	12'-0"
Copper Tubing	6'-0"	8'-0"	10'-0"
Cast Iron	Support at 8' - 0" intervals and on each side of and within 12" of both sides of joint		
Rod Size:	¾"	½"	5/8"
Pipe Size	(1/2" - 2")	(2-1/2" - 5")	(6" - 8")

**END OF SECTION**

## **SECTION 23 05 30 – HANGERS AND SUPPORTS FOR HVAC DUCTWORK**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, and DIVISION 1, GENERAL REQUIREMENTS, apply to the work in this section.

#### **1.02 SECTIONS INCLUDE**

- A. General: Refer to Section 23 05 00, Mechanical - General.
- B. Work Included: Provide all ductwork and ductwork accessories, auxiliaries, and adjuncts for all and systems as specified or shown.
- C. Work Described Elsewhere: HVAC piping, equipment, and controls are specified in other HVAC Sections.

#### **1.03 RELATED SECTIONS**

- A. All Sections of Division 23.

#### **1.04 SUBMITTALS**

- A. Air Balancing: Provide submittals for air balancing work as specified in Section 23 05 93 HVAC General.

### **PART 2 - PRODUCTS**

#### **2.01 GENERAL**

- A. The contractor shall provide all miscellaneous metal to bridge between structural beams to provide connection for duct supports. As an alternate ductwork may be supported from the roof deck if approved by the owner and structural engineer.
- B. Rectangular Ducts (Horizontal):
  - 1. Up to 30" duct width: Two 1-1/8" wide 16 gauge galvanized steel straps bolted to opposite sides of duct and firmly secured to overhead construction. Each strap must also be turned and screwed to bottom of duct.
  - 2. 30" and greater duct width: Trapeze assembly comprised of Unistrut, Powerstrut, channel supported at each end by rod firmly secured to overhead construction; affix duct to channel with angle bracket on each side. Each strap must also be turned and screwed to bottom of duct.
    - a. 30" to 72" duct width: Use P-1000 channel, size as necessary, 3/8" diameter rods.
- C. Round Ducts (Horizontal):
  - 1. Up to 40" in diameter: Two (2) 1 1/2" wide 18 gauge galvanized steel straps, firmly secured to overhead construction and extending around the entire perimeter of the duct and secured to the duct. Provide bracing to prevent duct sway as specified above for rectangular duct.

### **PART 3 - EXECUTION**

#### **3.01 DUCTWORK SUPPORTS**

- A. Supports
  - 1. Install ductwork in accordance with applicable details, SMACNA "Guidelines for Seismic Restraints of Mechanical Systems, Latest Edition" recommendations, manufacturer's recommendations, and best practice, coordinate all ductwork support connection with the Structural Engineer.
  - 2. Install ducts rigidly, securely, and air tight.
  - 3. Support ducts independently of ductwork - connected equipment and visa-versa.
  
- 4. Penetrations:

- a. Description: All penetrations of walls separating shall have a minimum clearance of 1/2-inch and a maximum clearance of 3/4 inch.
  - b. Materials: A minimum 1.5 lbs/cu.ft. fiberglass insulations shall be used and a nonhardening caulking compound.
  - c. Installation: The opening around the penetration shall be filled loosely with the fiberglass insulation. The opening is then to be sealed airtight with the non-hardening caulking compound. Pipes, ducts, etc., shall be supported on either side of the wall with supports to roof structure.
5. Support of rectangular metal ducts:
  6. Support per SMACNA or current local Mechanical Code whichever is more stringent.
  7. Support of round metal ducts:
    - a. Support per SMACNA, the Contract Documents or current local Mechanical Code whichever is more stringent.

**END OF SECTION**

**SECTION 23 05 48 – VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT**

**PART 1 - GENERAL**

**1.01 SEE SECTION 23 05 00**

- A. Furnish and install all systems, units, equipment, and parts to meet or exceed current applicable requirements for seismic resistance specified by codes, regulations, or agencies having jurisdiction. Include all supports, anchors, braces, and other restraining devices required. All seismic restraints and isolation shall meet Seismic requirements and are the responsibility of the contractor.
- B. Design and installation of seismic bracing shall be per CBC Chapter 16.

**1.02 QUALITY ASSURANCE**

- A. General: All isolators furnished under this Section for a given application shall be of a single manufacturer who has been regularly engaged in the design and manufacture of the equipment.
- B. Manufacturers must demonstrate to the satisfaction of the Engineer that the quality is equal to the equipment made by those manufacturers specifically named herein. Wherever possible, all materials and systems specified in this section shall be purchased from a single vibration isolation materials manufacturer to assure single responsibility for the performance of all isolation materials used.
- C. Vibration and Noise: The completed installation must control vibration and noise to the specified limits. Systems equipment, or parts which vibrate or generate vibration unduly or which generate or emit undue noise while in operation shall: (1) be adjusted, repaired, or replaced as appropriate to obtain acceptable levels of vibration or noise, or (2) be supported on or fitted with suppression or absorption devices or means which effectively prevent the transmission of vibration or noise beyond the offending item.

**1.03 SEISMIC RESISTANCE**

- A. Furnish and install all systems, units, equipment, and parts to meet or exceed current applicable requirements for seismic resistance specified by codes, regulations, or agencies having jurisdiction. Include all supports, anchors, braces and other restraining devices required. All seismic restraints will meet the following site specific seismic design criteria:
  - 1. Seismic Design Category D, 2) Importance Factor,  $I_p = 1.0$  except 1.5 for fire sprinklers; and 3)  $SDS = 1.147$
  - 2. Seismic restraints are the responsibility of the contractor.
- B. Design of seismic bracing shall meet requirements of CBC Chapter 16A.

**1.04 SUBMITTALS**

- A. Manufacturer's Data:
  - 1. Provide materials lists, catalog data sheets, manufacturer's drawings and technical literature covering details of all equipment or items specified or shown on drawings.
  - 2. For Metal Spring Isolators provide the following as a minimum:
    - a. Spring diameter.
    - b. Static deflection.
    - c. Compressed spring height.
    - d. Solid spring height.
    - e. Number of active coils.
    - f. Ratio of horizontal to vertical stiffness.
    - g. Operating height.
    - h. Spring constant.
    - i. Vertical load for each spring.
    - j. Location and designation of each isolator.

- k. Calculate horizontal and vertical loading and bending moment due to a horizontal force applied at the center of the gravity of the isolated equipment. Calculate bolt requirements.
  - 3. Indicate all bases and rail clearance of one inch.
- B. Shop Drawings:
  - 1. Submit plans, elevations and sections and details showing installation, operating heights and spring constants.
- C. Project Information:
- D. Static seismic calculations for all equipment, piping and miscellaneous structural steel connections to building frame.
  - 1. Calculations shall be performed by a California licensed structural engineer employed by the isolation manufacturer for a minimum of five years
- E. Certification of Seismic restraints include details of materials or methods which depart widely from those specified.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL**

- A. Acceptable manufacturers of vibration and seismic control devices:
- B. Mason Industries; Kinetics Noise Control; Flexonic, Metraflex, or equal.
- C. Provide piping and equipment isolation systems as specified or indicated on drawings.
- D. Manufacturer shall be responsible for the proper selection of isolators to accomplish the specified minimum static deflection, based on weight distribution of equipment to be isolated.
  - 1. Vibration isolators selected shall have no less than 80 percent of the deflections given in Table I, Schedule.
  - 2. Contractor shall furnish a complete set of approved shop drawings of all mechanical and electrical equipment to receive vibration isolation devices to the vibration isolation materials manufacturer. The shop drawings to be furnished shall include operating weights of the equipment to be isolated and the distribution of weight at support points or the center of gravity location in three planes.
- E. Manufacturer shall be responsible for selection of isolators to meet seismic codes.
- F. Manufacturer shall supply information on operating heights and methods for assuring installation meets specifications.
- G. The type of isolation, base and minimum static deflection shall be as required for each specific equipment application, but not less than that give in Table I, Vibration Isolation Schedule.
- H. If vibration isolators with a deflection greater than the minimum specified are required to meet sound criteria or because of system dynamics, suitable isolation systems shall be submitted and approval received in writing prior to any installation work.
- I. Coat all vibration isolation system exposed to moisture or an outdoor environment as follows:
  - 1. All steel parts to be hot dipped galvanized.
  - 2. All bolts to be cadmium plated.
  - 3. All springs to be cadmium plated and neoprene coated.

### **2.02 VIBRATION ISOLATION SCHEDULE**

- A. The minimum static deflection and type of vibration isolation system shall be as follows.

TABLE I.

Vibration Isolator Types and Minimum Static Deflection for Equipment and Components.



TYPE OF EQUIPMENT	ISOLATOR TYPE (*)	MINIMUM STATIC DEFLECTION, IN.
Duct Flexible Connection	DFC	--

\*Equipment Vibration isolation schedule designations as follows. Hyphenated designations are combinations of the following.

B. DFC - Rubber/cloth flexible duct connectors.

**2.03 DESCRIPTION OF FLEXIBLE CONNECTORS**

A. Duct Flexible Connectors (DFC)

1. "Ventglass" neoprene coated glass fabric.
2. Acceptable Suppliers: Ventfabrics, or equal.

B. Pipe Flexible Connectors (PFC)

1. Metallic Piping Systems (Below 140°F): Garlock style, 204, General Rubber 1050, or equal. Double arch seamless chlorobutyl elastomer tube and cover rated for 150 psi, 250°F service meeting ASTM specifications D2000 Grade 2AA610AB. L13.
  - a. No steel wire or rings shall be used as pressure reinforcement in neoprene connectors.
  - b. Connectors 2" diameter or less shall use threaded or flanged ends.
  - c. Connectors greater than two inches diameter shall use floating galvanized steel flanges.
  - d. Control cables or rods shall be used where pipe sizes exceed 12" or pressures are at or above 100 psi. If control cables or rods are used, the end fittings shall be isolated from the cable or rod by means of ½" thick bridge bearing neoprene washer bushings designed for a maximum of 1000 psi.
2. Metallic Piping System (140°F and above): Flexonics model TCS-R or equal. 304L Stainless Steel bellows rated for 150 psi, 400°F
  - a. Connectors two inches diameter or less shall use threaded or flanged ends.
  - b. Connectors greater than 2" diameter shall use floating galvanized steel flanges.
  - c. Control cables or rods shall be used where pipe sizes exceed 12" or pressures are at or above 100 psi. If control cables or rods are used, the end fittings shall be isolated from the cable or rod by means of ½" thick bridge bearing neoprene washer bushings designed for a maximum of 1000 psi.
3. Plastic Piping Systems: Ethylene Flexijoint PTFE bellows with five convolutions.
4. Others as specified in other piping sections or shown on drawings.

C. Flexible Pipe Hose: Stainless steel type (PFH)

1. Flexible connections in refrigerant and other high temperature lines shall be stainless steel braid and carbon steel fittings.
2. Hoses for thermal fluid must be suitable for 500°F operating temperature.
3. Connectors two inches diameter or less shall use male threaded nipples.
4. Connectors greater than two inches diameter shall be flanged.
5. All metal flexible connectors shall have a certified helium leak test and hydro test to the maximum rated system test pressure.
6. All flexible connectors shall be made in the USA.
7. Stainless steel hose assemblies with copper end fittings are not allowed.
8. Acceptable Suppliers: Mason Industries, Inc.; Microflex or equal.
  - a. Model: BSS, FCSS, or equal

D. Seismic Pipe Hose: (SPH)

1. Seismic connectors for pipe runs in the "L" configuration:
  - a. Flexible connectors shall be designed with sufficient live length on each flexible leg to provide a minimum of four (4) inches of movement in all directions.
  - b. In addition to the flexible legs, connectors shall be constructed with a 90o elbow.
  - c. Connectors shall have a minimum cycle life of 5000 cycles.
  - d. Materials shall be type 321 stainless steel hose, 304 stainless steel braid with elbows and ends to match pipe material.
  - e. Hoses for thermal fluid must be suitable for 500° F operating temperature.
  - f. Acceptable Suppliers: Microflex, Hyspan, or equal
2. Straight pipe runs:
  - a. Shall be of the Hyspan Tied Universal series 1511R with sufficient bellow design to provide a minimum of four (4) inches of movement in all directions
  - b. In addition to the bellow, units shall be constructed with a center spool piece, tie rods, and 150# drilled flanges.
  - c. Materials shall be type 304 stainless steel bellows, with carbon steel center spool piece, rods and flanges.
  - d. Seismic universal tied expansion joints shall be anchored to isolate for required seismic motion. Anchors shall be properly sized to handle the loads created by thrust and spring forces of the expansion joint.
  - e. Pressure rating 150 psi – 400 psi.

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. Specific application of products shall be as delineated in this and other Sections of the Division.
- B. Installation of all vibration isolation materials, spring and equipment bases specified in this section of the specifications shall be accomplished following the manufacturer's written instructions.
- C. Additional installation instructions may be specified in other Sections of the Division.
- D. The isolation materials manufacturer shall be responsible for the proper selection of spring rates to accomplish the specified minimum static deflections, for all spring and pad type isolators, based on the weight distribution of equipment to be isolated.
- E. The isolation materials manufacturer shall be responsible for the structural design of steel beam bases, to support mechanical equipment scheduled to receive a supplementary base.

#### **3.02 PREPARATION**

#### **3.03 FLEXIBLE CONNECTOR INSTALLATION**

- A. Duct Flexible Connectors (DFC)
  1. Provide at inlet and outlet of each supply and return fan and as shown on drawings.
  2. Allow one inch (1") minimum free space between metal collars each side of fabric.
  3. Connection shall be nominal six inches (6") wide with material taunt.

**END OF SECTION**

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

**PART 1 - GENERAL**

**1.01 SEE SECTION 23 05 00**

**PART 2 - PRODUCTS**

**2.01 IDENTIFICATION**

- A. Equipment: Black Phenolic Plates engraved with 1/2" high white letters. The equipment shall be identified by the mechanical equipment schedule tag numbers shown on the plans (ie. AC-1, REF-1, ACCU-1). Coordinate identification numbers with electrical contractor to ensure that the disconnect switches and other electrical/mechanical equipment has consistent identification numbers.
- B. Controls: Same as equipment above except 1/2" high letters.

**2.02 PIPE IDENTIFICATION**

- A. Stencil and Painted pipe identification shall be provided.
- B. Maximum spacing for identification shall be 10 feet.
- C. Identification shall be provided per the following
  - 1. At both sides of floor or wall penetrations
  - 2. Adjacent to all valves and flanges
  - 3. Adjacent to all changes in direction
  - 4. To be visible from the point of normal approach
- D. Indicate flow direction and type of fluid.
- E. Color code shall be as follows:
  - 1. Natural Gas - Yellow Background with Black Lettering
- F. Pipe Letter height shall be as follows:

Outside Pipe Diameter Including Insulation	Minimum Length of Label	Minimum Height of Letters
.75" – 1.25"	8"	.5"
1.5" – 2"	8"	.75"
2.5" – 6"	12"	1.25"
8" – 10"	24"	2.5"
Over 10"	32"	3.5"

**PART 3 - EXECUTION**

**3.01 EQUIPMENT AND CONTROL IDENTIFICATION**

- A. Identify all equipment with permanently attached plates.
- B. Identify all controls and controllers except thermostats in finished areas.

**3.02 IDENTIFICATION APPLICATIONS**

- A. Piping and Valves
  - 1. Provide identifications for all valves. Provide tags with lettered inscriptions (not numbered).

**END OF SECTION**

## **SECTION 23 05 93 – TESTING, ADJUSTING, AND BALANCING**

### **PART 1 - GENERAL**

#### **1.01 SEE SECTION 23 05 00**

- A. Work Included: This Section describes balancing requirements for all phases of HVAC work. The work includes complete balancing, adjusting and testing of the air and hydronic equipment and systems.

#### **1.02 QUALITY ASSURANCE**

- A. Testing and Balancing shall be performed in complete accordance with AABC National Standards for Field Measurement and Instrumentation only by an AABC or NEBB licensed contractor.
- B. Work shall be performed by an independent test and balance agency that specializes in, and whose business is limited to testing and balancing of air conditioning systems.
- C. Instruments used for testing and balancing of systems shall have been calibrated within a period of six (6) months and shall be checked for accuracy prior to start of work.

#### **1.03 SUBMITTALS**

- A. Provide to the Owner and Contractor with four (4) copies of a balancing agenda prior to start of balancing work including:
  - 1. General description of each air system with its associate equipment and operational cycles for winter heating, reheat, humidification, and cooling. Where different cycles are used for day and night time operation, describe separately.
  - 2. A complete list of all flow and terminal measurements to be performed.
  - 3. Agenda shall also include specific procedures for determining test parameters for flow. Specify type of instruments to be used, method of instrument application and air terminal correction factors for:
    - a. Air terminal configuration.
    - b. Flow direction (supply, return, or exhaust).
    - c. Effective area application to each size and type of air terminal.
    - d. Density corrections.
  - 4. Furnish a copy of agenda to the engineer and Owner prior to start of work, including qualifications of key personnel assigned to the project.
- B. Provide four (4) copies of final report, (two to the Owner and two to the Contractor) containing information outlined in AABC and in Part 3 - EXECUTION.

#### **1.04 NOTIFICATION AND SCHEDULING**

- A. A pre-balance conference shall be held prior to start as scheduled by the Contractor. Attendees at the meeting shall include representatives of the Balancing Contractor, General Contractor, Mechanical Sub-contractor, Control Sub-contractor, and Owner.
- B. The schedule for testing and balancing the HVAC system shall be established in coordination with the Balancing Contractor on a critical path network.
- C. The Balancing Contractor is responsible for initiating this continuing coordination to determine schedule for final testing and balancing services.

#### **1.05 COORDINATION WITH OTHER TRADES**

- A. To bring the HVAC system into a state of readiness for testing, adjusting and balancing, the Mechanical Contractor shall perform the following:
  - 1. Ensure that all splitters, extractor, volume, smoke and fire dampers are properly located and functional. Dampers serving requirements of smoke, minimum and maximum outside, return, relief, and exhaust air shall provide tight closure and full opening, with a smooth and free operation.

2. Verify that all supply, return, exhaust, and grilles, registers, diffusers and terminal units are installed and operational.
3. Ensure that air handling or conditioning systems, units, and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc., are blanked and/or sealed to eliminate excessive bypass or leakage of air. All fans and systems (supply, return, relief, and exhaust) are operating and free of vibration.

## **PART 2 - PRODUCTS**

### **2.01 INSTRUMENT AND TOOLS**

- A. Furnish all instrumentation and tools required to perform a complete air and water balance of all systems on this project.

### **2.02 FLOW METERING SYSTEM**

- A. Use flow metering systems specified and/or furnished to perform air and water balance.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. Coordinate required locations of duct test openings and damper locations specified in other sections.
- B. Coordinate work done by testing and balancing agency with work of other trades.
- C. Plan Check and Review:
  1. Review location and type of volume dampers inlet conditions to air terminals, valves and HVAC equipment.
  2. Review location, type and size of balancing valve, flow metering stations and automatic control valves in the water flow system.
  3. Review location of pressure sensors in the air and water distribution systems.
  4. Review automatic control systems as they affect the test and balance procedure.
  5. Review sheet metal and piping shop drawings to verify the installation of flow control devices.
- D. Job Site Inspections
  1. Check for necessary balancing hardware (dampers, flow meters, valves, pressure taps, thermometer wells, etc.) to determine if they are installed properly and readily accessible.
  2. Identify and report possible restrictions in systems (closed smoke/fire dampers, fire dampers, long runs of flexible duct, poorly installed duct fittings).
  3. The mechanical contractor shall make any changes in pulley, sheaves; supply new pulleys, sheaves, belts as required. In addition, the Mechanical Contractor to add dampers, etc. Necessary for correct balance at no additional cost to the Owner.
  4. Check for necessary balancing hardware (dampers, flow meters, valves, pressure taps, thermometer wells, etc.) to determine if they are installed properly and readily accessible.
- E. Identify and report possible restrictions in systems (closed smoke/fire dampers, fire dampers, long runs of flexible duct, poorly installed duct fittings).

### **3.02 TESTING**

- A. Testing equipment shall be furnished by the contractor; testing personnel shall be competent to conduct the tests.
- B. Test all ductwork for excessive leakage and/or noise. Testing on any completed section of the ductwork must be made before installation of the finished ceiling or before the ductwork is furred in inaccessible spaces. Any leaks found must be properly repaired or joints remade and the section retested until tight. Any leaks which cause an objectionable noise must be repaired, regardless of the amount of leakage.
- C. Should any piece of an apparatus or any material or work fail in any of the tests, it shall be immediately removed and replaced by new material, and portion of the work replaced shall again be tested by Contractor at his own expense.

### **3.03 OPERATIONAL TESTS AND ADJUSTMENTS**

- A. Upon completion of the work, all equipment and systems shall be operated and tested for a period of at least three consecutive days to demonstrate their satisfactory overall operation. On the last day of this period, the Contractors shall arrange for an acceptance test and final inspection by the Owner. All necessary adjustments and corrections to the systems shall be made prior to acceptance test so that the systems are operating smoothly and properly and absolutely ready before check and acceptance.
- B. Coordination of all items associated with the mechanical systems is the responsibility of the mechanical contractor, including all wiring in connection with mechanical equipment, and all temperature control work. It shall be this contractor's responsibility to determine that his systems, equipment and apparatus are properly wired and controlled and completely ready for satisfactory operation and test.
- C. Immediately before starting tests, all air filters shall be replaced as hereinbefore specified. All motors checked for rotation and all bearings lubricated.
- D. Operating and safety controls shall be tested at least three times, under ambient design conditions.

### **3.04 AIR BALANCE**

- A. Changes, additions and modifications to dampers, pulleys and/or drive belts and other equipment necessary for proper air balance shall be provided by the Mechanical Contractor at no additional cost to the Owner.
- B. The Mechanical Contractor shall retain the services of an independent certified test and balance agency to provide a complete air balance. All work shall be done by using instruments certified accurate to limits used in standard practice for testing and balancing of air distribution for heating-cooling systems.
- C. Study design specifications and engineering drawings and prepare schedule to physically inspect mechanical equipment for air distribution systems to be tested and balanced.
- D. Prepare test and balancing schedule, test record forms and necessary technical information about the air distribution systems for installed heating-cooling equipment, and fan systems, for complete total air balance.
- E. Recommend adjustments and/or corrections to mechanical equipment and air distribution systems that are necessary for proper balancing of air handling systems.
- F. Upon completion of the air handling system, the Air Balance Agency shall complete tests, analysis and balance of the air handling systems for heating-cooling equipment. The Air-Balance Agency then shall submit four copies of balance report to the Mechanical Contractor for forwarding to the Architect for evaluation and approval.
- G. Air Balance Report shall include the following data
  - 1. Design specifications of air handling equipment
    - a. CFM
    - b. Static Pressure
    - c. % of Outside Air
    - d. Fan Motor HP
    - e. Fan Motor BHP
    - f. Fan RPM
  - 2. Installed equipment data
    - a. Manufacturer
    - b. Identifying Data
  - 3. Balancing test data
    - a. Fan Speed
    - b. Fan Operating amperes
    - c. Fan Operating BHP

- d. Fan Duct sizes
  - e. Air Velocity (avg.)
  - f. Total CFM
  - g. Static Pressures
  - h. Design Specifications of grilles and/or diffusers
  - i. Manufacturer No. and Data
  - j. FPM
  - k. CFM
- 4. Installed equipment data
    - a. Manufacturer No. and Data
    - b. Location
  - 5. Balancing test data
    - a. FPM
    - b. CFM
- H. All outlets shall be set for the air pattern shown on plans.
- I. Supply and return air dampers shall be set for design CFM, on heating and cooling cycle.
- J. Test and balance shall correct for air density at 6000 ft. elevation and above.

**3.05 OWNERS INSTRUCTION**

- A. Review the installation of all equipment and controls with the Owner after all systems are operating automatically. Instruct the Owner in the adjustment of all control and equipment devices. Allow a minimum of 8 hours for this instruction.

**END OF SECTION**

## **SECTION 23 07 00 – HVAC INSULATION**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, and DIVISION 01 00 00, GENERAL REQUIREMENTS, apply to the work in this section.
- B. See 23 05 00

#### **1.02 SECTIONS INCLUDE**

- A. This Section describes insulation materials, methods, and applications for HVAC Mechanical Work, Special or specific details, applications, features, or methods may be described in work descriptions Sections or on the drawings.

#### **1.03 REFERENCES**

- A. Thermal insulation materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use:
  - 1. American Society for Testing of Materials Specifications:
    - a. ASTM C 547, "Standard Specification for Mineral Fiber Pipe Insulation"
    - b. ASTM C 585, "Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)"
    - c. ASTM C 1136, "Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation"

#### **1.04 SYSTEM PERFORMANCE**

- A. Insulation materials furnished should meet the minimum thickness requirements of National Voluntary Consensus Standard 90.1 (Latest edition), "Energy Efficient Design of New Buildings," of the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE).
- B. Insulation materials furnished and installed hereunder shall meet the fire hazard requirements of applicable building codes when tested in composite form per one of the following nominally equivalent test methods:
  - 1. American Society for Testing of Materials ASTM E 84
  - 2. Underwriters' Laboratories, Inc. UL 723, CAN/ULC-S102-M88
  - 3. National Fire Protection Association NFPA 255
- C. Molded pipe insulation shall be manufactured to meet ASTM C 585 for sizes required in the particular system.
- D. Molded fibrous glass pipe insulation shall comply with the requirements of ASTM C 547.

#### **1.05 QUALITY ASSURANCE**

- A. Qualifications of Installers: only a licensed firm employing installers specifically skilled and experienced in applying insulation to piping shall do Insulation work.
- B. Insulation materials and accessories furnished and installed hereunder shall, where required, be accompanied by manufacturers' current submittal or data sheets showing compliance with applicable specifications listed in above.
- C. Insulation materials, including all weather and vapor barrier materials, closures, hangers, supports, fitting covers, and other accessories, shall be furnished and installed in strict accordance with project drawings, plans, and specifications.
- D. Insulation materials and accessories shall be installed in a workmanlike manner by skilled and experienced workers who are regularly engaged in commercial insulation work.
- E. Codes and Standards:
  - 1. California Code of Regulations - Title 24.



2. National Fire Protection Association - 90A.

**1.06 DELIVERY AND STORAGE OF MATERIALS**

- A. All of the insulation materials and accessories covered by this specification shall be delivered to the job site and stored in a safe, dry place with appropriate labels and/or other product identification.
- B. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during, and after installation. No insulation material shall be installed that has become damaged in any way.
- C. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

**PART 2 - PRODUCTS**

**2.01 DUCT INSULATION – SEE 23 07 13**

**2.02 HVAC EQUIPMENT INSULATION – SEE 23 07 16**

**2.03 HVAC PIPING INSULATION – SEE 23 07 19**

**PART 3 - EXECUTION**

**3.01 APPLICATION / INSTALLATION**

- A. Use the types and thickness of insulation specified in work description Sections.
- B. Apply insulations in accordance with the manufacturer's recommendations and with instructions specified herein or noted on the drawings.
- C. Install insulations only after the systems, items, and equipment have been installed and tested, inspected, and accepted. Exceptions: Slip-on piping insulation and equipment insulations installed at the factory.
- D. Fit insulation snugly to the item being insulated; butt all joints tightly with no voids, spaces, or thin spots.
- E. Seal all joints completely; where sealing tape is used, center the tape over the joint.
- F. Except where specified or necessary, do not use staples or fasteners which penetrate vapor barrier jackets or covers on cold systems or equipment; where such penetrating fasteners are used, seal each penetration completely to maintain the vapor barrier integrity. All penetrations of the ASJ and exposed ends of insulation shall be sealed with vapor barrier mastic. Vapor seals at butt joints shall be applied at every fourth pipe section joint and at each fitting to provide isolation of water incursion.
- G. Use adhesives, mastics, cements, sealants, and finishes undiluted unless specifically directed otherwise; apply per manufacturer's directions.
- H. Install outdoor jacketing or other specified weather proofing or finishing on all insulations outdoors.
- I. Install all indoor exposed insulation with extra care and finish neatly.
- J. Follow specified methods of installation unless alternative methods are submitted and approved.

**3.02 FINISHING**

- A. Finishes and Protection:
  - 1. Insure that the exterior finish of all insulation is applied and complete as specified
  - 2. Make ready for painting, or painted to match existing including color where specified for paint.
  - 3. Install all metal jackets or protective sheathing where specified.
- B. Repair, Touchup: Properly repair and touchup all dents, rips, tears, or other damage inflicted on jackets or exterior surfaces of insulation. Breaks or punctures in the vapor barrier of external insulation will not be accepted and must be repaired prior to project acceptance.

**END OF SECTION**



## SECTION 23 07 13 – DUCT INSULATION

### PART 1 - GENERAL

#### 1.01 GENERAL REQUIREMENTS

- A. See Section 23 07 00
- B. A continuous, intact vapor barrier is critical for ducts.
- C. All insulation material shall have a mold, humidity, and erosion resistant face that has met the requirements of CMC Table 1701.
- D. Insulation applied to the exterior surface of ducts located in buildings shall have a flame spread of no more than 25 and a smoke developed rating of not more than 50.
- E. Insulate all above grade ductwork unless otherwise shown on the drawings or specified in Section 23 31 16 METAL DUCT.

### PART 2 - PRODUCTS

#### 2.01 ID-1 FLEXIBLE BLANKET/VAPOR BARRIER FACED

- A. Glass fiber reinforced Kraft/aluminum foil faced flexible blanket of 1.5 PCF nominal density resin bonded fibrous glass, have a installed thermal conductivity k factor of 0.25 at 75° F.; suitable for direct application and service on cold and dual temperature ductwork.
- B. Supply FSK jacket with a permeance of 0.02 or less
- C. Fiberglass ED-100 with all service facing, Certainteed Type 1001 Universal with Type IV facing, Schuller Manville Microlite with FSKL facing.

#### 2.02 ID-2 FLEXIBLE BLANKET/VAPOR BARRIER FACED

- A. Glass fiber reinforced Kraft/aluminum foil faced flexible blanket of 1.5 PCF nominal density resin bonded fibrous glass, have a installed thermal conductivity k factor of 0.25 at 75° F.; suitable for direct application and service on cold and dual temperature ductwork.
- B. Supply FSK jacket with a permeance of 0.02 or less
- C. Schuler Manville Microlite, Owens Corning, Certainteed.

### PART 3 - EXECUTION

#### 3.01 APPLICATIONS

- A. Supply Air Ducts indoors/concealed
  - 1. Use System ID-1 (Flexible Blanket / Vapor Barrier Faced)
    - a. 2" thickness for all sizes
    - b. Applies to all cross sections (I.E. rectangular, circular, etc.)
- B. Return Air Ducts indoors/concealed
  - 1. Use System ID-1 (Flexible Blanket / Vapor Barrier Faced)
    - a. 1 ½" thickness for all sizes
    - b. Applies to all cross sections (I.E. rectangular, circular, etc.)
- C. Do not externally insulate the following unless otherwise shown on the drawings or specified:
  - 1. Lined ductwork (indoors).
  - 2. Exposed ducts located in conditioned space.

#### 3.02 INSTALLATION FLEXIBLE BLANKET/VAPOR BARRIER FACED

- A. Install on supply and return ductwork so that condensation will not occur.
- B. Wrap around ducts, butt all joints. Secure with 3" (minimum) width tape at 18" (maximum) intervals along the duct; tape may be of the same material as the insulation facing with a pressure sensitive adhesive on one side or may be Hardcast DT490-C mineral impregnated woven synthetic fiber using Hardcast FTA-20 roller. In addition, on rectangular and cross section ducts, secure to the flat

bottoms more than 18" wide with StickKlip fasteners only with 1 ½" diameter washers at 16" centers both ways; one centered longitudinal row is sufficient for ducts up to 36" flat bottom width.

- C. Seal all seams and joints with 3" (minimum) width tape centered along the edge of the lap; tape shall be as specified above.
- D. Seal all fastener penetrations with 3" x 3" (minimum) tape centered over the washer; tape shall be as specified above.
- E. Where strap type duct supports penetrate the insulation, slit the insulation and facing, fit around the straps, and seal with tape as specified above; tape shall be of size to suit the situation and be applied in the number of layers necessary to obtain complete sealing.
- F. For low temperature air ductwork, insulate the straps a minimum of 4 inches from any point of contact with the duct.
- G. At trapeze or similar type duct supports, insert a 12" wide strip of Armaflex insulation, ½" thick between duct bottom and the supporting member across and 6" beyond both ends of the bearing surface. Lap ducts insulation over this insert and seal the same as other lapped seams.
- H. Insulate all flexible duct connectors to the same thickness as adjacent duct insulation.
- I. Continue insulation on terminal unit inlets to cover the entire inlet collar.
- J. Insulate over all duct access doors with the same thickness as adjacent duct insulation. Provide removable insulation piece with an outer label on the insulation identifying the type of door.
- K. Outdoors, provide additional seal over all joints and fastener or other penetrations by covering same 2" beyond tape sealing (above) with two (2) coats of Fosters 30-65 or Childers CP-34 vapor barrier coating reinforced with Fosters Mast a Fab or Childers Chil Glas #10 reinforced mesh. Vapor barrier coating shall have a permeance of 0.03 perms or less at 45 mils as tested by ASTM E96, procedure A.
- L. Finish all outdoor ductwork insulation by applying two (2) 1/8" thick coats of Foster 46-50 or Childers CP-10/11 weather barrier mastic reinforced with Fosters Mast a Fab or Childers Chil Glas #10 reinforced mesh. Vapor barrier coating shall have a permeance of 0.03 perms or less at 45 mils as tested by ASTM E96, procedure A. Lap all joints 2".
- M. All ductwork shall be wrapped with 1" rigid insulation board and two layers of 5/8" gypsum board taped and sealed as detailed on the drawings from supply and return fans for all air conditioning units.

### **3.03 INSTALLATION: FLEXIBLE BLANKET/COATED LINER**

- A. Apply a 1/16" thick coat of Foster 85-62 JacTac 3-M Company Scotch Grip #38, Childers-125-1, adhesive or duct butter on all end or edges of cuts, rips, etc., before or while installing.
- B. Secure to the ductwork with welded or StickKlip, fasteners with 1 ½" diameter washers with cupped or beveled heads. Set at 16 (maximum) on centers both ways; provide a row of pins within 1" of all edges and joints, and one row of pins (minimum) on each flat duct or plenum face. In addition secure the entire perimeter of all edges at seams or joints with a 4" minimum width application of the above specified adhesive. The upstream edge of all duct liner shall have a sheet metal closure to protect against erosion.
- C. Fasteners shall compress the liner no more than 1/8".
- D. Clip off protruding ends of fastener pins in plenums.
- E. In walk-in plenums, finish the interior face of liner with two (2) coats of Foster 30-36 Sealfas or Childers CP-50AMV1 lagging adhesive. All seams in insulation shall be sealed with fiberglass mesh embedded between coats of lagging adhesive.

**END OF SECTION**

## **SECTION 23 11 23 – FACILITY NATURAL GAS PIPING**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.
- B. Section 23 05 00 applies to this section.

#### **1.02 SUMMARY**

- A. This section includes all plumbing (equipment, fixtures, pipe and fittings, specialties) inside the building(s) and outside the building(s) to the point of connection to site plumbing systems.
- B. Provide complete plumbing systems including:
  - 1. Service connections to existing on-site utilities, and stubs for future connection to equipment provided under the work of this Section or other Sections of the Specifications.
  - 2. All piping systems for conduction of natural gas as shown or specified for plumbing work.
  - 3. All valves, piping supports, piping penetration auxiliaries, piping protective coverings, piping, and other piping accessories as shown or specified for plumbing work.
  - 4. All plumbing equipment and auxiliary items as specified herein or shown on the drawings.

#### **1.03 RELATED SECTIONS**

- A. Section 23 00 00 - HVAC
- B. Section 23 07 00 - Insulation
- C. Section 22 00 00- Plumbing

#### **1.04 QUALITY ASSURANCE**

- A. All plumbing fixtures and equipment shall comply with California Code of Regulations, Title 24, Part 6, latest edition.

#### **1.05 REFERENCES**

- A. Pipes and Tubes
  - 1. Steel Pipe: ASTM A53, Type S, Grade A, Schedule 40, seamless, black or galvanized, plain ends.
  - 2. Polyethylene Pipe: ASTM D2513 produced to APWA/ULCC standards for color coding of gas distribution systems.
- B. Fittings
  - 1. Steel Pipe Nipples: ASTM A733, made of ASTM A53 or ASTM A106, Schedule 40, seamless, galvanized, carbon-steel pipe.
  - 2. Malleable-Iron Unions: ASME B16.39, Classes 150 and 300; hexagonal stock; with ball-and-socket joint; metal-to-metal bronze seating surfaces; and female threaded ends with threads complying with ASME B1.20.1.
  - 3. Polyethylene Plastic: ASTM D2683 and D3261, socket or butt fusion fittings.

#### **1.06 JOINING MATERIALS**

- A. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- B. Heat Fusion

#### **1.07 STRUCTURAL REQUIREMENTS**

- A. Structural members shall not be cut or modified in any manner without specific instructions from the structural engineer and approval from DSA. Where possible, offset vents and pipes rising in walls, concealed above ceilings, below plates and rise through roof. Where this is not possible, install vents and pipes through plates as detailed on structural drawings.

### 1.08 SUBMITTALS

- A. Submit a general statement of materials and methods along with manufacturer's technical data and installation instructions for all equipment, fixtures, pipe and fittings, and plumbing specialties to be installed.
- B. Record Drawings: Per specification section 23 05 00 requirements.
- C. Operation and Maintenance Manuals: Per specification section 23 05 00 requirements.

## PART 2 - PRODUCTS

### 2.01 GENERAL

- A. Adapters: Wrought copper male adapters shall be used wherever it is necessary to connect copper tubing to a valve or "tee" having threaded connections.

### 2.02 PIPE, FITTING, AND JOINING MATERIALS

- A. Steel/Threaded Fittings
  - 1. Pipe: Black or galvanized steel per ASTM A-53 seamless, threaded ends, standard weight Schedule 40 or Schedule 80.
  - 2. Fittings:
    - a. Black or galvanized (to match pipe) banded malleable iron, threaded, ASTM A-197, 150 lb. standard or 300 lb. extra heavy per ANSI Standard B16.3 (to match pipe schedule).
    - b. Black or galvanized (to match pipe) banded cast iron, threaded, per ASTM A-126 Class B, 125 lb. standard or 250 lb. extra heavy per ANSI Standard B16.4 (to match pipe schedule).
    - c. Unions: AAR 300 lb. malleable iron, black or galvanized (to match pipe).
    - d. Joining Materials/Methods
      - 1) Rectorseal or pure lead and graphite thread lubricant.
      - 2) Permacel, P-412, 1/2" wide teflon pipe joint sealant.
- B. Steel/Welding Fittings
  - 1. Fittings: Black steel, permanently marked, seamless butt welding type, standard weight or extra strong (to match pipe schedule). Optional in lieu of tees where main is at least two pipe sizes larger than branch Bonney Forge, Thredolets for 1/2" to 2", weldolets for branch lines 2 1/2" to 4"; fitting shall suit main size.
  - 2. Unions: AAR 300 lb. malleable iron, black or galvanized (to match pipe).
  - 3. Joining Materials/Methods
    - a. Gas or electric arc welding per ASME Code for pressure piping.
- C. Polyethylene plastic butt fusion welded joints
  - 1. Pipe: Schedule 40, plain ends.
  - 2. Fittings: Polyethylene fusion welded type.
  - 3. Joining Materials/Methods: Fusion welded, using fusion welding fittings, and the manufacturers supplied control unit.
  - 4. Connections: Utilize only adapters supplied by the same manufacturer of the pipe.

### 2.03 PIPE AND FITTING APPLICATIONS

- A. Inside Building (to 5'-0" outside building line).
  - 1. Gas Piping: Schedule 40, black steel pipe; malleable iron screwed fittings for sizes 2" and smaller. Weld sizes 2 1/2" and larger. Weld all below grade piping and protect as specified herein.
  - 2. Plastic pipe and fittings shall not be used inside of buildings.
  
- B. Outside Building (from 5'-0" outside building line)

1. Gas piping
  - a. Above grade and to 30" below grade, shall be Schedule 40, black steel pipe with 150 lb. malleable iron, welded joints.
  - b. Below grade pipe shall be protected with X-Tru-Coat and fittings covered with X-Tru-Coat, heat shrink, sleeves to 6" above grade. Above grade sizes 2" and smaller may be screwed joints.
  - c. Underground gas piping below 30" depth and 30" after the first change in direction, shall be polyethelyene pipe with fusion welded joints.

#### **2.04 PIPE PROTECTION**

- A. Bare galvanized or black steel pipe buried in the ground shall have a corrosion protective wrap of one of the following:
  1. Polyvinyl Chloride Tape: The tape shall be of a minimum thickness of 10 mils and shall be laminated with a suitable adhesive, or shall be applied with a suitable primer adhesive. Width as recommended by the manufacturer for the pipe sizes being wrapped (4" minimum). Tape shall have continuous identification
  2. 3M X-Tru-Coat, factory-applied plastic coating with additional field-applied double-layer wrapping of Scotchrap #51, 20-mil plastic tape, Trentex No. V-10, B-20, Scotchwrap No. 50 Polyvinyl chloride tape wrap, or thermofit sleeves.
  3. Field Joint Cover: Tape coat, prime coat and one layer of Tape coat #20 heat-applied 62-mil tape.
- B. Provide a sacrificial anode for the underground portion of all steel piping when required by the local authority.

#### **2.05 VALVES**

- A. General
  1. Furnish two tee handle operators for each size to suit all valves which are installed below grade in access boxes and which are not fitted with integral handles; hub end valves shall be used where required.
  2. Valves on systems operating over 100 psi shall be rated for 150 lb. or higher as required.
- B. Shut-off service, natural gas
  1. Sizes 2" and smaller: NibcoT-585-70-UL, full port ball valve; 400 psi gas service rating; bronze body and ball, teflon seat, quarter turn handle with stops, swing-out accessibility/removal.
  2. Sizes 2 ½" to 4": DeZurik Fig. 425, 175 psi shut-off pressure differential; semi-steel body, threaded ends, eccentric plug with RS-49 facing, Fig. 483 lever handle.

#### **2.06 PIPING ACCESSORIES**

- A. Unions shall have the same pressure rating as pipe fittings.

#### **2.07 PIPING PENETRATION AUXILIARIES**

- A. Sleeves Below Slab or Grade: Metraseal model MS or equal with schedule 80 PVC sleeve. The seal shall be capable of withstanding a hydrostatic pressure of 20 psig. The seal shall be constructed of synthetic rubber with heavy-duty plastic pressure plates. All bolts and nuts shall be constructed of stainless steel.
- B. Escutcheons: Polished chrome plated brass or painted metal.

### **PART 3 - EXECUTION**

#### **3.01 GAS PIPING**

- A. Gas Piping: Install generally level with as few bends as possible. Install dirt legs and shut-off valves at each piece of equipment. Support as specified and in accordance with the C.P.C.
- B. Polyethylene Gas Piping: Shall be heat fusion welded in strict accordance with manufacturer's installation instruction. Bury high pressure mains (over 7" W.C.) 36" minimum and low pressure (7"

W.C. or less) 30". Place pipe on 6" sand bed on trench bottom and cover pipe with 12" sand after placement. Remaining backfill may be native soil.

- C. Bury a 14 AWG insulated copper locating wire with all non-metallic pipe. Copper wire shall have at least 12" above grade at each end.

**3.02 VALVES**

- A. Valves shall be full size of line in which installed. Furnish discs suitable for service intended. All valves shall be properly packed and lubricated. Unions shall be placed adjacent to each threaded or soldered valve or equipment connection 2" and smaller. Install flanges at all valves with stems vertical wherever possible. Stems shall not be placed below horizontal.
- B. Install unions adjacent to each valve and at final connection to each piece of equipment.
- C. All shutoff valves in gas lines shall be ball valves, unless otherwise shown.
- D. Valves shall be provided with brass identification tags indicating service controlled. Tags may be omitted on lines exposed in equipment rooms where service is obvious.

**3.03 PIPING TESTING: TESTING CRITERIA**

System	Medium	Pressure	Duration
Natural Gas	Air	150 psig above grade	12 hours
		65 psig below grade	12 hours

**END OF SECTION**



## **SECTION 23 31 13 – METAL DUCTS**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, and DIVISION 1, GENERAL REQUIREMENTS, apply the work in this section.

#### **1.02 SECTION INCLUDES**

- A. General: Refer to Section 23 05 00, Mechanical - General.
- B. Work Included: Provide all ductwork and ductwork accessories, auxiliaries, and adjuncts for all and systems as specified or shown.
- C. Work Described Elsewhere: HVAC piping, equipment, and controls are specified in other HVAC Sections.

### **PART 2 - PRODUCTS**

#### **2.01 DUCT WORK**

- A. Requirements
  - 1. Shop Fabricated Ductwork
    - a. Fabricate ductwork as required by classification as described below or gauges, and of configuration and sizes shown on the Drawings. Note that duct sizes shown are net inside; where ducts are lined, fabricate larger than shown to accommodate lining with shown dimensions net inside lining.
    - b. Fabricate ducts and fittings as shown on drawings, or if not detailed, fabricate in accordance with SMACNA.
    - c. Fabricate ducts with adequate cross-bracing or reinforcing to prevent drumming; should drumming subsequently occur, provide additional reinforcement as necessary to overcome same.
    - d. Construct ducts to provide smooth passage for the conducted air, laying edges exposed to the airstream in the direction of air flow.
    - e. Fabricate elbows or other fittings for changing direction of duct with a centerline radius equal to 1.5 times the duct width unless shown otherwise or necessitated by space restrictions. Where square or short radius turns are shown or required, fit with air turning vanes.
    - f. Fabricate diverging transitions with side slopes of 1:6; fabricate converging transitions with side slopes of 1:2. Greater slopes may be used only where space restriction prohibits specified slopes.
  - 2. Factory fabricated ductwork construction shall conform to applicable requirements stipulated above for shop fabricated ductwork.
- B. Galvanized Steel Ductwork (GSD)
  - 1. Rectangular Cross Section
    - a. Shop fabricated of prime grade lock seam for quality galvanized steel sheet in accordance with requirements stipulated above and fitted with auxiliaries and accessories as specified below and shown on the drawings.
  - 2. Low Pressure Ductwork, up to 2" static pressure and 2,500 fpm:
  - 3. Rectangular Duct: GSD gauge per SMACNA or C.M.C whichever is more stringent.
  - 4. Round Duct: As manufactured by United McGill Corp or equal. Uni-Rib, UNIRIB DUCT machine formed, spiral lock seam construction spot welded and bonded seams with an intermediate standing rib for rigidity. Slip joint construction couplings with a minimum of 2" insertion length. GSD gauge per SMACNA or C.M.C whichever is more stringent.

5. Fittings: (except elbows) machine formed using SMACNA RL-1 seams with seal class B.
  6. Plenums: Fabricate cross-brake panels and stiffen with galvanized steel angle iron members. Provide duct access doors as specified below and as shown on drawings.
  7. Elbows: fittings shall have a wall thickness not less than that specified for longitudinal straight ducts as shown in Table 3-2 and 3-3, SMACNA HVAC Duct Construction Standards, Metal and Flexible, 4" - 8" two piece, die stamped with fully welded longitudinal seam; 9" - 30", segmented standing seam construction; 31" - 36", segmented construction with joint spot welded and bonded. Each segmented elbow shall have the number of segments as indicated by Table 3-1 SMACNA HVAC Duct Construction Standards, Metal and Flexible for above 1500 fpm.
- C. Medium Pressure Duct, from above 2" to 6" static pressure and to 4000 fpm:
1. All ductwork shall be constructed per SMACNA guidelines or C.M.C whichever is more stringent for medium pressure ductwork.
  2. Flat Oval Duct:
    - a. As manufactured by United McGill Corp or equal. Uni-Seal flat oval duct and fittings, spiral lock seam or fully welded longitudinal seam, as needed, construction, and FORC reinforcing connectors.

Major Axis	up to 24"	25"- 36"	37"- 48"	49"- 60"	61" - 70"	71" & Up
GSD Gage:	24	22	22	20	20	18
Fittings Gage:	20	20	18	18	16	16

- b. Fittings: (except elbows) machined formed using SMACNA RL-1 seams with seal class A.
  3. All ductwork shall be constructed per SMACNA guidelines or C.M.C whichever is more stringent for medium pressure ductwork.
  4. Round Duct:
    - a. As manufactured by United McGill Corp or equal. Uni-Seal heavy gauge round duct and fittings machine formed, spiral lock seam or fully welded, as needed, construction for rigidity.
    - b. Fittings: (except elbows) machined formed using SMACNA RL-1 seams with seal class A.
  5. Unless otherwise specified, standing seam joint shall be used wherever possible on all fittings. All standing seam joints shall be sealed with a UL-Classified zero flame spread and zero smoke developed cement specially formulated for bonding metal-to-metal joints. In lieu of standing seam construction, joints may be solid welded or spot welded and bonded. All welded joints shall be coated with a protective paint, inside and out, to prevent damage to the galvanized surface. Spot-welded fittings shall have all joints sealed with a UL-Classified zero flame spread and zero smoke developed cement specially formulated for bonding metal-to-metal joints.
  6. Elbows: fittings shall have a wall thickness not less than that specified for longitudinal straight ducts as shown in Table 3-2 and 3-3, SMACNA HVAC Duct Construction Standards, Metal and Flexible, 4" - 8" two piece, die stamped with fully welded longitudinal seam; 9" - 30", segmented standing seam construction; 31" - 36", segmented construction with joint spot welded and bonded. Each segmented elbow shall have the number of segments as indicated by Table 3-1 SMACNA HVAC Duct Construction Standards, Metal and Flexible for above 1500 fpm.
  7. Divided-flow fittings shall be constructed with a radiused entrance to all branch taps and with no excess material projecting from the body into the branch tap entrance.
  8. Liner for all fittings shall be as specified above.
- D. Conical Fittings:
1. Low pressure:

- a. All conical fittings shall be constructed with a minimum 2" flare around entire perimeter and a minimum 1:2 slope unless noted otherwise.
- 2. Medium pressure:
  - a. All conical fittings shall be constructed with a minimum inlet equal to 1.5 times the outlet (1.5 x D) and a length equal to 0.7 times the outlet (0.7 x D) where D equals the duct diameter.
  - b. All conical fittings shall be constructed per SMACNA HVAC Construction Standards Metal And Flexible, figure 2-6
- E. 45 degree entry fittings:
  - 1. All 45 degree entry fittings shall be constructed per SMACNA HVAC Construction Standards Metal And Flexible, figure 2-6.

## 2.02 DUCTWORK ACCESS

- A. Duct Access Doors:
  - 1. Access panels - Rectangular ducts
    - a. Size to provide easy access, but not less than 18" wide.
    - b. Ventfabrics "Ventlok" insulated, hinged and latched type or equal
  - 2. Access panels - Round ducts
    - a. Size to provide easy access, but not less than 18" wide.
    - b. Ductmate-Metu round insulated access door or equal

## 2.03 DUCTWORK ADJUNCTS

- A. Intake/Exhaust Screens: Provide ½" mesh 18 gauge galvanized iron bird screens at all exterior openings in mechanical system except where provided by others.
- B. Combustion Air Openings: Provide corrosion resistant ¼" screen mesh at all combustion air openings except where ducts terminate in attics.
- C. Insulation: As specified in Section 23 07 00, Insulation.
- D. Test Fittings: Ventlok #699.
- E. Duct Penetrations:
  - 1. Where ducts penetrate fire separations in the building, provide fire dampers or smoke/fire dampers as specified, shown and required by code.
  - 2. Where ducts penetrate roof or exterior walls, provide 24 gauge galvanized sheet metal flashing and counterflashing; solder all joints and make watertight, including under all air handlers, around all duct work penetrations, and exhaust fans.
- F. Sealants
  - 1. Design Polymerics DP1020, Ductmate PROseal high velocity duct sealant, Childers CP-146/CP-148, Fosters 32-19/32-17, or equal, UL 723, ASTM E-84
  - 2. Low Shrinkage, flexible, and mildew resistant conforming to NFPA 90A and 90B
- G. Tapes and Adhesives:
  - 1. Pressureless Tapes: Hardcast, 4" wide Type DT 5400 mineral impregnated woven fiber tape with manufacturer's FTA-20 activator/adhesive (indoors) and RTA-50 activator/adhesive (outdoors), applied with brush or roller in accordance with manufacturer's directions.
- H. Transverse Duct Connections:
  - 1. Traverse Joints: Ductmate or WDCI proprietary duct connection systems will be accepted. Ductwork constructed using these systems will refer to the manufacturers guidelines for sheet gauge, intermediate reinforcement size and spacing, and joint reinforcements. TDC/TDF/T-24 shall be constructed as a SMACNA T-24 flange.
  - 2. The Ductmate companion angle with an integral polymer mastic seal shall be securely fastened to the duct walls using self-drilling screws, rivets or spot welding. Fastener spacing shall be as

recommended by the manufacturer for the size or duct and the pressure class. The raw duct ends shall be properly seated in the integral mastic seal. A continuous strip of closed cell gasket tape, size 1/4" x 3/4", shall be installed between the mating flanges of the companion angles at each transverse joint, and the joint shall be made up using 3/8" diameter x 1" long plated bolts and nuts. Drive-on or snap-on cleats shall be used at spacings as recommended by the manufacturer.

3. The Ductmate system shall not be used for applications with duct gauges heavier than 16 gauge or lighter than 26 gauge.
4. Longitudinal Seams: Pittsburgh Lock shall be used on all longitudinal seams. All longitudinal seams will be sealed with a mastic sealant. Snaplock is not acceptable.

### **PART 3 - EXECUTION**

#### **3.01 APPLICATIONS**

- A. Galvanized Steel Ductwork (GSD): Except where specified or shown otherwise, use (GSD) conforming to requirements (Part 2), or cross section configuration shown, in all locations (indoor/outdoor, above/below grade, concealed/exposed).
- B. Flexible Fibrous Glass Duct (FFG): Use (FFG) only where specifically called for on the drawings, as connection between terminal boxes and air outlets.
- C. Kitchen hood and equipment exhaust duct shall be in accordance with CMC Chapter 5.

#### **3.02 DUCTWORK**

- A. Pressure-Velocity Classification:
  1. All supply ductwork on constant volume systems (low pressure):
    - a. All ductwork shall be constructed per SMACNA static pressure class of positive +2" and a velocity of 2500 FPM.
    - b. Seal all joints and seams on all ducts and plenums per SMACNA seal class B. Pressure sensitive tapes are not allowed.
  2. All return ductwork (low velocity):
    - a. All ductwork shall be constructed per SMACNA static pressure class of negative -2" and a velocity of 2500 FPM.
    - b. Seal all joints and seams on all ducts and plenums per SMACNA seal class B. Pressure sensitive tapes are not allowed.
  3. All general exhaust ductwork [excluding kitchen and process systems] (low pressure):
    - a. All ductwork shall be constructed per SMACNA static pressure class of negative -2" and a velocity of 2500 FPM.
    - b. Seal all joints and seams on all ducts and plenums per SMACNA seal class B. Pressure sensitive tapes are not allowed.
- B. Broken places in galvanized coating made in forming shall be completely covered with galvanized paint.
- C. All ductwork shall comply with the C.M.C and the local jurisdiction's addendum.
- D. Ducts shall be reinforced in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2018 (low pressure and medium pressure, where shown on drawings). Duct shall be diagonally creased on all four sides. Seams shall be double crimped, bent and elbows shall be made with the throat radius of all bends 12" diameters of the width of the duct wherever possible and in no case shall the throat radius be less than one diameter of the branch duct. Where space does not permit the above radius or where square elbows are indicated on the drawings, they shall be equipped with turning vanes of an approved type for low velocity ducts. Medium velocity ducts shall not use turning vanes and shall not use square elbows unless shown otherwise. Use Ductmate closure systems for all round and rectangular ducts.

- E. Transition pieces in the ducts shall have the sides sloped approximately one to five and no abrupt changes or offsets of any kind in the duct system will be permitted. Round to round take-offs shall be made with 45° wye fittings.
- F. Ductwork Auxiliaries
  - 1. Flexible Connectors
    - a. Install duct sections being fitted with a flexible connector with a 3" minimum gap between the ends being bridged by the flexible connector. Provide a generous fold in connector to allow for movement; staple and seal closure.
    - b. Provide 26-gauge galvanized steel weather shield on top and sides of flexible duct connectors for outdoor installations. Install weather shield at same time as flexible connectors; unprotected flexible connections will be replaced with new connectors at contractor's expense if the weather shields are installed at a subsequent time.
- G. Duct sizes shown on lined duct shall be clear inside insulation.
- H. Paint the inside of ductwork visible through grilles and registers dull black.
- I. Furnish and install 1-1/2 x 1-1/2 x 3/16" closure angles around all exposed ducts through walls and ceilings. (Both sides)
- J. Furnish and install 2 x 2 x 3/16" closure angle dams around all ducts through floors. Weld corners, seal with silicone non-hardening sealant and anchor to floor.

### **3.03 FIELD QUALITY CONTROL**

- A. General
  - 1. Perform testing and provide demonstrations as specified in other HVAC Sections.
  - 2. Comply with requirements of Part 3, 23 05 00.
- B. Duct Cleaning
  - 1. Clean all ductwork in the shop prior to shipping. All ductwork shall be transported to the site in covered vans to eliminate contamination or shall be sealed prior to shipment and shall be protected from contamination at the site.
  - 2. After fabrication, and during and after installation, seal sections of open ductwork with plastic sheeting to prevent the intrusion of dirt and debris.
  - 3. After installation is complete, but before balancing and final connections are made, and with construction filters in place, blow clean all ductwork with the system fans operating at full air volume.
  - 4. All return air ductwork shall be kept sealed until all construction is complete. If the air conditioning system is used during construction, the return air ductwork system shall not be used. Other means of outlets shall be used, such as leaving doors or windows open.

### **3.04 ADJUSTING AND FINISHING**

- A. General: Comply with requirements of Part 3, 23 05 00. Adjust fan speeds as necessary.

**END OF SECTION**

## SECTION 23 31 16 – NONMETAL DUCTS

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. The requirements of the GENERAL SUPPLEMENTARY CONDITIONS, and DIVISION 1, GENERAL REQUIREMENTS, apply the work in this section.

#### 1.02 SECTION INCLUDES

- A. General: Refer to Section 23 05 00.
- B. Work Included: Provide all ductwork and ductwork accessories, auxiliaries and adjuncts for all systems as specified or shown.
- C. Work Described Elsewhere: HVAC piping, equipment, and controls are specified in other HVAC Sections.

### PART 2 - PRODUCTS

#### 2.01 DUCT WORK

- A. Factory-made Air Ducts (flexible ducts):
  - 1. Factory-made air ducts shall be approved for the use intended or shall conform to the requirements of UL 181
  - 2. Each portion of a factory-made air duct system shall be identified by the manufacturer with a label or other suitable identification indicating compliance with C.M.C. Standard No. 6-1 and its class designation. These ducts shall be listed and shall be installed in accordance with the terms of their listing.
  - 3. All factory-made air ducts must be Approved Class 0 or Class 1.
- B. Flexible Ducts: Comply with SMACNA's "Duct Construction Standards, Metal and Flexible. Owens-Corning Fiberglass Valuflex or equal, insulated, wire helix type, 6 inch W.C. min. Product shall qualify as Class I Air Duct per UL181. Inner liner shall be black where visible through registers. All flexible ductwork must have a FHC not exceeding 25/50.
- C. Flexible Ductwork - Circular Cross Section:
  - 1. Thermaflex, Anaco Flex Systems, Cal-Flex Model #2PPJ or equal insulated flexible glass fiber duct factory fabricated as a Class 1 air duct, constructed of 2-layers of polyester film 100% bonded together, encapsulating the galvanized steel wire. Insulated with fiberglass insulation and jacketed with a reinforced vapor barrier jacket listed and labeled as a Class 1 Air Duct. Tested in accordance with U.L. Standard 181. Meets all requirements of NFP 90-A & 90-B, UMC Standard 6.1, Appendix A. Inner liner shall be black where visible through registers. All flexible ductwork must have a FHC not exceeding 25/50
  - 2. R-Value shall be 8.0 or greater in accordance with ADC Flexible Duct Performance and Installation Standards.
  - 3. Joint sealant: Fiberglass Type II (glass fabric) Duct Tape with a UL 181 B-M rating and panduit strap, as detailed on drawings.

### PART 3 - EXECUTION

#### 3.01 APPLICATIONS

- A. Flexible Fibrous Glass Duct (FFG): Use (FFG) only where specifically called for on the drawings, as connection between terminal boxes and air outlets.
- B. All ductwork shall comply with the C.M.C and the local jurisdiction's addendum.
- C. Flexible Fibrous Glass Ducts (FFG) - install as follows:
  - 1. In a single piece not exceeding 5 feet in length downstream of terminal boxes (low pressure) and in a single piece not exceeding 3 feet in length upstream of terminal boxes (medium pressure).

2. With each section carrying a UL Class I label.
  3. With no sharp bends. Do not bend size 4" through 12" diameter in excess of 180° in a 6 ft. length; do not bend sizes over 12" diameter in excess of 90° in a 6 ft. length.
  4. Listed flexible duct: Install flexible duct as per manufacturers instructions. With all metal-to-metal connections secured with Panduit PLT-8H clamps or stainless steel cinch clamp, apply duct sealant between the end of the duct and the collar in a 2-inch band and clamp as described above. Allow at least 48 hours before pressure testing.
  5. Supported at 4 ft. centers with 24 gauge, 12" galvanized saddles.
- D. Flexible Fibrous Glass Ducts (FFG) – shall not be used to replace rigid elbows or fittings per the CMC.

### **3.02 FIELD QUALITY CONTROL**

- A. General
1. Perform testing and provide demonstrations as specified in other HVAC Sections.
  2. Comply with requirements of Part 3, Section 23 05 00.
- B. Duct Penetrations:
1. Where ducts penetrate fire separations in the building, provide fire dampers or smoke/fire dampers as specified, shown and required by code.
- C. Demonstrations: Before enclosing ductwork operate each fire damper and smoke/fire damper in the presence of the Owners representative to show that each damper is functional.
- D. Inspections: Evidence of poor fabrication or installation, as disclosed by job site inspections, will be cause for rejection; replacement or repair of defective work shall be done at no additional cost to the Owner.

**END OF SECTION**

## SECTION 23 33 13 - DAMPERS

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, and DIVISION 1, GENERAL REQUIREMENTS, apply to the work in this section.
- B. Section 23 05 00, General Mechanical Requirements applies to this section.

#### 1.02 QUALITY ASSURANCE

- A. All HVAC equipment shall comply with California Code of Regulations, Title-24, Part 6, latest edition.
- B. Comply with UL 1/81 and UL 181A for ducts and closures.

### PART 2 - PRODUCTS

#### 2.01 DAMPERS

- A. All dampers for use in low temperature air below 50° F duct shall have non-conducting composite damper shafts with shaft bearings and air seats.
- B. Manual Dampers:
  - 1. Round Ductwork 16" and smaller (low pressure):
    - a. Butterfly type, volume dampers.
    - b. Provide locking mechanism shall be provided on either the quadrants or end bearings. Ventlock or equal. Damper blade shall be a minimum of 22 gauge, but not less than two gauges more than the duct gauge.
    - c. All duct penetrations shall be gasketed to prevent air leakage.
    - d. Provide stand-offs as required for specified insulation thickness (see section 23 07 13).
    - e. Continuous 3/8" min rod shall be provided.
    - f. In locations where ducts are exposed use Ventlok #688 damper regulator for low pressure applications.
  - 2. Rectangular Ductwork 12" high and smaller (low pressure):
    - a. Rectangular volume dampers shall be Air Balance #111 or equal.
  - 3. Rectangular Ductwork larger than 12" high (low pressure):
    - a. Rectangular volume dampers shall be Air Balance #AC-2 or equal.
- C. Control Dampers:
  - 1. Ruskin CD-50, or equal, and shall be low leakage damper, with published leakage data certified under the AMCA certified ratings program showing leakage through a 48" x 48" damper at 4 in. w.g. pressure difference to be less than 6.2 cfm per sq. ft. Same published leakage data shall also include leakage information for all available damper sizes at pressure differences from 1 in. w.g. through 12 in. w.g.
  - 2. Low leakage dampers shall meet the following minimum construction standards: Frames shall be 5" x 1" x .125" minimum 6063T5 extruded aluminum hat channel with hat mounting flanges on both sides of the frame.
  - 3. Each corner shall be reinforced with two die formed internal braces and machine staked for maximum rigidity.
  - 4. Blades shall be airfoil type extruded aluminum (maximum 6" depth) with integral structural reinforcing tube running full length of each blade.
  - 5. Blade edge seals shall be extruded vinyl double edge design with inflatable pocket which enables air pressure from either direction to assist in blade-to-blade seal off. Blade seals shall be locked in extruded blade slots without use of cement, yet shall be easily replaceable in field.



6. Bearings shall be non-corrosive two piece molded synthetic. Axles shall be square or hexagonal, round are not acceptable, to provide positive locking connection to blades and linkage.
7. Linkage shall be concealed in frame.
8. Damper manufacturer's literature shall include performance data developed from testing in accordance with AMCA Standard 500 in an AMCA APPROVED LABORATORY showing pressure drop for all sizes of dampers required at all anticipated air flow rates.
9. Controls/Actuators will be furnished and mounted by others.

### **PART 3 - EXECUTION**

#### **3.01 DAMPERS**

- A. Install duct accessories according to applicable portions of details of construction as shown in SMACNA standards.
- B. Install volume-control dampers in lined duct with methods to avoid damage to liner and to avoid erosion of duct liner.
- C. Ductwork shall comply with Chapter 6 C.M.C.
- D. Where ducts penetrate fire separations in the building, provide fire dampers or smoke/fire dampers as specified, shown and required by code.
- E. Balancing Dampers
  1. Provide balancing dampers (same as volume dampers specified in this section) where shown on drawings and any other locations required to achieve proper system air balance. In general, balancing dampers are required at all zone supply air ducts from supply air plenums, equipment, and in ducts to supply and return air grilles. All dampers shall be placed as shown. Minimum of seven duct diameters prior to the diffuser or register.
  2. Damper operators shall be installed in either to side or bottom of ductwork.

**END OF SECTION**

**SECTION 23 33 43 – FLEXIBLE CONNECTORS**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

- A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, and DIVISION 1, GENERAL REQUIREMENTS, apply to the work in this section.
- B. Section 23 05 00, General Mechanical Requirements applies to this section

**1.02 QUALITY ASSURANCE**

- A. All HVAC equipment shall comply with California Code of Regulations, Title 24, Part 6, latest edition.
- B. Comply with UL 181 and UL 181A for ducts and closures.

**PART 2 - PRODUCTS**

**2.01 EQUIPMENT**

- A. Flexible Connectors: Ventlok, flexible fabric, Duralon Flexible fabric with Metalfab connectors at connections to fans and air handling equipment.
  - 1. Comply with UL 181, Class 1.
  - 2. Minimum fabric weight 26 oz. / sq. yd. ± 2 oz., thickness 0.019".
  - 3. Ventfabrics Inc. Ventlon, or equal, for exterior applications, resistant to sunlight, ozone and weather.
  - 4. Ventfabrics Inc. Ventglass, or equal, for interior applications.
  - 5. Complies with Underwriters Laboratories Standard # 214 for fire retardancy, and is accepted by the National Fire Protection Association for vibration isolation connectors in duct systems as covered by Paragraph 2-1.2.3 NFPA Bulletin #90A.
  - 6. Bonding Agent, Ventfabrics # 655 Adhesive or equal.

**PART 3 - EXECUTION**

**3.01 DUCTWORK AUXILIARIES**

- A. Flexible Connectors
  - 1. Install duct sections being fitted with a flexible connector with a 3" minimum gap between the ends being bridged by the flexible connector. Provide a generous fold in connector to allow for movement; staple and seal closure.
  - 2. Provide 26-gauge galvanized steel weather shield on top and sides of flexible duct connectors for outdoor installations. Install weather shield at same time as flexible connectors; unprotected flexible connections will be replaced with new connectors at contractor's expense if the weather shields are installed at a subsequent time.
  - 3. Ductwork shall be supported separately from the fan within 3 feet of the flexible connection.

**END OF SECTION**

**SECTION 23 74 33 – PACKAGED ROOFTOP AIR CONDITIONING UNITS**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

- A. The Requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, and DIVISION 1, GENERAL REQUIREMENTS, apply to the work in this section.

**1.02 DESCRIPTION**

- A. Work Included:
  - 1. Provide all equipment and accessories for the packaged rooftop gas/electric air conditioning units as specified herein.
  - 2. Controls and Instrumentation as specified herein.
- B. Starters.
- C. Electrical power connections.

**1.03 SCOPE**

- A. Installation of packaged, gas/electric, rooftop air conditioning units. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

**1.04 RELATED DOCUMENTS**

- A. This Section includes rooftop heating and cooling units.

**1.05 SUBMITTALS**

- A. Product Data: Include manufacturer's technical data for each model indicated, including rated capacities of selected model clearly indicated; dimensions; required clearances; shipping, installed, and operating weights; furnished specialties; accessories; and installation and startup instructions.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, components, and location and size of each field connection.
- C. Commissioning Reports: Indicate results of startup and testing commissioning requirements. Submit copies of checklists.
- D. Maintenance Data: Maintenance manuals specified in Division 1.
- E. Warranties: Special warranties specified in this Section.

**1.06 QUALITY ASSURANCE**

- A. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."
- B. Energy Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings" and Title 24 California Codes.
- C. Listing and Labeling: Provide electrically operated components specified in this Section that are listed and labeled.
  - 1. The rooftop unit(s) shall be certified in accordance with UL Standard 1995 and ANSI Standard Z21.47
  - 2. The rooftop unit(s) shall be safety certified by an accredited testing laboratory and the nameplate shall carry the label of the certification agency.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver rooftop units as factory-assembled units with protective crating and covering as recommended by the manufacturer.
- B. Coordinate delivery of units in sufficient time to allow movement into building.
- C. Handle rooftop units to comply with manufacturers written rigging and installation instructions for unloading and moving to final location.

### **1.08 COORDINATION**

- A. Coordinate installation of roof curbs, roof plenums, equipment supports, and roof penetrations with roof construction. Roof specialties are specified in Division 7 Sections.

### **1.09 WARRANTY**

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: A written warranty, executed by the manufacturer and signed by the Contractor, agreeing to replace components that fail in materials or workmanship, within the specified warranty period, provided manufacturer's written instructions for installation, operation, and maintenance have been followed.
  - 1. Warranty Period, Compressors: Manufacturers standard, but not less than 5 years after date of startup.
  - 2. Warranty Period, Heat Exchangers: Manufacturers non- prorated full parts replacement not less than 15 years after date of startup.

### **1.10 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
  - 1. Filters: One set of 4" filters for each unit to be installed prior to air balance.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Manufacturers:
  - 1. Carrier, Trane or equal.

### **2.02 ROOFTOP UNITS**

- A. Description: Factory assembled and tested; designed for roof or slab installation; and consisting of compressors, condensers, evaporator coils, condenser and evaporator fans, refrigeration and temperature controls, gas heater, filters, and dampers.
- B. Construction
  - 1. Unit shall be completely factory assembled, piped and wired and shipped in one section.
  - 2. Unit shall be specifically designed for outdoor roof top application with a fully weatherproof cabinet.
  - 3. Cabinet shall be constructed entirely of G90 galvanized steel with the exterior constructed of 18 gauge or heavier material.
  - 4. All openings through the base pan of the unit shall have upturned flanges of at least ½ inch in height around the opening through the base.
  - 5. Paint finish shall be capable of withstanding at least 2000 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.
  - 6. The unit roof shall be sloped or cross broken to assure drainage.
  - 7. Access to compressor(s), controls, filters, blower, heating section, and other items needing periodic checking or maintenance shall be through hinged access doors with a quarter turn latch.
  - 8. Unit specific color coded wiring diagrams shall match the unit color coded wiring and will be provided in both point-to-point and ladder form.
  - 9. Diagrams shall also be laminated in plastic and permanently affixed inside the control compartment.
  - 10. Access doors shall have stainless steel hinges and full perimeter gasketing.

11. Air side service access doors shall have rain brake overhangs.
12. All access doors will have an internal metal liner to protect the door insulation.
13. The interior air side of the cabinet shall be entirely insulated on all exterior panels with 1 inch thick, 1 1/2 lb. density fiberglass insulation.
14. Unit shall have decals and tags to indicate unit lifting and rigging, service areas and caution areas. Installation and maintenance manuals shall be supplied with each unit, located in a metal pocket in the control access section.
15. Unit shall have a 316 stainless steel, double sloping drain pan.

C. Supply Fans

1. The fan(s) shall be belt drive single width single inlet airfoil centrifugal, plenum fan. Blower(s) shall be entirely self contained on a slide deck for service and removal from cabinet. Adjustable V-belt drive shall be provided with a minimum 140% of the nameplate brake horsepower when the adjustable pulley is at the minimum RPM. Fan(s) and motor(s) shall be dynamically balanced.

D. Outside Air System

1. Shall be a fully modulating, sensible controlled economizer with multistage integrated economizer and compressor operation for maximum benefit. The economizer shall consist of a motor operated outdoor air damper and return air damper assembly constructed of extruded aluminum, hollow core, air foil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 25 CFM of leakage per sq. ft. of damper area when subjected to 2 in. w.g. air pressure differential across the damper. Damper motor shall be spring return to ensure closing of outdoor air damper during periods of unit shut down or power failure. Where indicated on controls drawings furnish actuator to accept a 0 to 10 volt D.C. signal by controls contractor. Economizer damper assembly shall be entirely self contained on a slide deck for service and removal from cabinet.
2. Exhaust/Relief Fans
3. The fan(s) shall be belt drive forward curve or plenum style. Adjustable V-belt drive shall be provided with a minimum 140% of the nameplate brake horsepower when the adjustable pulley is at the minimum RPM. Fan(s) and motor(s) shall be dynamically balanced. Provide modulating exhaust flow rate to maintain room pressure requirements. Modulate flow using an airfoil opposed blade damper using a null pressure control, as indicated on controls drawings and plans.

E. Motors

1. Motors shall be Energy + Plus efficiency as manufactured by Baldor, Toshiba, or Reliance. Motor bearings shall be ball bearing and shall have lubrication connections.

F. Condenser

1. The condensing section shall be equipped with direct drive, vertical discharge condenser fan(s). The condenser coil shall be sloped at least 30 degrees from horizontal to protect the coil from damage. Provide condenser coil anti vandalism guards manufactured from 13 gauge steel expanded metal on each unit installed at the factory.

G. Filters

1. 4" thick, fiberglass, pleated with an ASHRAE efficiency of 30%. Face velocity not to exceed 500 FPM.

H. Evaporator Coils Shall be constructed as follows:

1. Copper tube with aluminum fins mechanically bonded to the tubes.
2. Rated in accordance with ARI Standard 410.
3. Have galvanized steel end casings.
4. Have equalizing type vertical tube headers.
5. Furnished with a thermostatic expansion valve.

I. Refrigeration System

1. Compressors shall be scroll type with internal thermal overload protection and mounted on the compressor manufacturer's recommended rubber vibration isolators.
2. All units 8 tons and above shall be multiple stages with a minimum of 2 stages of capacity control.
3. Compressors shall be mounted in an isolated compartment to permit operation of the unit without affecting condenser air flow when the door to the compartment is open.
4. Compressors shall be isolated from the base pan and supply air to avoid any transmission of noise from the compressor into the building area.
5. System shall be equipped with thermostatic expansion valve type refrigerant flow control.
6. System shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant controls.
7. Unit shall be equipped with Schrader type service fittings on both the high side and low pressure sides of the system.
8. Unit shall be fully factory charged with refrigerant.
9. Options: (Multiple selections are permissible)
  - a. All circuits shall be equipped with liquid line sight glasses.
  - b. Unit shall be equipped with a 5 minute anti-short cycle delay timer for each stage.
  - c. Unit shall be equipped with 20 second between stage delay timers for each stage.

J. Gas Heat Section

1. Unit shall heat using natural gas fuel and with a two stages of heat capacity.
2. Unit shall be provided with a gas heating furnace(s) consisting of an aluminized tubular steel heat exchanger with multiple concavities, an induced draft blower and an electric pressure switch to lockout the gas valve until the combustion chamber is purged and combustion air flow is established. Drum type heat exchangers or heat exchanger tubes with separate internal turbulators are not acceptable.
3. Unit shall be provided with a gas ignition system consisting of an electronic ignitor to a pilot system, which will be continuous when the heater is operating, but will shut off the pilot when heating is not required.
  - a. Unit shall be equipped with redundant gas valves and high limit cut-out.
  - b. Unit shall have gas supply piping entrances in the unit base for through the curb gas piping and in the outside cabinet wall for across the roof gas piping.
4. The gas heat exchanger shall carry a 15 year non pro-rated warranty.

K. Controls

1. Provide controls system as indicated on controls drawing and plans. Dependent on controls layout furnish unit as follows:
  - a. Smoke Detector (Only for units 2000 cfm and greater and per applicable code. See Equipment schedule)
  - b. When scheduled unit shall be provided with a smoke detector sensing in the supply air wired to shut off the supply fan on detection of smoke.

L. Power Option

1. Unit shall be provided with a 115 volt ground fault service receptacle factory wired using transformer on the inside of the unit. (See Schedule For Locations). Division 16 shall provide connections to the transformer.

M. Screws

1. Provide tamper proof screws as directed by the Sacramento Unified School District Representative.

**2.03 ROOF CURBS**

- A. Unit shall be mounted on a factory furnished fully welded, airtight, roof curb. Roof curbs shall be constructed of galvanized steel. Curbs are to be fully gasketed between the curb top and unit bottom with the curb providing full perimeter support, cross structure support and air seal for the unit. All welds shall be complete to provide complete structural integrity.

**2.04 ROOF SUPPLY AND RETURN PLENUM CURBS**

- A. Provide a horizontal discharge plenum manufactured of minimum 18 gauge galvanized steel fully welded and sealed airtight. Plenum shall be internally insulated and include separation baffle between supply and return air streams. All welds shall be complete to provide complete structural integrity.

**END OF SECTION**

## SECTION 26 00 00 ELECTRICAL WORK

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. The Requirements of General Conditions and Special Conditions apply to Work of this Section as if fully repeated herein.

## 1.2 WORK INCLUDED

- A. Provide a complete working installation with all material and equipment as shown and specified.
- B. Provide submittals and shop drawings.
- C. Make electrical connections for equipment furnished as part of Work of other Sections.
- D. Include sealing and fireproofing of conduits and cables.
- E. Electrical products shall be anchored and fastened to building elements and finishes as follows:
  - 1. Concrete Structural Elements: Provide expansion anchors and powder actuated anchors.
  - 2. Steel Structural Elements: Provide beam clamps and spring steel clips.
  - 3. Concrete Surfaces: Provide expansion anchors.
  - 4. Solid Masonry Walls: Provide expansion anchors.
  - 5. Sheet Metal: Provide sheet metal screws.
  - 6. Wood Elements: Provide wood screws.
- F. Provide as-built drawings.

## 1.3 QUALITY ASSURANCES

- A. Requirements of Regulatory Agencies:
  - 1. Nothing in the Contract Documents shall be construed to permit Work not conforming to applicable codes, laws, ordinances, rules or regulations.
  - 2. All installed or connected equipment shall be labeled or certified for its use by a nationally recognized testing laboratory.
  - 3. All materials and equipment shall be installed in accordance with manufacturer's recommendations and in accordance with the National Electrical Contractors Association (NECA) Standard of Installation.

## 1.4 PERMITS, FEES AND INSPECTIONS

- A. Contractor shall obtain all permits and arrange for Owner to pay required fees to any governmental agency or utility company having jurisdiction over the work of this Section. Inspections required by any local ordinances or utility companies during construction shall be arranged by the Contractor.



- B. All work and materials covered by these specifications and accompanying drawings shall at all times be subject to inspection by the Architect or his representative. Any material not in accordance with the plans and specifications, or not installed in a neat and workmanlike manner, shall, upon order from the Architect, be removed from the premises or corrective action taken within three (3) days; and if material in question has been installed, the entire expense for removing and reinstalling shall be borne by the Contractor.
- C. On completion of the work, satisfactory evidence shall be furnished to the Architect to show that all work has been installed in accordance with the Codes.

## 1.5 SPECIFICATIONS AND CONTRACT DRAWINGS

- A. Accuracy of data given herein and on the drawings is as exact as could be secured, but their extreme accuracy is not guaranteed. The drawings and specifications are for the assistance and guidance of the Contractor and exact locations, distances, levels, etc., will be governed by the construction and the Contractor shall accept same with this understanding.
- B. Layouts of equipment, accessories and wiring systems are diagrammatic (not pictorial and not exact), but shall be followed as closely as possible. Architectural, structural, mechanical, and other drawings shall be examined noting all conditions that may affect this work. Where connections to equipment provided by other divisions are shown on electrical drawings, refer to drawings of respective division for exact locations and electrical requirements of equipment.
- C. Report conflicting conditions to the Architect for adjustment before proceeding with work. Should Contractor proceed with work without reporting conflict(s), he does so on his own responsibility, and shall alter work if directed by the Architect, at his own expense.
- D. Right is reserved to make minor changes in locations of equipment and wiring systems shown, providing change is ordered before conduit runs and/or work directly connected to same is installed and no extra materials are required.
- E. Drawings and specifications may be superseded by later detail specification and detail drawings prepared by the Architect, and the Contractor shall conform to them and to such reasonable changes in the contract drawings as may be called for by these revised drawings without extra cost to the Owner.
- F. Contractor may request additional detail(s) and such shall be conformed to, without additional cost. Contractor may offer alternate detail(s), but such detail(s) shall be approved by Architect and authority having jurisdiction

## 1.6 SUBMITTALS

- A. Submission Requirements
  1. Contractor is responsible for the scheduling of submittals in order to avoid detrimental impact to the construction schedule and to support the timely sequence of the Work. Allow a minimum of 15-working days for submittal review by the Engineer. Complex submittals or submittals which are not provided as complete packages may take longer than 15-working days for review. Contractor should allow time for potential rejection and re-submittal of submittals which are being offered as substitution to the specified products.
  2. Contractor shall review submittals for completeness, coordination and conflicts between subcontractors and other work in the Contract Documents. Submittals made by Contractor which are not thoroughly reviewed by the Contractor will be returned. Submittals

- which vary significantly from the Contract Documents and are not so identified prior to submission, will be returned to the Contractor without review.
3. Make submissions within following number of days from issuance of Notice to Proceed or Start Letter
    - a. Items needed in initial stages of Work or requiring long lead-time for ordering: 15 calendar days.
    - b. All other items: 21 calendar days.
  4. Before submitting a shop drawing or any related material, Contractor shall: review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, all of which are the sole responsibility of the Contractor; approve each such submission before submitting it; and stamp each such submission before submitting it. Engineer shall assume that no shop drawing or related submittal comprises a variation unless the Contractor advises the Engineer otherwise via a written instrument which is acknowledged by the Engineer in writing.
  5. Engineer will check submittals for conformance with design concepts of project. Approval covers only such conformance. Effort will be made by Engineer to discover any errors, but responsibility for accuracy and correctness of all submittals shall be with the Contractor.
  6. Approval of submittals will be on a general basis only and shall not relieve the Contractor from their responsibility for proper fitting and construction of the Work, nor from furnishing materials and labor required by the Contract which may not be indicated on the submittals when approved.
  7. No portion of the work requiring submittals shall be commenced until the submittal for that portion of the work has been approved by Engineer. All such portions of work shall be in accordance with the approved submittal. Any work performed without approved submittals will be done so at the Contractor's own risk. Work found not to be in compliance with the approved submittals shall be removed and corrected at the Contractor's own expense.
  8. Number of Copies Required - Contractor shall submit following number of copies:
    - a. Shop Drawings: 1-electronic copy in PDF format.
    - b. Product Data/Material Lists: 1-electronic copy in PDF format.
    - c. Samples: As specifically indicated in pertinent specification section.
    - d. Substitution Request: 1-copy in PDF format
  9. Submittals shall include (where applicable):
    - a. Date and revision dates.
    - b. Project title and number.
    - c. The names of Architect, Engineer, Contractor, Subcontractor and supplier or manufacturer.
    - d. Identification of product or material.
    - e. Relation to adjacent structure or material.
    - f. Field dimensions, clearly identified as such.
    - g. Specification section number.
    - h. A blank space for Engineer's stamp.
    - i. Contractor's stamp on each, initialed or signed, certifying that submittal was reviewed, field measurements have been verified and submittal is in compliance with the applicable specification section and the overall Contract Documents.
  10. Incomplete, inaccurate or non-complying submittals requiring revisions, re-submittal and additional review time, shall not be considered as a basis for Contract time extension.
  11. Two reviews will be made for each submittal. Additional reviews will be charged to the Contractor. A rejection of a submittal or review of a partially presented submittal constitutes one submittal review. Incomplete submittals, such as product data submitted without required shop drawings, will be returned without review.

**B. Required Submittals**

1. Various specification sections may state additional information to be submitted.
2. Submittals are required for all materials even though the submitted material may be exactly as specified in the Project Manual.
3. Electrical Materials Submittal:
  - a. Submit product data only for materials that are being substituted. Product data is not required for materials that are being provided as specified.
  - b. Electrical materials include raceway, boxes, supports, finish material, etc.
4. Electrical Equipment Submittal:
  - a. Submit product data for all equipment.
  - b. Electrical equipment includes panelboards, switchboards, transformers, underground pullboxes, floor boxes, light fixtures, etc.
5. Low Voltage and Control Systems Submittals:
  - a. Provide product data for each item in the system.
  - b. Provide shop drawings for each system.
  - c. Low voltage and control systems include lighting controls, sound communications, fire alarm, etc.

**C. Product Data**

1. Manufacturer's Standard Schematic Drawings:
  - a. Modify drawings to delete information which is not applicable to the Project.
  - b. Supplement standard information to provide additional information which is applicable to the Project.
2. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.
  - a. Clearly mark each copy to identify pertinent materials, products or models. Mark out or remove all extraneous information.
  - b. Show dimensions and clearances required.
  - c. Show performance characteristics and capacities.
  - d. Show wiring diagrams and controls.

**D. Shop Drawings**

1. Submit shop drawings as a copy of the original set maintained by the Contractor. Shop drawings are to include the name of the project, the name of Contractor and are to be numbered consecutively. Provide legible and complete copies in every respect. Provide quantity as described below. Do not reproduce bid document drawings in lieu of Contractor or subcontractor produced shop drawings.
2. Contract documents define the general scope of work. Contractor's submittal shall not be a duplication of the contract drawings, but shall be a result of site and system investigation and shall show all the work required. Do not reproduce bid document drawings in lieu of Contractor or subcontractor produced shop drawings.
3. If shop drawings show variations from Contract requirements because of standard shop practice or other reason, make specific mention of such variations in letter of transmittal, as well as on drawings, in order that (if acceptable) suitable action may be taken for proper adjustment of the Contract Documents. Unless specific changes have been noted and approved, no deviations from Contract Documents will be accepted.
4. If the shop drawings are accepted or rejected, all reviewed and stamped copies will be distributed to all parties. If corrections are required, the Contractor is responsible for making the necessary corrections and re-submitting the shop drawings in a timely fashion as

to not affect the project schedule. The Contractor must secure final acceptance prior to commencing work involved.

#### E. Substitutions

1. Engineer's Approval Required:
  - a. Contract is based on materials, equipment and methods described in Contract Documents. Substitutions will not be reviewed and approved prior to the award of the contract.
  - b. Engineer will consider proposals during the submittal process for substitution of materials, equipment and methods only when such proposals are accompanied by full and complete technical data and all other information required by Engineer to evaluate proposed substitution. Substitution shall be submitted with completed Substitution Request Form.
  - c. Do not substitute materials, equipment or methods unless such substitution has been specifically approved for this work by Engineer.
2. "Or Equal": Whenever, in Contract Documents, any material, process or specified patent or proprietary name and/or by name of manufacturer is indicated, such name shall be deemed to be used for purpose of facilitating description of material and/or process desired, and shall be deemed to be followed by the words "or equal", or "accepted equal", and Contractor may offer any material or process which shall be equal in every respect to that so indicated or specified; provided, however, that if material, process or article offered by Contractor is not, in opinion of Architect, equal in every respect to that specified, then Contractor must furnish material, process or article specified or one that in opinion of Engineer is equal thereof in every respect.
3. "No Substitutions": Items indicated as "No Substitutions" must be provided as specified and no alternates will be allowed. These items are required either due to District standards by the Board or to match materials recently installed by others.
4. Coordination: Approval of substitution shall not relieve Contractor from responsibility for compliance with all requirements of Drawings and Project Manual, and Contractor shall be responsible at his own expense for any changes in other parts of his own work or work of others which may be caused by approved substitution.
5. DSA Approval: Substitutions of certain items may cause such items to require a Deferred Approval by DSA. Should a DSA Deferred Approval be required, the Contractor shall provide all information and documents necessary to complete the Deferred Approval process without any additional costs to the Owner, including engineering, calculation and modification of substitute products.

### 1.7 OPERATION AND MAINTENANCE MANUALS

- A. General: Contractor shall incorporate in Maintenance/Operation Manual(s) all brochures, manufacturer's catalogs and written instructions for equipment and materials needing regular care or maintenance and other items as required elsewhere in project documents. Prepare all such manuals in durable plastic loose leaf binders size to accommodate 8-1/2 x 11 sheets with following minimum data:
  1. Identification on or readable through, front cover stating general nature of manual.
  2. Neatly typewritten index of all contents.
  3. Site plan and building plans indicating location of equipment referenced (reduced scale).
  4. Complete instructions regarding operation, maintenance, replacement instructions and programming instructions of all equipment involved.
  5. Complete nomenclature of all replaceable parts, their part numbers, current cost and name and address of nearest vendor of parts.

6. Copy of all guarantees and warranties issued, in a separate binder as specified in this section.
  7. Copy of approved shop drawings (reduced scale) with all data concerning changes made during construction.
- B. Extraneous Data:
1. Where contents of manuals include manufacturer's catalog pages, clearly indicate precise items included in the Project installation and delete, or otherwise clearly indicate, all manufacturer's data with which the Project installation is not concerned.
- C. Materials shall be organized in a logical and consistent manner, by specification section number, with separating tabs clearly marked.
- D. Data shall be provided for:
1. Panelboards
  2. Switchboards
  3. Transformers
  4. Lighting Fixtures
  5. Lighting Control System
  6. Stage Lighting System
  7. Emergency Lighting System
  8. Sound and Signal Systems
  9. Intrusion Alarm System
  10. Clock System
  11. Fire Alarm System
  12. AV Systems
  13. Telephone System
- E. In addition to the requirements above, contractor shall provide final programming information to District on disk for all systems requiring programming.
- 1.8 RECORD DRAWINGS (AS-BUILTS)
- A. At time of installation, installed locations of all underground work shall be recorded on prints by Contractor, and reviewed with Inspector. Record drawings are to be maintained and adjusted on a daily basis by the Contractor.
- B. All information entered on drawings copy shall be neat, legible and emphasized by drawing "clouds" around changed items. Changes shall be made in an accurate manner by a qualified draftsman acceptable to Architect. Completed Record Drawings shall be signed by the Contractor.
- C. Locate and dimension all major equipment and underground work, including stubs and pull-boxes. Provide dimensions from curbs, foundations, or other permanent landmarks.
- D. All symbols and designations used in preparing record drawings shall match those used in the Contract Drawings.
- E. Record drawing shall be up-dated monthly.
- F. Record drawing signoff:

1. At such time that the underground work has been completed, all the contractors and sub contractors notes, sketch and miscellaneous drawings documenting installed locations not currently part of the ongoing record drawing set shall be transferred. These updates shall be reviewed for accuracy by the inspector of record and architect. Once all corrections have been completed the inspector shall sign and date the record set coversheet noting it as acceptance of the underground phase of record drawings.
2. At project completion, the record drawings shall be submitted by the contractor for project inspector and architect review and comment. These will be returned to the contractor for revisions. Once all corrections have been completed the inspector shall sign and date the record set coversheet noting it as acceptance of the completed record drawings. The original record drawings are to be resubmitted to the architect along with a scanned electronic file set in PDF format with file names matching the drawing titles.

#### 1.9 GUARANTEES

- A. Standard Guarantee: Provide individual as well as overall guarantees for all work executed under this Contract or any extra work to be absolutely free of all defects of workmanship and materials for a period of two years from the date of filing of notice of completion and acceptance by Owner. Repair and make good all such defects and repair any damage to other work caused thereby which may occur during same period at no cost to the owner.
- B. Indicate on Guarantee Form specific provisions required by individual specification sections. List all special requirements, extended periods, bonding, etc.
- C. Additional Guarantees: Provide additional guarantees (in excess of year(s) required by Standard Guarantee) where specifically required by pertinent Specification Sections.
- D. Binder: Provide a binder with all guarantees placed in the order in which they occur in the project manual. Include an Index of Guarantees listing each specification section, specific items covered and length of guarantee for each item.

#### 1.10 SITE EXAMINATION AND CONDITIONS

- A. Examine site; verify dimensions and locations against Drawings and become informed of all conditions under which Work is to be done before submitting proposals.
- B. Where signal systems exist, and services of other firms are required, Contractor shall instruct those firms to investigate existing systems and determine labor and materials needed to add devices or modify systems.
- C. Where new conduits are to be run underground at existing sites, contractor shall visit site prior to bidding and walk routes of new underground conduits, note areas of concrete and asphalt being crossed, and include in bid all costs for cutting and patching.
- D. Where existing conduits are shown, their location is diagrammatic and their exact location may not be known.
- E. No allowances shall subsequently be made in Contractor's behalf for any extra expense to which he or his "subs" may be put due to failure or neglect to discover conditions affecting the work.

#### 1.11 UTILITY COMPANY COORDINATION:

- A. Immediately after award of contract, Contractor shall contact utility company representatives for power, telephone, and TV services. Contractor shall obtain specific requirements and details from respective representative. Contractor shall discuss the aspects of the project related to services and coordinate scheduling of the work and inspections required by utility companies.

#### 1.12 UNDERGROUND UTILITIES:

- A. Existing underground utilities, services, circuits, piping, irrigation piping, etc., are present, but their exact locations are not known. Contractor shall locate and protect before trenching or excavating in any area. Consult utility companies, "as-built drawings" and Owner's maintenance personnel for location of existing underground work. If existing piping or utilities are damaged during construction. Contractor shall repair immediately at own expense. New underground work shall be modified as necessary to conform to existing conditions.

#### 1.13 CLEANING AND CLEANUP

- A. After all work has been accomplished such as sanding, painting, etc., lighting fixtures, panelboards, and switchboards shall be cleaned to remove all dust, dirt, grease, paint, or other marks. All electrical equipment shall be left in a clean condition inside and out, satisfactory to the Architect. Keep buildings and premises free from accumulated waste materials, rubbish, and debris resulting from work herein, and, upon completion of said work, remove tools, appliances, surplus materials, waste materials, rubbish, debris, and accessory items used in or resulting from said work and legally dispose of off the site.

#### 1.14 PROTECTION

- A. The Contractor shall protect from damage during construction the work and materials of other trades as well as the electrical work and material. Electrical equipment stored and installed on the job site shall be protected from dust, water, or any other damage.

#### 1.15 WORKING SPACE

- A. Adequate working space shall be provided around electrical equipment in strict compliance with the Codes. In general, provide 6'6" of headroom and 36" minimum clear work space in front of switchboards, panelboards, transformers, disconnect switches and controls for 120/208 volts and 42" for 277/480 volts. Carefully coordinate locations and orientation of electrical equipment with other divisions to ensure that working space will be clear of piping, conduits, and equipment provided by others.

#### 1.16 COOPERATION AND COORDINATION

- A. Cooperate and coordinate with other crafts in putting the installation in place at a time when the space required by this installation is accessible. Work done without regard to other crafts shall be moved at the Contractor's expense.

#### 1.17 INSPECTION

- A. The Contractor shall cooperate with the Architect and shall provide assistance at all times for the inspection of the electrical work performed under this contract. He shall remove covers,

operate machinery, or perform any reasonable work which, in the opinion of the Engineer, will be necessary to determine the quality and adequacy of the work.

#### 1.18 MANUFACTURER'S DIRECTIONS

- A. Follow manufacturer's directions where these directions cover points not included on the drawings or in the specifications. When equipment is provided by other divisions, obtain directions from respective supplier.

#### 1.19 WORKMANSHIP

- A. Good workmanship shall be evidenced in the installation of all electrical materials and equipment. Equipment shall be level, plumb and true with the structure and other equipment. All materials shall be firmly secured in place and adequately supported and permanent. The recommendations of the National Electrical Contractors Association Standard of installation shall be followed except where otherwise specifically directed.

#### 1.20 OPERATING TEST

- A. After the installation is complete, and at such time as the Engineer and other authorities having jurisdiction may request, the Contractor shall conduct an operating test for approval.

### PART 2 - PRODUCTS

#### 2.1 NOT USED

### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. Manufacturer's Directions: Follow manufacturer's directions where manufacturers of articles used furnish directions covering points not specified or shown.
- B. All Work shall be done in orderly, workmanlike manner and present neat appearing installation when completed.
- C. Provide metal backing plates, anchor plates, and similar items that are required for anchorage for the Work of this Section; securely weld or bolt to metal framing. Wood blocking or backing will not be permitted in combination with metal framing.
- D. Equipment: Accurately set and level, neatly place support and anchor properly. Anchorage shall conform to the requirements of California Building Code. No allowance will be made for negligence to foresee means of placing, installing or supporting equipment in position.
- E. Electrical products shall be anchored and fastened to building elements and finishes as follows:
  - 1. Concrete Structural Elements: Provide expansion anchors and powder actuated anchors.



2. Steel Structural Elements: Provide beam clamps and spring steel clips.
3. Concrete Surfaces: Provide expansion anchors.
4. Solid Masonry Walls: Provide expansion anchors.
5. Sheet Metal: Provide sheet metal screws.
6. Wood Elements: Provide wood screws.

### 3.2 TESTING AND ADJUSTING

- A. Furnish all labor and test equipment required for the Work of this Division. Testing work is defined as that work necessary to establish that equipment has been properly assembled, connected, and checked to verify that intent and purpose of Drawings, manufacturer's instruction manuals, and directions of Architect have been accomplished in satisfactory manner.
- B. Test each individual circuit at panel with equipment connected for proper operation.
- C. Test each individual receptacle device for proper polarity and grounding.
- D. Test each ground fault circuit interrupter for proper operation.

END OF SECTION

## SECTION 26 05 05 SELECTIVE DEMOLITION FOR ELECTRICAL

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Removal of existing electrical equipment, wiring, and conduit in areas to be remodeled; removal of designated construction; dismantling, cutting and alterations for completion of the Work.
2. Disposal of materials.
3. Storage of removed materials.
4. Identification of utilities.
5. Salvaged items.
6. Protection of items to remain as indicated on Drawings.
7. Relocate existing equipment to accommodate construction.

## 1.2 SUBMITTALS

- A. Shop Drawings: Indicate demolition and removal sequence and location of salvageable items; location and construction of temporary work. Describe demolition removal procedures and schedule.

## 1.3 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of capped utilities, conduits, and equipment abandoned in place.

## 1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with State, Municipality, Highways, and Public Work's standard.

## 1.5 SCHEDULING

- A. Schedule work to coincide with new construction.
- B. Cease operations immediately when structure appears to be in danger and notify Architect/Engineer. Do not resume operations until directed.

## 1.6 COORDINATION

- A. Conduct demolition to minimize interference with adjacent and occupied building areas.
- B. Coordinate demolition work with Owner's representative and all other disciplines.
- C. Coordinate and sequence demolition so as not to cause shutdown of operation of surrounding areas.

- D. Shut-down Periods:
  - 1. Arrange timing of shut-down periods of in service panels with Owner's representative. Do not shut down any utility without prior written approval.
  - 2. Keep shut-down period to minimum or use intermittent period as directed by Owner's representative.
  - 3. Maintain life-safety systems in full operation in occupied facilities, or provide notice minimum 72 hours in advance.
- E. Identify salvage items in cooperation with Owner.

## PART 2 - PRODUCTS

### 2.1 NOT USED

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify wiring and equipment indicated to be demolished serve only abandoned facilities.
- B. Verify termination points for demolished services.

### 3.2 PREPARATION

- A. Take care to ensure that there will be no damage to structural elements or portions thereof 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.
- B. Erect, and maintain temporary safeguards, including warning signs and lights, barricades, and similar measures, for protection of the public, Owner, Contractor's employees, and existing improvements to remain.
- C. Protect existing structures, facilities, and plant life from damage. Items damaged because of demolition operations shall be repaired or replaced, at no cost to the Owner.
- D. Temporary egress signage and emergency lighting.
- E. Existing Fire and Intrusion Alarm Systems: Maintain existing systems in service. Disable system only to make switchovers and connections. Make temporary connections to maintain service in areas adjacent to work area.
- F. Existing Telephone System: Maintain existing system in service.
- G. Existing Public Address and Clock Systems: Maintain existing systems in service. Disable system only to make switchovers and connections. Make temporary connections to maintain service in areas adjacent to work area.

### 3.3 DEMOLITION

- A. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Owner or Architect/Engineer before disturbing existing installation.
- B. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- C. Remove conduit, wire, boxes, and fastening devices to avoid any interference with new installation.
- D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit and wiring servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.
- E. Disconnect and remove abandoned panelboards and distribution equipment.
- F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- H. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
- I. Remaining Circuits and Equipment: Reinstall existing electrical installations disturbed. Certain existing electrical installations may be in walls, ceilings or floors that are to be removed and are essential for the operation of other remaining installations. Where this condition occurs provide a new extension of original circuits, raceways, equipment and outlets to retain service continuity. Installations shall be concealed in finished areas.
- J. Reconnect equipment being disturbed by renovation work and required for continue service to or nearest available panel.
- K. Disconnect or shut off service to areas where electrical work is to be removed. Remove electrical fixtures, equipment, and related switches, outlets, conduit and wiring which are not part of final project.
- L. Install temporary wiring and connections to maintain existing systems in service during construction.
- M. Perform work on energized equipment or circuits with experienced and trained personnel.
- N. Remove, relocate, and extend existing installations to accommodate new construction.
- O. Repair adjacent construction and finishes damaged during demolition and extension work.
- P. Remove exposed abandoned grounding and bonding components, fasteners and supports, and electrical identification components, including abandoned components above accessible ceiling finishes. Cut embedded support elements flush with walls and floors.
- Q. Clean and repair existing equipment to remain or to be reinstalled.
- R. Protect and retain power to existing active equipment remaining.
- S. Cap abandoned empty conduit at both ends.

## T. 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 jack-hammer within 2-inches of reinforcing or structural steel to remain; remove final 2-inches of material with chipping gun.

## 3.4 EXISTING PANELBOARDS

- A. Ring out circuits in existing panel affected by the Work. Where additional circuits are needed, reuse circuits available for reuse. Install new breakers.
- B. Tag unused circuits as spare.
- C. Where existing circuits are indicated to be reused, use sensing measuring devices to verify circuits feeding Project area or are not in use.
- D. Remove existing wire no longer in use from panel to equipment.
- E. Provide new updated directories where more than three circuits have been modified or rewired.

## 3.5 SALVAGE ITEMS

- A. Remove and protect items indicated on Drawings to be salvaged and turn over to Owner.
- B. Items of salvageable value may be removed as work progresses. Transport salvaged items from site as they are removed.

## 3.6 REUSABLE ELECTRICAL EQUIPMENT

- A. Carefully remove equipment, materials, or fixtures which are to be reused.
- B. Disconnect, remove, or relocate existing electrical material and equipment interfering with new installation.
- C. Relocate existing lighting fixtures as indicated on Drawings. Clean fixtures and re-lamp. Test fixture to see if it is in good working condition before installation at new location.

## 3.7 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.

### 3.8 CLEANING

- A. Remove demolished materials as work progresses. Legally dispose.
- B. Keep workplace neat.
- C. 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.
- D. Perform sandblasting, chipping, grinding, acid washing, etching, and other work as required by conditions encountered and new materials involved
- E. Use of acids or other cleaning agents shall include neutralizing, washing, rinsing, and drying, as applicable.
- F. Determine substrate requirements for reconditions surfaces in cooperation with the manufacturer's representative and installer of each new installer involved.
- G. 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.

### 3.9 PROTECTION OF FINISHED WORK

- A. Do not permit traffic over unprotected floor surface.

END OF SECTION 26 05 05

## SECTION 26 05 19 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes building wire and cable; service entrance cable; and wiring connectors and connections.

## 1.2 REFERENCES

- A. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- B. National Fire Protection Association:
  - 1. NFPA 70 - National Electrical Code with California Amendments.
  - 2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
- C. Underwriters Laboratories, Inc.:
  - 1. UL 1277 - Standard for Safety for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.

## 1.3 SYSTEM DESCRIPTION

- A. Product Requirements: Provide products as follows:
  - 1. Solid conductor for feeders and branch circuits 10 AWG and smaller.
  - 2. Stranded conductors for control circuits.
  - 3. Conductor not smaller than 12 AWG for power and lighting circuits.
  - 4. Conductor not smaller than 14 AWG for control circuits.
  - 5. Increase wire size in branch circuits to limit voltage drop to a maximum of 3 percent.
  - 6. 10 AWG conductors for 20 ampere or larger as designated on plans for 120 volt branch circuit home runs longer than 75 feet.
  - 7. 10 AWG conductors for 20 ampere or larger as designated on plans for 277 volt branch circuit home runs longer than 200 feet.
- B. Wiring Methods: Provide the following wiring methods:
  - 1. Concealed Dry Interior Locations: Use only building wire, Type THHN/THWN-2 insulation, in raceway.
  - 2. Exposed Dry Interior Locations: Use only building wire, Type THHN/THWN-2 insulation, in raceway.
  - 3. Above Accessible Ceilings: Use only building wire, Type THHN/THWN-2 insulation, in raceway.
  - 4. Wet or Damp Interior Locations: Use only building wire, Type THHN/THWN-2 insulation, in raceway.

5. Exterior Locations: Use only building wire, Type XHHW-2 insulation, in raceway.
6. Underground Locations: Use only building wire, Type XHHW-2 insulation, in raceway.

#### 1.4 DESIGN REQUIREMENTS

- A. Conductors shall be copper.

#### 1.5 SUBMITTALS

- A. Product Data: Submit for building wire and each cable assembly type.
- B. Test Reports: Indicate procedures and values obtained.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of components and circuits.

#### 1.7 QUALITY ASSURANCE

- A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet when tested in accordance with NFPA 262.
- B. Perform Work in accordance with State, Municipality, Highways, and Public Work's standard.
- C. Maintain one copy of each document on site.

#### 1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

#### 1.9 FIELD MEASUREMENTS

- A. Verify field measurements are as indicated on Drawings.

#### 1.10 COORDINATION

- A. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.
- B. Wire and cable routing indicated is approximate unless dimensioned.
- C. Determine required separation between wire, cable and other work. Determine cable routing to avoid interference with other work.

### PART 2 - PRODUCTS



## 2.1 BUILDING WIRE

- A. Product Description: Single conductor insulated wire.
- B. Conductor: Copper.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation Temperature Rating: 75 or 90 degrees C.
- E. Insulation Material: Thermoplastic.

## 2.2 SERVICE ENTRANCE CABLE

- A. Conductor: Copper.
- B. Insulation Voltage Rating: 600 volts.
- C. Insulation: Type SE.

## 2.3 PLASTIC TAPE:

- A. Black 7 mil thick general purpose electrical tape, Scotch 33 plus or equal.

## 2.4 INSULATING RESIN:

- A. Use two part liquid epoxy resin with resin and catalyst in premeasured, sealed mixing pouch. Scotchcast 4 or equivalent.

## 2.5 REDUCING ADAPTERS:

- A. Burndy, Thomas and Betts or approved equal.

## 2.6 TERMINATIONS

- A. Terminal Lugs for Wires 6 AWG and Smaller: Solderless, compression type copper.
- B. Lugs for Wires 4 AWG and Larger: Color keyed, compression type copper, with insulating sealing collars.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify interior of building has been protected from weather.
- B. Verify mechanical work likely to damage wire and cable has been completed.

- C. Verify raceway installation is complete and supported.

### 3.2 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.

### 3.3 EXISTING WORK

- A. Remove exposed abandoned wire and cable, including abandoned wire and cable above accessible ceiling finishes. Patch surfaces where removed cables pass through building finishes.
- B. Disconnect abandoned circuits and remove circuit wire and cable. Remove abandoned boxes when wire and cable servicing boxes is abandoned and removed. Install blank cover for abandoned boxes not removed.
- C. Provide access to existing wiring connections remaining active and requiring access. Modify installation or install access panel.
- D. Extend existing circuits using materials and methods as specified.
- E. Clean and repair existing wire and cable remaining or wire and cable to be reinstalled.

### 3.4 INSTALLATION

- A. Route wire and cable 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.
- B. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- C. Identify and color code wire and cable. Identify each conductor with its circuit number or other designation indicated.
- D. Special Techniques--Building Wire in Raceway:
  - 1. Pull conductors into raceway at same time.
  - 2. Install building wire 4 AWG and larger with pulling equipment.
- E. Special Techniques - Wiring Connections:
  - 1. Clean conductor surfaces before installing lugs and connectors.
  - 2. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
  - 3. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
  - 4. Install split bolt connectors for copper conductor splices and taps, 6 AWG and larger.

5. Install solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
  6. Install insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
  7. Encapsulate below grade splices at outlet, pull and junction boxes with specified insulating resin kits. Make all splices watertight.
  8. Install waterproof wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller in outdoor or wet locations.
  9. Where oversized cables are used to accommodate voltage drop, whether a single or parallel feeder, provide appropriate reducing adapter and conductors for termination.
- F. Install stranded conductors for branch circuits 10 AWG and smaller. Install crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under screws.
- G. Install terminal lugs on ends of 600 volt wires unless lugs are furnished on connected device, such as circuit breakers.
- H. Size lugs in accordance with manufacturer's recommendations terminating wire sizes. Install 2-hole type lugs to connect wires 4 AWG and larger to copper bus bars.
- I. For terminal lugs fastened together such as on motors, transformers, and other apparatus, or when space between studs is small enough that lugs can turn and touch each other, insulate for dielectric strength of 2-1/2 times normal potential of circuit.

### 3.5 WIRE COLOR

- A. General:
1. For wire sizes 10 AWG and smaller, install wire colors in accordance with the following:
    - a. Black and red for single phase circuits at 120/240 volts.
    - b. Black, red, and blue for circuits at 120/208 volts single or three phase.
    - c. Orange, brown, and yellow for circuits at 277/480 volts single or three phase.
  2. For wire sizes 8 AWG and larger, identify wire with colored tape at terminals, splices and boxes. Colors are as follows:
    - a. Black and red for single phase circuits at 120/240 volts.
    - b. Black, red, and blue for circuits at 120/208 volts single or three phase.
    - c. Orange, brown, and yellow for circuits at 277/480 volts single or three phase.
- B. Neutral Conductors: White. When two or more neutrals are located in one conduit, individually identify each with proper circuit number.
- C. Branch Circuit Conductors: Install three or four wire home runs with each phase uniquely color coded.
- D. Feeder Circuit Conductors: Uniquely color code each phase.
- E. Ground Conductors:
1. For 6 AWG and smaller: Green.
  2. For 4 AWG and larger: Identify with green tape at both ends and visible points including junction boxes.

3.6 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.3.1.

END OF SECTION

## SECTION 26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Rod electrodes.
  - 2. Wire.
  - 3. Mechanical connectors.
  - 4. Exothermic connections.

## 1.2 REFERENCES

- A. Institute of Electrical and Electronics Engineers:
  - 1. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
  - 2. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.
- B. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- C. National Fire Protection Association:
  - 1. NFPA 70 - National Electrical Code, with California Amendments.
  - 2. NFPA 99 - Standard for Health Care Facilities.

## 1.3 SYSTEM DESCRIPTION

- A. Grounding systems use the following elements as grounding electrodes:
  - 1. Metal underground water pipe.
  - 2. Metal building frame.
  - 3. Concrete-encased electrode.
  - 4. Ground ring.
  - 5. Rod electrode.
  - 6. Plate electrode.

## 1.4 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: 25 ohms maximum.

## 1.5 SUBMITTALS

- A. Product Data: Submit data on grounding electrodes and connections.

- B. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of components and grounding electrodes.

#### 1.7 QUALITY ASSURANCE

- A. Provide grounding materials conforming to requirements of NEC, IEEE 142, and UL labeled.
- B. Perform Work in accordance with State, Municipality, Highways, and Public Work's standard.
- C. Maintain one copy of each document on site.

#### 1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum 3 years documented experience.

#### 1.9 PRE-INSTALLATION MEETINGS

- A. Convene minimum one week prior to commencing work of this section.

#### 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.
- C. Do not deliver items to project before time of installation. Limit shipment of bulk and multiple-use materials to quantities needed for immediate installation.

#### 1.11 COORDINATION

- A. Complete grounding and bonding of building reinforcing steel prior concrete placement.

### PART 2 - PRODUCTS

#### 2.1 ROD ELECTRODES

- A. Product Description:
  - 1. Material: Copper.

2. Diameter: 0.75 inch.
3. Length: 10 feet.

B. Connector: Connector for exothermic welded connection.

## 2.2 WIRE

- A. Material: Stranded copper.
- B. Foundation Electrodes: 4/0 AWG or as indicated on drawings.
- C. Grounding Electrode Conductor: Copper conductor insulated.
- D. Bonding Conductor: Copper conductor insulated.

## 2.3 MECHANICAL CONNECTORS

- A. Description: Bronze connectors, suitable for grounding and bonding applications, in configurations required for particular installation.

## 2.4 EXOTHERMIC CONNECTIONS

- A. Product Description: Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify final backfill and compaction has been completed before driving rod electrodes.

### 3.2 PREPARATION

- A. Remove paint, rust, mill oils, surface contaminants at connection points.

### 3.3 EXISTING WORK

- A. Modify existing grounding system to maintain continuity to accommodate renovations.
- B. Extend existing grounding system using materials and methods as specified.

### 3.4 INSTALLATION

- A. Install in accordance with IEEE 142 and 1100.
- B. Install rod electrodes at locations as indicated on Drawings. Install additional rod electrodes to achieve specified resistance to ground.

- C. Install grounding and bonding conductors concealed from view.
- D. Install 4/0 AWG bare copper wire in foundation footing or as indicated on Drawings.
- E. Bond together metal siding not attached to grounded structure; bond to ground.
- F. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- G. Connect to site grounding system.
- H. Install continuous grounding using underground cold water system and building steel as grounding electrode. Where water piping is not available, install artificial station ground by means of driven rods or buried electrodes.
- I. Permanently ground entire light and power system in accordance with NEC, including service equipment, distribution panels, lighting panelboards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.
- J. Install branch circuits feeding isolated ground receptacles with separate insulated grounding conductor, connected only at isolated ground receptacle, ground terminals, and at ground bus of serving panel.
- K. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with NEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes or metal enclosures of service equipment. Ground conduits by means of grounding bushings on terminations at panelboards with installed number 12 conductor to grounding bus.
- L. Grounding electrical system using continuous metal raceway system enclosing circuit conductors in accordance with NEC.
- M. Permanently attach equipment and grounding conductors prior to energizing equipment.

### 3.5 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Grounding and Bonding: Perform inspections and tests listed in NETA ATS, Section 7.13.
- C. Perform ground resistance testing in accordance with IEEE 142.
- D. Perform leakage current tests in accordance with NFPA 99.
- E. Perform continuity testing in accordance with IEEE 142.
- F. When improper grounding is found on receptacles, check receptacles in entire project and correct. Perform retest.

### 3.6 INDEPENDENT TESTING ORGANIZATION AND PERSONNEL



- A. Obtain the services of an independent third-party testing organization to perform electrical tests.
- B. Independent testing organization and personnel shall meet the requirements of NETA ATS 3.1 and 3.2.
- C. Provide written test results and a final report of electrical tests per NETA ATS 5.4 to Engineer.

END OF SECTION

## SECTION 26 05 29 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Conduit supports.
2. Formed steel channel.
3. Spring steel clips.
4. Sleeves.
5. Mechanical sleeve seals.
6. Firestopping relating to electrical work.
7. Firestopping accessories.
8. Equipment bases and supports.

## 1.2 REFERENCES

## A. ASTM International:

1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

## B. FM Global:

1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved by Factory Mutual Research for Property Conservation.

## C. National Fire Protection Association:

1. NFPA 70 - National Electrical Code with California Amendments.

## D. Underwriters Laboratories Inc.:

1. UL 263 - Fire Tests of Building Construction and Materials.
2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
3. UL 1479 - Fire Tests of Through-Penetration Firestops.
4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
5. UL - Fire Resistance Directory.

## 1.3 DEFINITIONS

- A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

#### 1.4 SYSTEM DESCRIPTION

- A. Firestopping Materials: ASTM E119, ASTM E814, UL 263, UL 1479, to achieve fire ratings of adjacent construction in accordance with FM and UL Design Numbers noted on Drawings.
- B. Firestop interruptions to fire rated assemblies, materials, and components.

#### 1.5 PERFORMANCE REQUIREMENTS

- A. Firestopping: Conform to applicable code, FM, and UL for fire resistance ratings and surface burning characteristics.
- B. Firestopping: Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

#### 1.6 SUBMITTALS

- A. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.
- B. Product Data:
  - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
  - 2. Firestopping: Submit data on product characteristics, performance and limitation criteria.
- C. Firestopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.
- D. Design Data: Indicate load carrying capacity of trapeze hangers and hangers and supports.
- E. Submit details and calculations for support and anchors that are not specifically detailed on the Drawings where required by California Building Standards Code, California Code of Regulations, Title 24. Pre-approved systems may be used as noted below only if the pre-approval is current and accepted by the local agency having jurisdiction.
- F. Where pre-approved bracing systems will be employed, submit:
  - 1. System component brochure describing components used and detailed installation instructions.
  - 2. Loads to be transmitted to the structure at anchor points.
- G. Where pre-approved bracing systems are not used, submit details and calculations of proposed systems. Include:
  - 1. Detailed drawings and calculations showing system to be installed, stamped by a Structural Engineer registered in the state of California.
  - 2. Loads to be transmitted to the structure at anchor points.
  - 3. Submit detailed routing and installation drawings of all raceway systems requiring seismic supports for review. Include attachment points, raceway sizes and methods proposed for securing and attaching.
- H. Manufacturer's Installation Instructions:

1. Hangers and Supports: Submit special procedures and assembly of components.
2. Firestopping: Submit preparation and installation instructions.

- I. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- J. Firestopping Engineering Judgments: For conditions not covered by UL listed designs, submit judgments by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.

## 1.7 QUALITY ASSURANCE

- A. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10-inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
  1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.
  2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
    - a. Floor Penetrations Within Wall Cavities: T-Rating is not required.
- B. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.
  1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.
  2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.
- C. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.
- D. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10-inch water gage minimum positive pressure differential to achieve fire resistant rating as indicated on Drawings for floor assembly.
- E. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
- F. Perform Work in accordance with State, Municipality, Highways, and Public Work's standard.
- G. Maintain one copy of each document on site.

## 1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum 3 years documented experience.

## 1.9 PRE-INSTALLATION MEETINGS

- A. Convene minimum one week prior to commencing work of this section.

#### 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

#### 1.11 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F.
- B. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.
- C. Provide ventilation in areas to receive solvent cured materials.

### PART 2 - PRODUCTS

#### 2.1 CONDUIT SUPPORTS

- A. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.
- B. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.
- C. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.
- D. Conduit clamps - general purpose: One-hole malleable iron for surface mounted conduits.
- E. Cable Ties: High strength nylon temperature rated to 185 degrees F. Self-locking.

#### 2.2 FORMED STEEL CHANNEL

- A. Product Description: Galvanized 12 gage thick steel.

#### 2.3 SPRING STEEL CLIPS

- A. Product Description: Mounting hole and screw closure.

#### 2.4 SLEEVES

- A. Sleeves for Through Non-fire Rated Floors: 18 gage thick galvanized steel.

- B. Sleeves for Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
- C. Sleeves for Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.
- D. Fire-stopping Insulation: Glass fiber type, non-combustible.

## 2.5 MECHANICAL SLEEVE SEALS

- A. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

## 2.6 FIRESTOPPING

- A. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
  - 1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
  - 2. Foam Firestopping Compounds: Single component foam compound.
  - 3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
  - 4. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.
  - 5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
  - 6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
  - 7. Firestop Pillows: Formed mineral fiber pillows.
- B. Color: Dark gray.

## 2.7 FIRESTOPPING ACCESSORIES

- A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.
- B. Dam Material: Permanent:
  - 1. Mineral fiberboard.
  - 2. Mineral fiber matting.
  - 3. Sheet metal.
  - 4. Plywood or particle board.
  - 5. Alumina silicate fire board.
- C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

- D. General:
  - 1. Furnish UL listed products.
  - 2. Select products with rating not less than rating of wall or floor being penetrated.
- E. Non-Rated Surfaces:
  - 1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.
  - 2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify openings are ready to receive sleeves.
- B. Verify openings are ready to receive firestopping.

#### 3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
- B. Remove incompatible materials affecting bond.
- C. Install backing materials to arrest liquid material leakage.
- D. Obtain permission from Architect/Engineer before using powder-actuated anchors.
- E. Obtain permission from Architect/Engineer before drilling or cutting structural members.

#### 3.3 INSTALLATION - HANGERS AND SUPPORTS

- A. Anchors and Fasteners:
  - 1. Concrete Structural Elements: Provide precast inserts and expansion anchors.
  - 2. Steel Structural Elements: Provide beam clamps, spring steel clips, steel ramset fasteners, and welded fasteners.
  - 3. Concrete Surfaces: Provide self-drilling anchors and expansion anchors.
  - 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts.
  - 5. Solid Masonry Walls: Provide expansion anchors and preset inserts.
  - 6. Sheet Metal: Provide sheet metal screws.
  - 7. Wood Elements: Provide wood screws.
- B. Inserts:
  - 1. Install inserts for placement in concrete forms.

2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
  4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
  5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.
- C. Install conduit and raceway support and spacing in accordance with NEC.
- D. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
- E. Install multiple conduit runs on common hangers.
- F. Supports:
1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
  2. Install surface mounted cabinets and panelboards with minimum of four anchors.
  3. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch off wall.
  4. Support vertical conduit at every floor.

### 3.4 INSTALLATION - FIRESTOPPING

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.
- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating.
- D. Place intumescent coating in sufficient coats to achieve rating required.
- E. Remove dam material after firestopping material has cured.
- F. Fire Rated Surface:
1. Seal opening at floor, wall, partition, ceiling, and roof as follows:
    - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
    - b. Size sleeve allowing minimum of 1-inch void between sleeve and building element.
    - c. Pack void with backing material.
    - d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
  2. Where cable tray, bus, cable bus, conduit, wireway, and trough penetrates fire rated surface, install firestopping product in accordance with manufacturer's instructions.
- G. Non-Rated Surfaces:



1. Seal opening through non-fire rated wall, partition, floor, ceiling, and roof opening as follows:
  - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
  - b. Size sleeve allowing minimum of 1-inch void between sleeve and building element.
  - c. Install type of firestopping material recommended by manufacturer.
2. Install floor plates or ceiling plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
3. Exterior wall openings below grade: Assemble rubber links of mechanical seal to size of conduit and tighten in place, in accordance with manufacturer's instructions.
4. Interior partitions: Seal pipe penetrations at clean rooms, laboratories, hospital spaces, computer rooms, telecommunication rooms, and data rooms. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

### 3.5 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment.
- B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of formed steel channel. Brace and fasten with flanges bolted to structure.

### 3.6 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Seal with adjustable interlocking rubber links.
- B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.
- C. Set sleeves in position in forms. Provide reinforcing around sleeves.
- D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- E. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.
- F. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with fire stopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- G. Install chrome plated steel escutcheons at finished surfaces.

### 3.7 FIELD QUALITY CONTROL

- A. Inspect installed firestopping for compliance with specifications and submitted schedule.

### 3.8 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.9 PROTECTION OF FINISHED WORK

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

## SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes conduit, surface raceways, wireways, outlet boxes, pull and junction boxes, and handholes.

## 1.2 REFERENCES

- A. American National Standards Institute:
  - 1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
  - 2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
  - 3. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).
- B. National Electrical Manufacturers Association:
  - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
  - 2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
  - 3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
  - 4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
  - 5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
  - 6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
  - 7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

## 1.3 SYSTEM DESCRIPTION

- A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.
- B. Underground More than 5 feet outside Foundation Wall: Provide thickwall nonmetallic conduit. Provide cast metal boxes.
- C. Underground Within 5 feet from Foundation Wall: Provide thickwall nonmetallic conduit. Provide cast metal boxes.
- D. In Slab Above Grade: Not permitted.
- E. Below Slab on Grade: Use thickwall nonmetallic conduit. Terminate with coated rigid steel elbows and short length of coated rigid steel conduit out of concrete.
- F. Outdoor Locations, Above Grade: Provide galvanized rigid steel conduit. Provide cast metal outlet, pull, and junction boxes.

- G. Wet and Damp Locations: galvanized rigid steel conduit. Provide cast metal outlet, junction, and pull boxes. Provide flush mounting outlet box in finished areas.
- H. Concealed Dry Locations: Provide electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes where shown on drawings.
- I. Exposed Interior Dry Locations: Use rigid steel conduit or intermediate metal conduit below eight feet or where subject to damage. Use rigid steel conduit, intermediate metal conduit, or electrical metallic tubing above eight feet or in electrical, mechanical or telecommunication rooms. Use sheet-metal or cast metal boxes. Use flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

#### 1.4 DESIGN REQUIREMENTS

- A. Minimum Raceway Size:
  - 1. 0.75 inch unless otherwise specified.
  - 2. 1 inch for Homeruns unless otherwise specified.
  - 3. 1 inch for outside foundation line unless otherwise specified.

#### 1.5 SUBMITTALS

- A. Product Data: Submit for the following:
  - 1. Flexible metal conduit.
  - 2. Liquidtight flexible metal conduit.
  - 3. Nonmetallic conduit.
  - 4. Flexible nonmetallic conduit.
  - 5. Raceway fittings.
  - 6. Conduit bodies.
  - 7. Surface raceway.
  - 8. Wireway.
  - 9. Pull and junction boxes.
  - 10. Handholes.
- B. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Project Record Documents:
  - 1. Record actual routing of conduits larger than 2 inches.
  - 2. Record actual locations and mounting heights of outlet, pull, and junction boxes.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- B. Protect PVC conduit from sunlight.

## 1.8 COORDINATION

- A. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.
- B. Coordinate Work of this Division and Work of other Divisions in advance of installation. Provide additional Work to overcome tight conditions at no increase in Contract Sum.
- C. Coordinate installation of outlet boxes for equipment specified in other divisions.

## PART 2 - PRODUCTS

### 2.1 METAL CONDUIT

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Intermediate Metal Conduit (IMC): Rigid steel.
- C. Fittings and Conduit Bodies: NEMA FB 1. Fittings shall be steel/malleable iron with threaded fittings. Use insulated metallic bushings with lug where ground connections are required. Use plastic bushing for non-bonding applications.

### 2.2 PVC COATED METAL CONDUIT

- A. Product Description: NEMA RN 1; rigid steel conduit with external PVC coating, 40 mil thick.
- B. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

### 2.3 FLEXIBLE METAL CONDUIT

- A. Product Description: Interlocked steel construction.
- B. Fittings: NEMA FB 1.

### 2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

- A. Product Description: Interlocked steel construction with PVC jacket.
- B. Fittings: NEMA FB 1.

### 2.5 ELECTRICAL METALLIC TUBING (EMT)

- A. Product Description: ANSI C80.3; galvanized tubing.
- B. Fittings and Conduit Bodies: NEMA FB 1; steel couplings and connectors. Box connectors shall have with insulated throat. Set screw type couplings.

## 2.6 NONMETALLIC CONDUIT

- A. Product Description: NEMA TC 2; Schedule 40 PVC for normal power and 80 PVC for emergency power.
- B. Fittings and Conduit Bodies: NEMA TC 3.

## 2.7 WIREWAY

- A. Product Description: General purpose for indoor applications and raintight type for outdoor locations wire way.
- B. Knockouts: Manufacturer's standard.
- C. Cover: Hinged cover with full gaskets.
- D. Connector: Flanged.
- E. Fittings: Lay-in type with removable top, bottom, and side; captive screws and drip shield for outdoor.
- F. Finish: Rust inhibiting primer coating with gray enamel finish.

## 2.8 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
  - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 0.5-inch male fixture studs where required.
  - 2. Boxes for shall be 1.5-inch-deep by 4-inch square minimum.
  - 3. Boxes for telecommunications outlets shall be 2-1/8-inch-deep by 4-11/16-inch square minimum. Provide 1-gang device ring.
  - 4. Concrete Ceiling Boxes: Concrete type.
- B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.

## 2.9 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 4X; 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: Nonskid cover with neoprene gasket and stainless-steel cover screws.
  3. Cover Legend: "ELECTRIC".
- E. Concrete composite Handholes: Die-molded, concrete composite hand holes:
1. Cable Entrance: Pre-cut 6-inch x 6-inch cable entrance at center bottom of each side.
  2. Extension: 12" reinforced concrete below box.
  3. Cover: Concrete composite cover with nonskid finish. Covers shall be marked "ELECTRIC", "SIGNAL", "GROUND" or as indicated on drawings.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

#### 3.2 EXISTING WORK

- A. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces.
- B. Remove concealed abandoned raceway to its source.
- C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets when raceway is abandoned and removed. Install blank cover for abandoned outlets not removed.
- D. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.
- E. Extend existing raceway and box installations using materials and methods [compatible with existing electrical installations, or] as specified.
- F. Clean and repair existing raceway and boxes to remain or to be reinstalled.

#### 3.3 INSTALLATION

- A. Ground and bond raceway and boxes.
- B. Fasten raceway and box supports to structure and finishes.
- C. Identify raceway and boxes.
- D. Arrange raceway and boxes to maintain headroom and present neat appearance.

## 3.4 INSTALLATION - RACEWAY

- A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.
- B. Arrange raceway supports to prevent misalignment during wiring installation.
- C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- D. Group related raceway; support using conduit rack. Construct rack using steel channel and provide space on each for 25 percent additional raceways.
- E. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports
- F. Do not attach raceway to ceiling support wires or other piping systems.
- G. Construct wire way supports from steel channel.
- H. Route exposed raceway parallel and perpendicular to walls.
- I. Route raceway installed above accessible ceilings parallel and perpendicular to walls.
- J. Route conduit in and under slab from point-to-point.
- K. Maintain clearance between raceway and piping for maintenance purposes.
- L. Maintain 12-inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.
- M. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- N. Bring conduit to shoulder of fittings; fasten securely.
- O. 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 minimum 20 minutes.
- P. Install conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- Q. Install no more than equivalent of three 90-degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install factory elbows for bends in metal conduit larger than 2-inch size.
- R. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
- S. Install fittings to accommodate expansion and deflection where raceway crosses seismic and expansion joints.
- T. Install suitable pull string or cord in each empty raceway except sleeves and nipples.
- U. Install suitable caps to protect installed conduit against entrance of dirt and moisture.



- V. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings.
- W. Close ends and unused openings in wire way.

### 3.5 INSTALLATION - BOXES

- A. Adjust box location up to 10 feet prior to rough-in to accommodate intended purpose.
- B. Orient boxes to accommodate wiring devices.
- C. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- D. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- E. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- F. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches separation. Install with minimum 24 inches separation in acoustic rated walls.
- G. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- H. Install stamped steel bridges to fasten flush mounting outlet box between studs.
- I. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- J. Install adjustable steel channel fasteners for hung ceiling outlet box.
- K. Do not fasten boxes to ceiling support wires or other piping systems.
- L. Support boxes independently of conduit.
- M. Install gang box where more than one device is mounted together. Do not use sectional box.
- N. Install gang box with plaster ring for single device outlets.

### 3.6 INSTALLATION CONCRETE COMPOSITE HANDHOLES

- A. Install boxes flush with finished grade or surface material.
- B. Provide hold down bolts for all covers.
- C. Provide minimum 12" depth of crushed rock or pea gravel below boxes for drainage. Ground bond steel cover plate with insulated green grounding conductor.

### 3.7 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements.

- B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation.
- C. Locate outlet boxes to allow luminaires positioned as indicated on reflected ceiling plan.
- D. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

### 3.8 ADJUSTING

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install knockout closures in unused openings in boxes.

### 3.9 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION 280533

## SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Nameplates.
  - 2. Labels.
  - 3. Wire markers.
  - 4. Conduit markers.
  - 5. Underground Warning Tape.

## 1.2 SUBMITTALS

- A. Product Data:
  - 1. Submit manufacturer's catalog literature for each product required.
  - 2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.
- B. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

## 1.3 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of tagged devices; include tag numbers.

## 1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with State, Municipality, Highways, Public Work's standard.

## 1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept identification products on site in original containers. Inspect for damage.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

## 1.7 ENVIRONMENTAL REQUIREMENTS

- A. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

## PART 2 - PRODUCTS

### 2.1 NAMEPLATES

- A. Product Description: Laminated three-layer plastic with engraved black letters on white contrasting background color.
- B. Letter Size:
  - 1. 0.125 inch high letters for identifying individual equipment and loads.
  - 2. 0.25 inch high letters for identifying grouped equipment and loads.
- C. Minimum nameplate thickness: 0.125 inch.

### 2.2 LABELS

- A. Labels: Embossed adhesive tape, with 0.125 inch white letters on black background.

### 2.3 WIRE MARKERS

- A. Description: Self-adhering, pre-printed, machine printable or write-on, self-laminating vinyl wrap around strips. Blank markers shall be inscribed using the printer or pen recommended by manufacturer for this purpose.
- B. Legend:
  - 1. Power and Lighting Circuits: Branch circuit or feeder number as indicated on Drawing
  - 2. Control Circuits: Control wire number as indicated on shop drawings.

### 2.4 CONDUIT AND RACEWAY MARKERS

- A. Description: Nameplate fastened with straps.
- B. Color:
  - 1. 480 Volt System: Orange lettering on white background.
  - 2. 208 Volt System: Blue lettering on white background.
  - 3. Fire Alarm System: Red lettering on white background.
- C. Legend:

1. 480 Volt System: 480 VOLTS.
2. 208 Volt System: 208 VOLTS.
3. Fire Alarm System: FIRE ALARM.

## 2.5 UNDERGROUND WARNING TAPE

- A. Description: 4 inch wide plastic tape, detectable type, color yellow with suitable warning legend describing buried electrical lines.

## PART 3 - EXECUTION

### 3.1 PREPARATION

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

### 3.2 EXISTING WORK

- A. Install identification on existing equipment to remain in accordance with this section.
- B. Install identification on unmarked existing equipment.

### 3.3 INSTALLATION

- A. Install identifying devices after completion of painting.
- B. Nameplate Installation:
  1. Install nameplate parallel to equipment lines.
  2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.
  3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners, or adhesive.
  4. Secure nameplate to equipment front using screws.
  5. Secure nameplate to inside surface of door on recessed panelboard in finished locations.
  6. Install nameplates for the following:
    - a. Switchboards.
    - b. Switchgear.
    - c. Motor Control Centers.
    - d. Distribution Panelboards
    - e. Panelboards.
    - f. Transformers.
    - g. Service Disconnects.
    - h. Fused and Non-Fused Disconnects.
    - i. Automatic Transfer Switches.
- C. Provide color coded nameplates that present, as applicable, the following information:

1. Equipment or device designation.
  2. Amperage, kVA, or horsepower rating where applicable.
  3. Voltage or signal system name.
  4. Source or power or control.
  5. Examples:
    - a. Boards: CH2A; 1000A; 277/480V, 3-Phase, 4-Wire.
    - b. Feeder Power Supply for Panel "XXX" Originates at Panel "XXX".
    - c. Transformers: T-1; 112.5kVA; 480V to 120/208V, 3-Phase, 4-Wire; Served from H2A; Load Served L2A.
    - d. Disconnects and Individual Motor Starters: AHU-1; 25HP; 480V, 3-Phase, 3-Wires; Served from EHD5.
    - e. Available Fault Current: XX,XXX Amperes. Date Calculated: XX/XX/XX.
- D. Color coding for nameplates for power systems:
1. 277/480V Normal – Yellow with black letters.
  2. 277/480V Emergency/Battery – Red with white letters.
  3. 120/208V Normal – Blue with white letters.
  4. 120/208V Emergency/Battery – Red with white letters.
  5. UPS Power – Orange with black letters.
- E. Color coding for nameplates for signal systems:
1. Fire alarm and life safety - Red with black letters.
  2. Nurse call - Light Blue with white letters.
  3. Security - Green with white letters.
  4. Clock/Intercom/Sound/MATV/CATV - Magenta with white letters.
  5. Energy Management System – White with black letters.
- F. Label Installation:
1. Install label parallel to equipment lines.
  2. Install label for identification of individual control device stations, receptacles, and switches.
  3. Install labels for permanent adhesion and seal with clear lacquer.
- G. Wire Marker Installation:
1. Install wire marker for each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.
  2. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.
  3. Install labels at data outlets identifying patch panel and port designation as indicated on Drawings.
- H. Conduit Marker Installation:
1. Install conduit marker for each conduit longer than 6 feet.
  2. Conduit Marker Spacing: 20 feet on center.
- I. Junction Box Identification
1. Color code and identify all junction boxes located above suspended ceilings and below ceilings in non-public areas.
  2. Use finish paint suitable for use on metal surfaces.

3. Boxes shall be identified with permanent felt tip marker on cover indicating panel and circuit numbers. Paint junction box covers using the color coding listed below.
  - a. 480/277 Volt System: Orange.
  - b. 208/120 Volt System: Blue.
  - c. Fire Alarm System: Red.
  - d. Security System: Green.
  - e. Nurse Call System: Yellow
  
- J. Underground Warning Tape Installation:
  1. Install underground warning tape along length of each underground conduit, raceway, or cable 8 inches below finished grade, directly above buried conduit, raceway, or cable.
  
- K. BRASS TAGS:
  1. Provide brass tags for all feeder cables in underground vaults and pull boxes.
  2. Provide brass tags for empty conduits in underground vaults, pull boxes and stubs.
  
- L. WARNING, CAUTION AND INSTRUCTION SIGNS
  1. Provide warning, caution or instruction signs where required by OSHA, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems.
    - a. Install engraved plastic-laminated instruction signs with approved legend where instructions or explanations are needed for system of equipment operation
    - b. Provide polyester film self-adhesive signs for indoor/outdoor equipment and door warning. Use rigid polyethylene non-adhesive signs where adhesives will not work; for example, installing on a metal fence. Provide sign color and marking that meets OSHA regulations. For example, DANGER (red background with white letters), HIGH VOLTAGE (white with black letters).
      - 1) Use 2 by 4 inch signs for small equipment or enclosure doors.
      - 2) Use 7 by 10 inch or 10 by 14 inch signs for large equipment or enclosure doors.
  
  2. Emergency Operating Signs: Install engraved laminate signs with white letters on red background with minimum 3/8 inch high lettering for emergency instructions on power transfer, load shedding, or other emergency operations.

END OF SECTION 260553

## SECTION 262413 - SWITCHBOARDS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes main and distribution switchboards.

## 1.2 REFERENCES

- A. National Electrical Manufacturers Association:
  - 1. NEMA FU 1 - Low Voltage Cartridge Fuses.
  - 2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
  - 3. NEMA PB 2 - Deadfront Distribution Switchboards.
  - 4. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less.
- B. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- C. Underwriters Laboratories Inc.:
  - 1. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
  - 2. UL 891 - Dead-Front Switchboards.

## 1.3 SUBMITTALS

- A. Product Data: Submit electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings, and time-current curves of equipment and components.
- B. Test Reports: Indicate results of factory production and field tests.

## 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

## 1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

## 1.6 ENVIRONMENTAL REQUIREMENTS



- A. Conform to NEMA PB 2 service conditions during and after installation of switchboards.

## 1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

## 1.8 SEQUENCING

- A. Sequence Work to avoid interferences with building finishes and installation of other products.

## PART 2 - PRODUCTS

### 2.1 MOLDED CASE CIRCUIT BREAKER

- A. Product Description: UL 489, molded-case circuit breaker.
- B. Field-Adjustable Trip Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have mechanism for adjusting long time delay, short time delay, continuous current, short time pickup, long time pickup, instantaneous pickup setting for automatic operation. Range of Adjustment: seconds, amperes, percent.
- C. Field-Changeable Ampere Rating Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have changeable trip units.
- D. Current Limiting Circuit Breaker: Circuit breaker indicated as current-limiting have automatically-resetting current limiting elements in each pole. Let-through Current and Energy: Less than permitted for same size Class RK-5 fuse.
- E. Solid-State Circuit Breaker: Electronic sensing, timing, and tripping circuits for adjustable current settings; ground fault trip with integral ground fault sensing and zero sequence type ground fault sensor; instantaneous trip; and adjustable short time trip.
- F. Current Limiter: Designed for application with molded case circuit breaker.
  - 1. Coordinate limiter size with trip rating of circuit breaker to prevent nuisance tripping and to achieve interrupting current rating specified for circuit breaker.
  - 2. Interlocks trip circuit breaker and prevent closing circuit breaker when limiter compartment cover is removed or when one or more limiter is not in place or has operated.

## PART 3 - EXECUTION

### 3.1 EXISTING WORK

- A. Disconnect and remove abandoned switchboards.
- B. Maintain access to existing switchboards and other installations remaining active.
- C. Clean and repair existing switchboards to remain or to be reinstalled.

### 3.2 INSTALLATION

- A. Install in accordance with NEMA PB 2.1.
- B. Install engraved plastic nameplates.
- C. Install breaker circuit directory.
- D. Modifications to existing switchboards and control centers shall be as indicated on the Drawings. New equipment shall match existing where possible and in all cases be compatible with existing. Where new breakers are installed in existing equipment, provide all hardware and trim pieces as required for a complete closed installation. Provide new nameplates at equipment where existing breakers are identified by nameplates and provide new breaker identification in directory where existing breakers are identified in a directory.
- E. Where new breakers are indicated to be installed in existing switchboard, but insufficient space exists, provide enclosed circuit breakers externally and tap existing bussing. Tap conduit and wire sizes shall be same as breaker line side conduit and wire.

### 3.3 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.1.

### 3.4 ADJUSTING

- A. Adjust operating mechanisms for free mechanical movement.
- B. Tighten bolted bus connections.
- C. Adjust circuit breaker trip and time delay settings to values as indicated on Fault, Coordination, and ArcFlash Study.

### 3.5 CLEANING

- A. Touch up scratched or marred surfaces to match original finish.

END OF SECTION 262413

## SECTION 262416 - PANELBOARDS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Distribution and branch circuit panelboards.

## 1.2 REFERENCE STANDARDS

- A. Institute of Electrical and Electronics Engineers:
  - 1. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
- B. National Electrical Manufacturers Association:
  - 1. NEMA FU 1 - Low Voltage Cartridge Fuses.
  - 2. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
  - 3. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
  - 4. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
  - 5. NEMA PB 1 - Panelboards.
  - 6. NEMA PB 1.1 - General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.
- C. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- D. National Fire Protection Association:
  - 1. NFPA 70 - National Electrical Code with California Amendments.
- E. UL:
  - 1. UL 50 - Cabinets and Boxes
  - 2. UL 67 - Safety for Panelboards.
  - 3. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
  - 4. UL 1283 - Electromagnetic Interference Filters.
  - 5. UL 1449 - Transient Voltage Surge Suppressors.
  - 6. UL 1699 - Arc-Fault Circuit Interrupters.

## 1.3 SUBMITTALS

- A. Product Data: Submit catalog data showing specified features of standard products.

- 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. Source Quality control submittals: Indicate results of factory tests and inspections.
- D. Field Quality Control Submittals: Indicate results of Contractor furnished tests and inspections.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of panelboards and record actual circuiting arrangements.
- B. Operation and Maintenance Data: Submit spare parts listing, source and current prices of replacement parts and supplies, and recommended maintenance procedures and intervals.

#### 1.5 QUALITY ASSURANCE

- A. Qualifications
  - 1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

### PART 2 - PRODUCTS

#### 2.1 DISTRIBUTION PANELBOARDS

- A. Description: NEMA PB 1, circuit breaker type panelboard.
- B. Operation:
  - 1. Minimum integrated short circuit rating as indicated on Drawings.
- C. Materials
  - 1. Panelboard Bus: Copper current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.
  - 2. Molded Case Circuit Breakers: UL 489, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Furnish circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.
  - 3. Molded Case Circuit Breakers with Current Limiters: UL 489, circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole.
  - 4. Current Limiting Molded Case Circuit Breakers: UL 489, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical A, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 fuse.
  - 5. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated on Drawings. Provide pad-locking device for each breaker.
  - 6. Surge Suppressers: Integrated in panelboard.

7. Enclosure: NEMA PB 1, Type 1 for indoor and 3R for outdoor applications. Finish to match cover.
8. Cabinet Front: Surface door-in-door type, fastened with concealed trim clamps, hinged door with flush lock, and welded metal directory frame.
9. Permanent circuit numbers.

D. Finishes:

1. Manufacturer's standard gray enamel.

## 2.2 BRANCH CIRCUIT PANELBOARDS

A. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

B. Materials:

1. Panelboard Bus: Copper current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.
2. For non-linear load applications subject to harmonics furnish 200 percent rated, plated copper, solid neutral.
3. Minimum Integrated Short Circuit Rating or as indicated on Drawings.
4. Molded Case Circuit Breakers: UL 489, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Provide UL class 760 arc-fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers..
5. Current Limiting Molded Case Circuit Breakers: UL 489, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical A, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 fuse.
6. Surge Suppressor: Integrated in panelboard.
7. Enclosure: NEMA PB 1, Type 1 for indoor and Type 3R outdoor applications. Finish to match cover.
8. Cabinet Box: 6 inches deep, 20 inches.
9. Provide pad-locking device on each breaker.

C. Cabinet Front: Flush or surface cabinet front as indicated on drawings with door-in-door concealed trim clamps, concealed hinge, welded metal directory frame, and flush lock keyed alike.

D. Permanent circuit numbers.

E. Finishes:

1. Finish in manufacturer's standard gray enamel.

## PART 3 - EXECUTION

### 3.1 DEMOLITION

- A. Disconnect abandoned panelboards. Remove abandoned panelboards and load centers.

- B. Maintain access to existing panelboard and load centers remaining active and requiring access. Modify installation or provide access panel.

### 3.2 INSTALLATION

- A. Install panelboards according to NEMA PB 1.1.
- B. Install panelboards plumb.
- C. Install recessed panelboards flush with wall finishes.
- D. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.
- E. Install filler plates for unused spaces in panelboards.
- F. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes to balance phase loads. Identify each circuit as to its clear, evident and specific purpose of use.
- G. Install engraved plastic nameplates.
- H. Install spare conduits out of each recessed panelboard to accessible location above ceiling. Minimum spare conduits: five empty 1 inch. Identify each as spare.
- I. Ground and bond panelboard enclosure. Connect equipment ground bars of panels according to NFPA 70.
- J. Modifications to existing panelboards shall be as indicated on the Drawings. New equipment shall match existing where possible and in all cases be compatible with existing. Where new breakers are installed in existing equipment, provide all hardware and trim pieces as required for a complete closed installation. Provide new nameplates at equipment where existing breakers are identified by nameplates and provide new breaker identification in directory where existing breakers are identified in a directory.
- K. Where new breakers are indicated to be installed in existing panel, but insufficient space exists, provide enclosed circuit breakers externally and tap existing bussing. Tap conduit and wire sizes shall be same as breaker line side conduit and wire.

### 3.3 REPAIR/RESTORATION

- A. Repair existing panelboards to remain or to be reinstalled.

### 3.4 FIELD QUALITY CONTROL

- A. Inspect and test according to NETA ATS, except Section 4.
- B. Perform circuit breaker inspections and tests listed in NETA ATS, Section 7.6.
- C. Perform switch inspections and tests listed in NETA ATS, Section 7.5.
- D. Perform controller inspections and tests listed in NETA ATS, Section 7.16.1.

3.5 ADJUSTING

- A. Measure steady state load currents at each panelboard feeder; rearrange circuits in panelboard to balance phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

3.6 CLEANING

- A. Clean existing panelboards and load centers to remain or to be reinstalled.

END OF SECTION 262416

## SECTION 262726 - WIRING DEVICES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes wall switches; receptacles; device plates; and decorative box covers.

## 1.2 REFERENCES

- A. National Electrical Manufacturers Association:
  - 1. NEMA WD 1 - General Requirements for Wiring Devices.
  - 2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

## 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's catalog information showing dimensions, colors, and configurations.
- B. Samples: Submit two samples of each wiring device and wall plate illustrating materials, construction, color, and finish.

## 1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

## PART 2 - PRODUCTS

## 2.1 WALL SWITCHES

- A. Product Description: NEMA WD 1, Heavy-Duty, AC only general-use snap switch.
- B. Body and Handle: Plastic (color to match existing devices) with toggle handle.
- C. Ratings:
  - 1. Voltage: 120-277 volts, AC.
  - 2. Current: 20 amperes.
  - 3. Wiring: Back and side wired. Back wiring with clamp type terminals suitable for stranded or solid wire.

## 2.2 RECEPTACLES

- A. Product Description: NEMA WD 1, heavy-duty receptacle.



- B. Device Body: Plastic (color to match existing devices).
- C. Configuration: NEMA WD 6.
- D. Convenience Receptacle: Type 5-20.
- E. GFCI Receptacle: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.
- F. Wiring: Back and side wired. Back wiring with clamp type terminals suitable for stranded or solid wire.
- G. Tamper Resistant Receptacle: Convenience receptacle with internal spring loaded mechanical shutter. Type 5-20.
- H. Special Purpose Receptacles: Type and rating and number of poles indicated or required for the anticipated purpose.

### 2.3 WALL PLATES

- A. Decorative Cover Plate: Stainless Steel.
- B. Jumbo Cover Plate: Stainless Steel.
- C. Weatherproof Cover Plate: Gasketed cast metal plate with hinged and gasketed device cover. Provide extended cover for receptacles located in wet locations when attachment plug is inserted (while-in-use).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify outlet boxes are installed at proper height.
- B. Verify wall openings are neatly cut and completely covered by wall plates.
- C. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

### 3.2 PREPARATION

- A. Clean debris from outlet boxes.

### 3.3 EXISTING WORK

- A. Disconnect and remove abandoned wiring devices.
- B. Modify installation to maintain access to existing wiring devices to remain active.
- C. Clean and repair existing wiring devices to remain or to be reinstalled.

### 3.4 INSTALLATION

- A. Install devices plumb and level.
- B. Install switches with OFF position down.
- C. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- D. Do not share neutral conductor on load side of dimmers.
- E. Install receptacles with grounding pole on top.
- F. Connect wiring device grounding terminal to outlet box with bonding jumper and branch circuit equipment grounding conductor.
- G. Install wall plates on flush mounted switches, receptacles, and blank outlets.
- H. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
- I. Connect wiring devices by wrapping solid conductor around screw terminal. Install stranded conductor for branch circuits 10 AWG and smaller. When stranded conductors are used in lieu of solid, use crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under device screws.
- J. Use jumbo size plates for outlets installed in masonry walls.
- K. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- L. Provide weather resistant GFI receptacles with specified weatherproof covers for all receptacles installed outdoors or in damp or wet locations.
- M. Provide GFI receptacles for all receptacles installed within 6 feet of sinks.
- N. Provide GFI receptacles for all receptacles installed in kitchens.
- O. Provide GFI receptacles for all receptacles serving electric drinking fountains.
- P. Provide isolated ground receptacles for all receptacles serving computers and electronic cash registers.
- Q. Unless noted otherwise, do not use combination switch/receptacle devices.
- R. For flush floor service fittings, use tile rings for installations in tile floors.
- S. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

### 3.5 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate locations of outlet boxes to obtain mounting heights [as specified and] as indicated on Architectural elevations.
- B. Install wall switch 44 inches to center of box above finished floor.

- C. Install convenience receptacle 18 inches to center of box above finished floor.
- D. Install convenience receptacle 6 inches to center of box above counter or back splash of counter.
- E. Install dimmer 44 inches to center of box above finished floor.

### 3.6 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.

### 3.7 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

### 3.8 CLEANING

- A. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION 262726

## SECTION 262816.16 - ENCLOSED SWITCHES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Fusible.
  - 2. Nonfusible switches.

## 1.2 REFERENCE STANDARDS

- A. National Electrical Manufacturers Association:
  - 1. NEMA FU 1 - Low Voltage Cartridge Fuses.
  - 2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- B. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

## 1.3 SUBMITTALS

- A. Product Data: Submit switch ratings and enclosure dimensions.

## 1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of enclosed switches and ratings of installed fuses.

## 1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

## PART 2 - PRODUCTS

## 2.1 FUSIBLE SWITCH ASSEMBLIES

- A. Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle lockable in OFF position.
- B. Operation:

1. Switch Ratings
  - a. Switch Rating: Horsepower rated for AC or DC as indicated on Drawings.
  - b. Short Circuit Current Rating: UL listed for 10,000 rms symmetrical amperes when used with or protected by Class H or K fuses (30-600 ampere). 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses 30-600 ampere switches employing appropriate fuse rejection schemes). 200,000 rms symmetrical amperes when used with or protected by Class L fuses (800-1200 ampere).

C. Materials:

1. Fuse clips: Designed to accommodate NEMA FU 1, Class R fuses.
2. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
  - a. Interior Dry Locations: Type 1.
  - b. Exterior Locations: Type 3R.
  - c. Industrial Locations: Type 12.
3. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.
4. Furnish switches with entirely copper current carrying parts.

## 2.2 NONFUSIBLE SWITCH ASSEMBLIES

- A. Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position enclosed load interrupter knife switch. Handle lockable in OFF position.

B. Operation:

1. Switch Ratings
  - a. Switch Rating: Horsepower rated for AC or DC as indicated on Drawings.
  - b. Short Circuit Current Rating: UL listed for 10,000 rms symmetrical amperes when used with or protected by Class H or K fuses (30-600 ampere). 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses 30-600 ampere switches employing appropriate fuse rejection schemes). 200,000 rms symmetrical amperes when used with or protected by Class L fuses (800-1200 ampere).

C. Materials:

1. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
  - a. Interior Dry Locations: Type 1.
  - b. Exterior Locations: Type 3R.
  - c. Industrial Locations: Type 12.
2. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.
3. Furnish switches with entirely copper current carrying parts.

## PART 3 - EXECUTION

### 3.1 DEMOLITION

- A. Disconnect and remove abandoned enclosed switches.
- B. Maintain access to existing enclosed switches and other installations remaining active and requiring access. Modify installation or provide access panel.

### 3.2 INSTALLATION

- A. Install enclosed switches where indicated.
- B. Install enclosed switches plumb. Provide supports.
- C. Height: 5 feet to operating handle.
- D. Install fuses for fusible disconnect switches.
- E. Install engraved plastic nameplates. Engrave nameplates with the equipment served and the panel and circuit number supplying the switch.
- F. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

### 3.3 REPAIR/RESTORATION

- A. Repair existing enclosed switches to remain or to be reinstalled.

### 3.4 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.5.

### 3.5 CLEANING

- A. Clean existing enclosed switches to remain or to be reinstalled.

END OF SECTION 262816.16

## SECTION 26 55 61 STAGE LIGHTING

**PART 1 - GENERAL****1.1 WORK INCLUDED**

- A. General Conditions and requirements of Division 1 and Section 16010 apply to all work of this Section.
- B. Furnish and install Stage Lighting System as shown and specified. It is the intent that a complete operating system be installed and that any brackets, supports, plugs, cords, or other items required to achieve this end result shall be furnished whether or not such item or items are specified herein or shown on the drawings.

**1.2 GENERAL REQUIREMENTS**

- A. Equipment Tests and Standards:
  - 1. All components of the system shall bear Underwriter's label and the complete system, as a whole, shall be approved by the Underwriter's Laboratories.
  - 2. All internal wiring of dimmer cabinet, control console, control stations, and other components requiring internal wiring shall be completely prewired the factory and ready for connection of feeders and branch circuits by the Contractor.
- B. Instructions and Manuals:
  - 1. Equipment supplier's factory engineer shall provide technical assistance to Contractor during construction; supervise energization and operational testing of system and each component; demonstrate system operation to the satisfaction of Owner; and furnish wiring schematics for all items of equipment, installation instructions, and printed detail of all routine maintenance and servicing as part of manuals.
  - 2. Manuals shall be provided in substantial fiberboard covers, with title page, list of contents, and conspicuous label on cover and be delivered to and approved by Architect prior to testing and demonstration. Also, refer to requirements for manuals in Section 16010, Electrical.
- C. Submittals: Furnish catalog data, shop drawings, wiring diagrams, and support details. Also, refer to requirements for shop drawings, substitutions, materials, and submittals in Section 16010, Electrical.
- D. Guarantee: Guarantee complete system for one year and dimmer modules for two years. Refer to guarantee and warranties requirements in Section 16010, Electrical.

**STAGE LIGHTING  
SECTION 26 5561  
16-1244**

**PART 2 - DETAIL REQUIREMENTS AND PRODUCTS**

**2.1 EQUIPMENT STANDARDS**

- A. The Stage Lighting System shall be as manufactured by Strand Lighting, or approved equal.
- B. Stage lighting system instruments shall be LED engine light source. Refer to plans for different lighting instruments.
- C. Stage lighting equipment shall be designed to operate on 208Y/120 volts, 3 phase, 4 wire, 60 cycle service.

**2.2 PRODUCTS**

- A. Stage/House Lighting Contact Relay Panel:
  - 1. General:
    - a. The contact relay panel shall be fully digital, rugged, and designed specifically for entertainment.
    - b. Contact relay panel shall have 36 relays.
    - c. Contact relay panel shall be UL and CSA listed.
- B. Control Console: The lighting control shall be a Strand 250ML Lighting Control Console. All controls shall be microprocessor based and specifically designed to provide complete control of stage, studio and entertainment lighting systems.
  - 1. General:
    - a. Capacities:
      - 1) The console shall consist of a single enclosure with fully integrated processor.
      - 2) The console shall support the processing of up to 1024 total DMX512 outputs by use potentiometers for submasters, playbacks and effects as well as buttons to activate cues.
      - 3) The console shall support up to 250 control channels for the purpose of controlling dimmers for incandescent loads.
      - 4) The console shall support up to 30 automated luminaires with a maximum of 40 attributes each. Each intensity channel shall be controlled on a Highest Takes Precedence basis while each attribute channel shall be controlled on a Last Takes Precedence basis.
      - 5) Intensity channels shall be stored on faders or as cues.
      - 6) Communication to system devices shall be available over a network, DMX or MIDI.
      - 7) The console shall store up to 999 cues, 24 pages of 24 fades that can be submasters, effects or playbacks. Each effect can have up to 99 steps per effect.



- b. Mechanical: The console shall consist of a free standing tabletop console with LED status indicators, LED backlit buttons, a small LED display for general information and labeling function keys, a LCD display for page number designation, a color display for the consoles primary onboard display and softkey labeling, faders for submasters, playback masters and a grand master; as well as 4 encoders for automated luminaire manipulation.
  - c. Electrical:
    - 1) The supply voltage shall be 100 - 240 VDC (from the power supply). The 250ML shall be powered through the use of an independent power supply with a molded plug appropriate to the specific geographical locale in use. No internal modification to the system is required to enable operation 100VAC, 110VAC, 220VAC or 240VAC.
    - 2) The following data input/output connectors shall be provided:
      - a) 2 DMX512 Out (5-pin XLR - Female).
      - b) 1 DMX512 In (5-pin XLR - Male).
      - c) 1 RJ-45 Network cable port for network communication.
      - d) 1 USB Port.
      - e) 1 DC In for connection to the power supply.
      - f) 1 VGA port for connection to a VGA monitor.
      - g) 2 MIDI 6-pin ports for MIDI In/Thru.
2. 250 ML Lighting Control Software:
- a. General:
    - 1) Setup - The following configuration features are available.
      - a) Record Mode - The 250ML Lighting Control Console shall be able to configure cue storage to either full or partial mode for compatibility with both traditional theatrical consoles and standard moving light consoles.
      - b) Lock/Unlock - The 250ML Lighting Control Console shall be able to be locked or unlocked for safety of show data.
      - c) MIDI - can be configured by MIDI channels and MIDI notes.
      - d) Playback Configuration - The 250ML Lighting Control Console shall be configurable for either hold last look or release last look.
      - e) Display Screen shall be adjustable for backlight intensity.
    - 2) Patch - The following patch features are available.
      - a) DMX Patch - any dimmer or group of dimmers (1 through 1024) shall be configurable for any channel patch (1 through 250).
      - b) Automated Luminaire patch - any automated luminaire shall be controllable from the console up to 30 automated luminaires with a maximum of 40 attributes each.
      - c) A user editable fixture library can create any fixture not currently available within the provided extensive library.
      - d) Any moving light can be configured for pan invert, tilt invert and/or pan/tilt swap.

**STAGE LIGHTING  
SECTION 26 5561  
16-1244**

- 3) Archive - the following archival features are available.
  - a) Save Show - the current show shall be saved on a USB key.
  - b) Clear Memory - the stored data of cues and subs shall be removable from the current showfile.
  - c) Clear Palettes - the stored automated luminaire palettes shall be removable from the current showfile.
  - d) Default Setup - the current configuration shall be restored to factory defaults.
  - e) Load Show - any previously stored 250ML showfile shall be loadable to the current showfile of the console.
- 4) Maintenance - the following maintenance features are available:
  - a) Reset Desk - allows the entire console to restore back to factory defaults.
  - b) Update Software - allows the ability to update the console software. Any software update shall be available from the support section of the manufacturer's website.
  - c) Update VGA Screen - allows a software update for the VGA screen's output.
  - d) Test Mode - allows for a simple test procedure for all hardware that comprises the 250ML Lighting Control Console.
- 5) Cues - up to 999 cues can be recorded on the 250ML Lighting Control Console.
  - a) Cue numbering can be whole numbers (1 ..2..3..) or single digit point cues (1.1...1.2...1.3....).
  - b) Cues shall have both up and down time for fading. Timing shall range from 0 to 5:00 in whole seconds and 1/10th of a second.
  - c) Cues shall be able to automatically trigger the next sequential cue via the Follow command. The Follow command is based on a time of 0 to 5:00.
- 6) Faders - 24 faders and 24 pages of those faders are available for storage of different types of lighting looks.
  - a) Submasters - each fader can have a static lighting look stored to it called a submaster.
  - b) i. Time is available on each submaster for intensity, position, color and beam. Time ranges from manual to 5:00.
  - c) Playbacks - each fader can have multiple lighting looks stored to it to be played back sequentially as a playback.
  - d) Time is available on each playback step for intensity. Time ranges from manual to 5:00.
  - e) Attribute families can playback as snap, fade time or snap at 100%.
  - f) Effects - each fader can have multiple lighting looks stored to it to be played back sequentially and automatically as an effect.

- g) Time is available on each playback step for intensity. Time ranges from manual to 5:00.
  - h) Attribute families can playback as snap, fade time or snap at 100%.
  - i) Groups - collection of automated luminaires.
  - j) i.. With a dedicated Group button, collections of automated luminaires can be stored on softkeys for up to 30 groups.
3. 250ML Lighting Console Hardware:
- a. The 250ML Lighting Control Console has the following hardware.
    - 1) 24 60mm faders for submaster playback each with a 4 color backlit configurable bump button.
    - 2) 1 60mm fader as a playback master.
    - 3) 2 - 60mm faders for cue crossfade and playback.
    - 4) Backlit LOAD and GO buttons.
    - 5) LCD Display and arrow keys for paging of faders and automated luminaires.
    - 6) A 14" x 2.1" LCD display with 4 corresponding softkeys and labels for such.
    - 7) A 7" color screen with 10 softkeys and 4 indented encoders with labels for such.
    - 8) 6 dedicated backlit buttons for items such as Fixtures, Position, Color, Beam, Effects and Groups.
    - 9) 1 - 60mm fader as a Grand Master.
    - 10) 1 backlit Blackout button.
4. Data Cable Specification:
- a. The DMX512 cable, Belden 9829, conforms to the DMX512A standard developed by the Engineering Commission of the United States Institute for Theatre Technology (USITT).
5. Documentation:
- a. A manual shall be available for download from the support section of the manufacturer's website.
  - b. A quick start guide shall be included with the console at purchase and be available from the support section of the manufacturer's website.
6. Environmental Specification:
- a. The acceptable ambient operating temperature shall be 0 to 40 degrees Celsius (32 to 104 Fahrenheit) and the ambient storage temperature shall be -40 to 70 degrees Celsius (-40 to 158 Fahrenheit).
  - b. The acceptable operation location shall be the equivalent of a good office environment, without excessive dust.
  - c. Acceptable humidity levels for operation shall be 5% - 95%, non-condensing.
7. Standards Compliance: The console shall be CE marked and ETL, cETL listed.

**STAGE LIGHTING  
SECTION 26 5561  
16-1244**

**PART 3 - EXECUTION**

**3.1 INSTALLATION REQUIREMENTS**

- A. Provide all lamps, wiring, supports, hangers, etc. for a complete system in operating condition when delivered to Owner.
- B. All cables and individual conductors shall be identified with Brady or E-Z code wire markers at each termination or splice. Coding shall match coding on final diagrams.
- C. Terminal blocks shall be identified with exact wire marker code (numerical or alphabetical) connected to it and as shown on wiring diagrams.
- D. "Common" neutrals for circuits connected to contact relay panel will not be allowed. Each circuit shall be provided with its own separate neutral conductor.
- E. Interconnect dimmer packs and dimmer panel. Provide all conduit, wire, wiring gutters, cables, plugs, etc. as required for a complete operational system.

**3.2 SYSTEM CHECK-OUT**

- A. A competent factory engineer shall check the installation before energizing. No part of the system shall be energized until so checked and approved.
- B. After system has been connected and energized, Contractor shall performance test entire system to determine that components and system are completely operational.
- C. After Contractor's performance testing, a competent factory engineer shall train Owner's representative on operation of entire system. Contractor shall coordinate time for training with the School.
- D. The contractor shall place fixtures and aim them per Owner request. It is contractor's responsibility to coordinate with the Owner.

**- END OF SECTION -**

## SECTION 265600 - EXTERIOR LIGHTING

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes exterior luminaires, poles, and accessories.

## 1.2 SUBMITTALS

- A. Shop Drawings: Indicate dimensions and components for each luminaire not standard Product of manufacturer.
- B. Product Data: Submit dimensions, ratings, and performance data.

## 1.3 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

## 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle solid wood poles in accordance with ANSI O5.1.

## 1.5 COORDINATION

- A. Furnish bolt templates and pole mounting accessories to installer of pole foundations.

## PART 2 - PRODUCTS

## 2.1 LUMINAIRES

- A. Product Description: Complete exterior luminaire assemblies, with features, options, and accessories as scheduled.

## 2.2 LED DRIVERS

- A. Product Description: High-power-factor type electronic driver certified by Certified Ballast Manufacturers, Inc. to comply with ANSI C82.15, suitable for environmental conditions specified, with voltage to match luminaire voltage.

## 2.3 METAL POLES

- A. Material and Finish: As indicated on Drawings.

- B. Section Shape and Dimensions: As indicated on Drawings.
- C. Height: As indicated on Drawings.
- D. Base: As indicated on Drawings.
- E. Accessories:
  - 1. Handhole.
  - 2. Anchor bolts.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify foundations are ready to receive fixtures.

#### 3.2 EXISTING WORK

- A. Disconnect and remove abandoned exterior luminaries.
- B. Extend existing exterior luminaire installations using materials and methods compatible with existing installations, or as specified.
- C. Clean and repair existing exterior luminaries to remain or to be reinstalled.

#### 3.3 INSTALLATION

- A. Install concrete bases for lighting poles at locations as indicated on Drawings.
- B. Install poles plumb. Install shims to adjust plumb. Grout around each base.
- C. Install lamps, ballasts, and drivers in each luminaire.
- D. Bond and ground luminaries, metal accessories, and metal poles.

#### 3.4 FIELD QUALITY CONTROL

- A. Operate each luminaire after installation and connection. Inspect for improper connections and operation.

#### 3.5 CLEANING

- A. Clean photometric control surfaces as recommended by manufacturer.
- B. Clean finishes and touch up damage.

#### 3.6 PROTECTION OF FINISHED WORK

- A. Replace ballast and drivers that have failed at Substantial Completion.

END OF SECTION 265600

**PART 1 - GENERAL****1.1 INCLUSION OF OTHER CONTRACT DOCUMENTS**

- A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

**1.2 WORK SPECIFIED ELSEWHERE**

- A. Section 26 0000, Electrical Work
- B. Section 27 1000, Data Communications

**1.3 QUALITY ASSURANCE**

- A. Mention of certain materials in these Specifications shall not be construed as releasing the Contractor from furnishing such additional material(s) or equipment and labor that may be required to provide a complete and operable system conforming to standard design practice, installation and performance
- B. Products and equipment in these Specifications are listed by manufacturer and model number with assumed performance criteria. Certain equipment and systems are District standards with no substitutions allowed and will be identified as such. Where allowed, some equipment substitutions may be submitted subject to review. All substituted equipment is subject to approval in writing by the Owner and Engineer. Substitution provisions under this specification are: the contractor is to provide engineering certification substantiating equivalence, improved or equal reliability, long term service life, service history and internal component system design.
- C. Materials specified herein shall be new, free of defects and shall be the manufacturer's latest design. They shall be permanently labeled with the manufacturer's name, model number and serial number. Active circuitry shall be solid state and shall be rated for continuous use. Similar devices shall be of the same manufacturer.
- D. Finish color of all loudspeakers and associated mounting hardware shall be coordinated with the Architect and Owner.
- E. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Project Inspector. Work not so inspected is subject to uncovering and replacement.

**1.4 SCOPE OF WORK**

- A. Description: Provide all materials, engineering, and labor required to provide a complete and fully operational Multipurpose Room Sound System as described on the Drawings and in these Specifications. This work shall include the furnishing, installation, assembly, set up, and testing of the Multipurpose Room Sound System indicated on the Drawings and specified herein.



**SOUND SYSTEM FOR MP  
ROOM  
SECTION 27 4116  
17-1300**

- B. Multipurpose Room Sound System is intended to provide a stand-alone sound reinforcement system to serve the Multipurpose Room. The MP Room Sound System includes full range loudspeakers above the stage, numerous microphone and line level inputs, wired and wireless microphones, amplification, system processing with automatic mixing and control, a CD player, an assisted listening system, and a rolling cart with a Blu-Ray player. Included with the Multipurpose Room Sound System are additional portable assisted listening transmitters and receivers to support conference rooms in the Library and Administration buildings.

**1.5 BIDDER QUALIFICATION**

- A. This work shall be performed by an Audiovisual Systems Contractor (aka "Systems Integrator" or "Contractor") who has at least five (5) years direct experience with the devices, equipment and systems of the type specified herein, and who has a fully staffed and equipped maintenance and repair facility within one hundred (100) miles of the project location.
- B. Supervisors shall have at least five (5) years direct experience in similar work. Installation and maintenance personnel shall have at least three (3) years direct experience in similar work.
- C. The electronics contractor shall hold the necessary licenses issued by the State of California for an electrical contractor, State of California Electrical Contractor's License, State California Journeyman Electrical Certificate or Specialty Electrician for Low Voltage Systems, where applicable.

**1.6 SUBMITTALS**

- A. All submittals shall be accompanied by complete descriptive literature with technical data.
- B. Prior to ordering materials or commencing any construction activities, the AV Systems Contractor shall provide a complete bill of materials, including all quantities of software licenses, commissioning, components, devices, equipment, wiring, and labor required to complete this work. Each item of equipment to be listed with the following:
  - 1. Item number
  - 2. Manufacturer
  - 3. Model number
  - 4. Description or nomenclature
  - 5. Quantity to be furnished
  - 6. Compilation of manufacturer's catalogs or specification sheets on major system components.
- C. Furnish shop drawings, including one line and wiring diagrams. Contractor shall also submit name of firms he proposes to do work under this Section, addresses, phone numbers, and name of firm's contact, for approval. Such firms shall have offices and service departments within a 100 mile radius of project and shall have been in business

of this type for at least five years. Also, refer to requirement for shop drawings, substitutions, materials, and submittals in Section 26 0000, Electrical Work. Two submittal reviews will be made by the Architect's representative. Subsequent reviews will be charged to the Contractor. A rejection of a submittal or review of partially presented submittal constitutes one submittal review.

- D. Record Drawings: Refer to General Conditions. Final Inspection will not be made until drawings are received and approved. Record Drawings shall include "As-Built" one-line and wiring diagrams, with terminations identified and wire color coding schedule.
- E. Submit a System Technical Manual containing the following at a minimum:
  - 1. Equipment supplier of systems to demonstrate operation of systems to satisfaction of Owner and furnish Owner three (3) wiring schematics for all items of equipment, installation instructions, and details of all routine maintenance and servicing which must be given to systems by Owner. Wiring schematics must list all static/fixed IP addresses for all codecs or system processors where connected to the campus LAN. Manuals shall be provided in 3-ring binders, with title page, list of contents, and conspicuous label on cover and shall be delivered to District. Refer to Section 16010 for additional requirements. Submit copy to Architect for approval before delivering to Owner.
  - 2. Complete as-built drawings showing internal wiring of all equipment assemblies, wiring between equipment assemblies, running sheets showing cable color coding and terminal connections on all equipment assemblies, and field changes and/or additions.

## **1.7 GUARANTEE**

- A. Refer to General Conditions and Section 26 0000.
- B. One firm to assume full responsibility for performance on all work of this section. Guarantee all equipment against defects in material and workmanship for two (2) years, and provide on the premises service during normal working hours for two years, at no cost to Owner if trouble is not caused by misuse, abuse, or accident, or at current labor rates if so caused. Provide to Owner manufacturer's written one year guarantee for equipment and parts.
- C. Service shall normally be available within 24 hours from service department of authorized distributor of manufacturer by factory trained servicemen. All requests for service and repair under this warranty shall be honored, except when damage has resulted from vandalism, misuse or natural disaster.
- D. On-the-premises service at other than normal working hours to also be available, but labor charges for such calls to be paid by Owner at current labor rates.
- E. Documentation: Documentation of changes, spectrums, levels, repair or replacement of equipment shall be noted and indicated in the Owners System Technical Manual

## **1.8 REFERENCES AND STANDARDS**

- A. For all equipment operating at 26 volts or more, or utilizing over 50 watts, Contractor to submit proof within time allowed for that all items of equipment will conform to

**SOUND SYSTEM FOR MP  
ROOM  
SECTION 27 4116  
17-1300**

requirements of UL Label or listing of equipment by UL to be accepted as evidence of conformance.

- B. For all items of equipment operating at 25 volts or less, and utilizing less than 50 watts, Contractor may submit, in lieu of such label or listing, written certificate from any nationally recognized testing agency, adequately equipped and competent to perform such services, that each item has been tested and conforms to UL standards, including method of test of UL.
- C. All materials, equipment and installation procedures shall comply with the National Electrical Safety Code.

**1.9 DELIVERY, STORAGE AND HANDLING**

- A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.
- B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the work.
- C. Transport, store and handle in strict accord with the manufacturer's written recommendations.
- D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work. Coordinate with Owner and General Contractor regarding times of installation for each part of the building

**1.10 PROJECT CONDITIONS**

- A. Products shall be available at project when required for installation so as to not delay job progress. Installer for these products shall cooperate with installers performing work under other sections involved to effort proper installations.
- B. Coordinate with Owner and General Contractor regarding times of installation for each part of the building. Coordinate with Electrical Contractor and conduct a site inspection to ensure conduit, junction boxes, floor boxes, LAN data cables, etc. required prior to the installation of audiovisual system components have been installed.

**PART 2 - PRODUCTS**

**2.1 GENERAL**

- A. Provide a complete, easy-to-use, stand-alone sound system for the Multi-Purpose Building. The system will include a minimum of 16 inputs fir wired and wireless microphones and source devices. A minimum of 8 audio outputs will be provided for sound reinforcement and assisted listening. A system digital signal processor will be used for automatic mixing of all 16 inputs and 8 outputs, speaker processing, feedback reduction, and control with several programmed presets for different system

configurations. The control system will provide easy access to system presets and volume control. Multiple wired microphone and line level input plates will be installed throughout the MP building. Loudspeakers will consist of three fixed install main speakers positioned left, center, and right above the stage.

- B. Quality of Work: Material and equipment specified herein have been selected as the basis of acceptable quality and performance and have been coordinated to function as components of the included systems. Where a particular material, device, piece of equipment or system is specified directly, the current manufacturer's specification for the same shall be considered to be a part of these specifications, as if completely contained herein in every detail.
1. All materials specified herein shall be new and shall be the manufacturer's latest design, permanently labeled with the manufacturer's name, model number and serial number. All active circuitry shall be solid state and shall be rated for continuous use. Similar devices shall be of the same manufacturer, unless specifically noted otherwise in these specifications.
  2. All auxiliary and incidental equipment necessary for the operation and protection of the systems specified in this section shall be furnished and installed as if specified in full herein.

## 2.2 EQUIPMENT

### A. Digital Signal Processing Unit

1. Provide a single DSP (or multiple networked DSPs) with a minimum of 16 selectable balanced mic or line level inputs and a minimum of 8 line level audio outputs. All signal processing, mixing, and routing functions including input gains shall be controllable via software. DSP shall include Ethernet and control ports for CAT5/RJ45 connections to LAN and control interface, an RS-232 port, two control inputs, and four logic outputs.
2. Audio conversion shall be minimum 24-bit, 48kHz with a minimum processor dynamic range of 110 dB(A). Frequency response: 20 Hz to 20 kHz +/- 0.5 dB.
3. System shall be programmed for the following (at a minimum): automatic mixing for all 16 inputs and 8 outputs, gain/volume control for all I/O, speaker processing (parametric EQ, mixing, and delay), feedback reduction, matrixes, compressors, gates, filters, and meters. The unit shall be capable of storing a minimum of 6 preset system configurations.
4. Acceptable products: Symetrix Solus 16 and power supply.

### B. Power Amplifier

1. Provide one (1) four channel class-D amplifier with onboard DSP in a 2RU chassis rated at a minimum of 400 watts per channel at an 8 ohm continuous load, all channels driven.
2. Performance criteria: Maximum Total Harmonic Distortion (THD) of 1.0% with 4 or 8 ohm load, frequency response (8 ohm) of 20 Hz to 15 kHz +/- 0.2 dB,
3. Amplifier shall include onboard DSP for speaker processing on all four channels including parametric EQ, delay, and crossover filters. Inputs and outputs shall be

**SOUND SYSTEM FOR MP  
ROOM  
SECTION 27 4116  
17-1300**

through Euroblock connectors. Amplifier to include power conserving technology including switchmode power supply and multi-stage sleep mode.

4. Acceptable products, the following or an approved equal: QSC CXD4.2

C. CD/Media Player:

1. Provide one (1) commercial CD player as a source device housed in the equipment rack. CD player shall be able to play CD, WAV, and MP3 files and also include a fully retractable iPod dock.
2. Acceptable products, the following or an approved equal: Denon DN-500C.
3. Accessories:
  - a. Rack mount kit (included)
  - b. Unbalanced to balanced stereo line converter for connection to balanced inputs on the DSP (Radio Design Labs FP- UBC2 or equal)

D. Equipment Rack and Rack Accessories

1. Provide one (1) wall-mounted equipment rack to house the DSP, power amplifier, CD/media player, wireless microphone receivers and antenna distribution, and assisted listening transmitter.
2. EIA compliant 19" wall-mounted rack shall have be capable of holding sixteen (16) rack units/spaces (1.75" height) with a usable depth of at least 20 inches and a weight capacity of 150 lbs. Center section and backpan shall be 16-gauge steel, phosphate pre treated and finished in a black textured powder coat. Rackrail shall be constructed of 11-gauge steel with tapped 10-32 mounting holes in universal EIA spacing with black e- coat finish and marked rackspaces. Rack shall be constructed to swing open for component cabling access, center section shall pivot for either left or right opening. Rack shall have 1/2", 3/4", 1" and 1-1/2" electrical knockouts, and BNC knockouts for UHF/VHF antennas in top and bottom. Backpan shall have 10-1/2" x 10-1/2" cutout for cable pass-through. Rack shall include a locking mechanism with key to secure the center section to the back panel for security purposes.
3. Acceptable products, the following or an approved equal: Middle Atlantic EWR-16-22
4. Accessories:
  - a. Provide vertical power strips to support rack mounted equipment.
  - b. Provide at least one rack-mounted horizontal power conditioner with integrated lights and surge protection rated for at least 15 amps (Furman PL-8 C or an approved equal).
  - c. Provide rack-mount screws and rack mount kits for all equipment to be mounted in the rack if none are included by the equipment manufacturer.
  - d. Provide 1-3/4 inch vent panels between power amplifiers and remaining equipment.

E. Portable Cart and Accessories

1. Provide a rolling cart with a commercial blu-ray player, unbalanced to balanced line converter, and accessories for video projection in the Multipurpose Room. Cart shall include space for a future large venue LCD projector.
2. Rolling equipment rack shall be custom built or an off-the-shelf product capable of supporting the specified equipment. The cart shall contain casters and a brake system to lock the cabinet in place when in use. The cart shall be designed such that one person can push and maneuver the cart into position. Cart may be constructed out of wood or steel and will be capable of supporting at least twice the installed weight load.
3. Provide one (1) commercial blu-ray player as a source device for video presentations, housed on the rolling cart. "Universal" disc player shall be capable of playing blu-ray, DVD, and CDs as well as include network and USB ports for other formats and devices including streaming services. Player must include both HDMI audio/video output for connection to the projector and separate stereo channel audio output for the PA system. Acceptable products, the following or an approved equal: Denon DBT-1713
4. Include, at a minimum, an unbalanced to balanced stereo line converter for connection to the Multipurpose Room AV System (Radio Design Labs FP-UBC2 or equal). Also include a surge protected power strip for devices on the rolling cart, and required HDMI and audio connection cables.

F. Wall Mount Control

1. User control of the system shall be through a wall mounted control connected to the DSP through CAT 5 cable. Control interface shall feature an 8-character backlit display supporting up to 31 scrolling characters and three buttons for navigating menus and initiating control actions. A total of 24 possible menus should support up to 16 items each to initial system presets, volume control, microphone muting, and other functions.
2. Acceptable products: Symetrix ARC-2e

G. Wired Microphones and Stands

1. Provide three (3) wired dynamic vocal microphones.
2. Performance criteria: 55 Hz to 15 kHz frequency response with cardioid polar pattern, dynamic range >105 dB.
3. Includes two stage pop filter to reduce wind and breath sounds, a low frequency roll-off switch, and an on/off switch.
4. Acceptable products, the following or an approved equal: Sure SM58S
5. Accessories:
  - a. Windscreen
  - b. Microphone stand (Atlas MS20 or equal)
  - c. Microphone cable (25' with male XLR both ends) for each microphone.

H. Wireless Microphones

1. Provide a total of four (4) wireless microphone systems with two (2) each of handheld and two (2) each of bodypack systems with head worn microphone.

**SOUND SYSTEM FOR MP  
ROOM  
SECTION 27 4116  
17-1300**

2. Rackmount receivers shall feature rugged metal construction, one touch quick scan frequency selection, XLR connections, battery level indicator, and removable antennas for connection to an antenna distribution system.
  3. Working range should be at least 300 feet for the basic receivers depending on conditions (not including antenna distribution system).
  4. Handheld and bodypack transmitters shall use AA batteries with a life of up to 14 hours, have a typical RF transmitter output of 10 mW
  5. Handheld microphone shall match the characteristics of the wired dynamic vocal microphone specified above.
  6. Provide an antenna distribution system for remote location of 1/2 wave omnidirectional antennas. Install antennas (two required) at the locations specified herein and in the Drawings using 50-ohm RG58 cable at approximately 14' above floor (coordinate with Architect prior to rough-in).
  7. Select wireless frequency bands with the most available channels and least interference based on local conditions. All wireless microphones are to operate in the same band.
  8. Acceptable products, the following or an approved equal:
    - a. Two (2) Shure BLXR/SM58 systems
    - b. Two (2) Shure BLX14R systems with
    - c. Two (2) PGA31 headworn microphones
    - d. One (1) Shure UA844SWB antenna distribution system
    - e. Two (2) 1/2 wave omnidirectional antenna (matching the selected frequency band)
- I. Assisted Listening Systems
1. Assisted listening devices for the Multipurpose Room are required by ADA based on occupancy. Confirm quantity as required based on current ADA standards.
  2. Provide one (1) radio frequency assisted listening transmitter and a minimum of twenty five (25) assisted listening receivers for the Multipurpose Room. System shall also include neck loops for a minimum of 25% of all receivers provided, rack mount kit, charging station, remote antenna for wall mount, ALS signage, and antenna cable.
  3. Furnish and install an RF wireless listening system for use by the hearing-impaired. The assistive listening system (ALS) shall be capable of broadcasting on 57 channels and be frequency agile. The RF receiver shall be capable of receiving on 57 wide and narrow band channels. The device shall tune to a single channel and user shall not be able to change the channel. The receiver shall have a signal-to-noise ratio of 80 dB or greater and shall have an audio frequency response of 50 Hz -15 kHz ( $\pm 3$  dB). The device shall employ a unique DSP SQTM noise reduction technology. The unit shall have a programmable squelch circuit. The unit shall incorporate a multi-functional display that indicates battery status, inventory number and channel. The device shall have the option of being lanyard or belt clip worn and the lanyard shall have the option of an integrated DSP driven neck loop that automatically senses and sends optimized audio signals directly to hearing

aids and cochlear implants equipped with telecoils. The neck loop shall have a field strength of 400 mA/m (+/- 3dB) and frequency response of 100Hz to 5kHz (+/- 3 dB ref 1kHz). The device shall have a USB connector used for inventory control, set up, chaining and firmware upgrades. The device shall incorporate automatic battery charging circuitry and use a non-proprietary lithium ion battery. The device shall have additional charging contacts to allow multiply charging options. The ALS system shall have 80dB SNR or greater, end-to-end.

4. In addition to the Multipurpose Room assisted listening system, provide a minimum of two (2) additional transmitters and four (4) receivers as portable systems to cover the conference rooms in both the Library and Administration buildings.
5. Acceptable products, the following or an approved equal (provide quantities as specified for a complete system):
  - a. Listen Technologies LT-800-072-01 Stationary RF Transmitter (Qty. 1)
  - b. Listen Technologies LA-122 Universal Antenna Kit (Qty. 1)
  - c. Listen Technologies LA-326 Universal Rack Mounting Kit (Qty. 1 ea.)
  - d. Listen Technologies LR-4200-072 Intelligent DSP RF Receiver (Qty. 25 for MP)
  - e. Listen Technologies LA-401 Universal Ear Speaker (Qty. min. 25 for MP)
  - f. Listen Technologies LA-430 Intelligent Earphone/Neck Loop Lanyard (min. 7)
  - g. Listen Technologies LA-LA-381-01 Intelligent 12-Unit Charging Tray (Qty. 1)
  - h. Listen Technologies LPT-A107-B Dual RCA to Dual RCA Cable (Qty. 1)
  - i. Listen Technologies LA-304 Assistive Listening Notification Signage Kit (Qty. 1)
  - j. Listen Technologies LT-700-072 Portable RF Transmitter (Qty. 2)
  - k. Listen Technologies LA-278 Behind-the-Head Microphone (Qty. 2)
  - l. Listen Technologies LR-400-072 Portable RF Receiver (Qty. 4)
  - m. Listen Technologies LA-164 Ear Speaker (Qty. 4)
  - n. Listen Technologies LA-322 8-Unit Portable Carrying Case (Qty. 1)
  - o. Listen Technologies LA-166 Neck Loop (min. 1)

#### J. Loudspeakers

1. Refer to Drawings for quantity and locations. Speaker system shall consist of full-range speakers mounted on the wall above and to the sides of the stage in a left, center, right configuration. The center speaker will be wall mounted at a height approximately 23 feet above the main floor while the left and right speakers will be wall mounted at a height of approximately 18 feet above the main floor.
2. Wall mount speakers shall be at least a two-way design containing a separate high frequency and low frequency transducer. High frequency transducer shall be a minimum 1" exit, 1.4" voice coil compression driver and low frequency transducer shall be a minimum 12" diameter cone woofer with 2.5" diameter voice coil in a painted ABS polymer or plywood enclosure. Nominal coverage angle (-6 dB) shall be 75 degrees conical. Speakers shall have a nominal impedance of 8 ohms and an average sensitivity of at least 95 dB SPL, 1W/1M and a rated thermal power handling of at least 500 watts. Frequency response shall be at least 60 Hz to 20



**SOUND SYSTEM FOR MP  
ROOM  
SECTION 27 4116  
17-1300**

kHz, -10 dB or flatter. Speakers shall include all mounting hardware including a mount that allows both horizontal and vertical aiming adjustment to hold without slipping over time. Speakers shall be factory finished in white (upon approval of the Architect).

3. Acceptable products, the following or an approved equal: QSC AD-S12.

**K. Wiring, Plugs, and Accessories**

1. Furnish speaker, audio, Cat 5 data, HDMI, control, and any other cables for point to point connections between equipment as needed. While data network cabling is outside of the scope of the AV Contractor, AV Contractor is still required to provide Cat 5 cable connections between the components and between connected components and campus LAN. See drawings for dimensional estimates.
2. 12 AWG overall size or larger required for Multipurpose Room speakers, 2 conductors, overall jacket and plenum rated. West Penn, Belden, Canare, or equal.
3. Installed microphone/line level cable shall be stranded four (4) or two (2) conductor twisted pairs, 22 AWG overall size or larger for standard microphone cables, plenum rated where required, and feature aluminum foil shielding, an exterior PVC jacket, and drain wire. Acceptable cable manufacturers, the following or an approved equal: Canare, Belden, or West Penn.
4. All microphone plugs at input plates shall be female XLR, Pro Co WP1004 or equal.
5. Line level audio outlets at plates shall be male XLR, Pro Co WP1014 or equal.
6. Speaker outlets (at permanently mounted speakers) shall be Pro Co WP1009 or equal with D-Series 4-conductor Speakon connector.
7. All plates shall be permanently engraved and numbered per the diagram.
8. Provide additional plates for remote antenna (BNC for wireless microphones, Pro Co WP1019 or equal). Use 50-ohm RG58 cable for antennas.
9. Provide line level audio interconnects between rack mounted components, provide CAT5e cable as required for control system and data connections, provide cable for 12V control/triggers, and any other cables as needed for a complete and functional system.
10. Leave additional length coiled inside speaker back box, junction boxes, and at equipment racks as needed for installation and to facilitate easy replacement of speakers or other components as needed.
11. Provide plenum rated cable where required per NEC. Shielded cables shall be insulated.
12. In addition to the permanently installed cables, provide at least one (1) minimum 6-foot long pre-terminated HDMI cable, at least three (3) minimum 25-foot microphone cables with male XLR connectors at both ends, at least two (2) minimum 25-foot long audio line level cable with female XLR connectors at both ends.

**PART 3 - EXECUTION****3.1 INSPECTION**

- A. Prior to all work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where fabrication and installation of the work of this Section may properly commence.
- B. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in discrepant areas until discrepancies have been fully resolved. Commencing work denotes acceptance of existing conditions.

**3.2 INSTALLATION**

- A. Supply all necessary equipment, cabling, labor, system setup, and other services necessary for the proper installation of the products/system as indicated on the Drawings and specified herein for a complete and finished installation. Equipment shall be completely installed, tested and in operating order at time of substantial completion. Proper operational and network support control functions shall be verified.
- B. Install in accord with reviewed Shop Drawings, referenced standards, manufacturer's installation recommendations or as directed by Architect.
  - 1. Set work accurately in locations, alignment and elevations, and make plumb, level, true and free from rack, measured from established lines and levels.
  - 2. Identification: Permanently label all controls, jacks, XLR receptacles, microphone box plates and speaker level receptacles.
- C. All wiring throughout entire system shall be installed in conformance with standard industry practice. Wiring and cable shall be continuous and splice-free for the entire length of run between designated connections or terminations. Correct the following unacceptable wiring conditions:
  - 1. Deformed, brittle or cracked insulation.
  - 2. Insulation shrunken or stripped further than 1/8 inch away from the actual point of connection within a connector or on a punch block.
  - 3. Cold solder joints.
  - 4. Flux joints.
  - 5. Ungrommetted, unbushed or uninsulated wire or cable entries.
  - 6. Deformation or improper radiusing of wire or cable.
- D. All audio cables within cabinets shall be bound with plastic cable ties so that cables are in tight contact for their entire length. Dress, lace or harness wire and cable to prevent mechanical stress on electrical connections. No wire or cable shall be supported by a connection point.
- E. Grounding
  - 1. Provide a single point grounding system.

**SOUND SYSTEM FOR MP  
ROOM  
SECTION 27 4116  
17-1300**

2. Component grounds, inter-connections, and cable shield ground shall be rendered such that system shall be free from ground loops, hum, noise, instability, and possible electrical shocks.
  3. All audio circuit wiring external to equipment cabinets shall be of type of cable that will allow shields to be insulated from ground and audio circuits. Shields shall be grounded at point of lowest audio level only and shall be free of any other ground for their entire length. Where two (2) cables join or connect together on terminal strip, shields shall be insulated from all other conductors and connected together in manner similar to cable conductors.
- F. Maintain signal continuity for balanced lines connected to and between balanced equipment: Pin #1 to Pin #1, Pin #2 to Pin #2, Pin #3 to Pin #3. Maintain electrical polarity even if devices of different manufacturers use varying "pin hot" wiring connections.
- G. All cables entering cabinets shall be identified with Panduit SSM4S-C or PLF/MA-C marker tie flags. Upon completion of installation, six (6) copies of one-line "as-built" wiring diagram shall be furnished to Architect.
- H. Batteries: Provide batteries in all equipment requiring batteries and not provided by manufacturer. Batteries shall be as recommended by manufacturer.
- I. Electrical Contractor to provide and install conduit, junction boxes, power, and other infrastructure required to support audiovisual systems per the Drawings and Specifications.
- J. Loudspeakers: Speakers are to be mounted at the locations and heights indicated on the Drawings and Specifications herein. The center speaker will be wall mounted at a height approximately 23 feet above the main floor while the left and right speakers will be wall mounted at a height of approximately 18 feet above the main floor. Orient speakers for the most even coverage, typically at a point approximately 2/3 of the distance from the stage wall to the opposite wall and at seated ear height. Calculated angles for proper coverage at the specified mounting heights are as follows: 30 degrees down from horizontal for the center speaker and 20 degrees down from horizontal for the left and right side speakers. Center speaker shall be horizontally aimed at 0 degrees (perpendicular to the stage wall) while side speakers should be splayed outward toward the end walls in the range of 10 to 15 degrees.
- K. DSP: Speaker processing will be programmed in the amplifier DSP per the recommendations from the speaker manufacturer for optimum performance. Main DSP unit shall utilize automatic mixing and gain control for all microphone inputs. System presets shall be programmed into the DSP including at least 6 preset conditions: "Video Presentation", "Typ. Assembly", "Manual" (bypassing automatic mixing and allowing individual mics to be manually turned on and off or muted through the control), "Panel Presentation", "CD Player", etc. Final presets to be determined with the end users. Wall control tied to the DSP shall include (at a minimum) master volume control, volume/mute for individual speakers, selection of system presets (up to 8), individual mic gain and mute controls, and projection screen control. Presets can also be programmed automatically based on time of day and date. Contractor should load an uncompiled program into the system's memory, if applicable.

- L. Mount AV input plates to installed junction boxes at 18" above the floor. AV control interfaces to be mounted to installed junction boxes at 48" above the floor.
- M. Cleaning: Remove grease, dust, dirt, stains, fingerprints, etc. from sight-exposed surfaces on equipment and rack/cabinet. Repair and touch up marred surfaces. Broom clean room and other areas where work was performed at the end of each day.

### **3.3 CONSTRUCTION MEETINGS**

- A. The Contractor shall schedule construction meetings at the jobsite as follows:
  - 1. Prewire meeting shall occur after raceways are installed and prior to pulling of any wire or cable.
  - 2. Pre-termination meeting shall occur after wire and cable has been installed and prior to termination.
- B. Meetings shall be scheduled by the Contractor and shall include the Project Inspector, School's Representative, the electrical subcontractor, and the System subcontractor as a minimum.

### **3.4 TESTING AND TRAINING**

- A. After all equipment specified herein has been installed and is in operating condition, performance tests shall be conducted by Contractor to determine that installation and components comply with these specifications. Contractor shall furnish competent personnel for these tests.
- B. Testing shall be scheduled with the Owner and the Project Inspector and shall occur after receipt by Architect of Contractor's written certification of completion, record one-line diagram, wiring diagrams, maintenance and operation manuals, and other "As-Built" data required by these specifications. Tests shall be scheduled with School before occupancy occurs.
- C. Energize and commission equipment in accordance with manufacturer's instructions. Test all microphone inputs with a "live" microphone. Test wireless systems for clarity and range capabilities. Test all source devices. Set gain levels for all microphone inputs to provide necessary headroom without feedback. Verify that equipment rack and individual equipment chassis are properly grounded. Test AV controls to ensure proper operation.
- D. Provide tests and measurements of the sound amplification system using a Third Octave Band Real Time Analyzer with filters meeting ANSI S1.11 Class III and sound measurement system whose free field response satisfies tolerances of ANSI S1.4, Type II. A pink noise should be used to equalize the system to a "flat" frequency response using parametric equalizers and time/phase alignment. Use proper equalizing techniques to achieve "flat" response, try to "cut" problematic peaks in the response instead of "boosting" dips. Desired system response is: 60 Hz to 15 kHz,  $\pm 3$  dB or less variation. Uniformity of distribution in the seating area shall be checked by measuring sound levels at various locations from front-to-back and side-to-side throughout the seating area and noting variations in level readings, while keeping the source constant. Desired SPL response throughout the room is  $\pm 3$  dB or less variation. Ensure main speakers are time aligned with respect to the input signal and delay settings.

**SOUND SYSTEM FOR MP  
ROOM  
SECTION 27 4116  
17-1300**

- E. Supplier shall demonstrate operation of systems and provide training to all end users, administrative staff, and system administrator. District shall provide a list of authorized personnel for training sessions. Coordinate times of instruction with District, at District's convenience. Supplier shall provide a minimum of 1 hour of user instructions to school staff and 2 hours of user/maintenance instructions to District maintenance personnel. Instruction periods shall not coincide and shall be scheduled with District, not school staff. Deliver to Owner at time of demonstration, all settings and codes programmed into system. Furnish three copies on manufacturer's standard programming worksheets.
  
- F. Train Owner's maintenance personnel and operators in the procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of the system. Provide a user manual for controls and menu navigation. Provide a copy of the DSP software settings and system configurations in electronic format. Include an internal signal flow diagram for the DSP software configuration in the System Technical Manual.

**- END OF SECTION -**

## SECTION 28 46 00 – FIRE ALARM SYSTEM WITH FIRE ALARM AND DIGITAL AUDIO

## 1.1 WORK INCLUDED

- A. Requirements of Divisions 00 and 01 and Section 26 05 00 apply to all work of this Section.
- B. Furnish and install Fire Alarm System including a new control panel with integral digital audio and all wiring and connections and other materials as shown on Plans and specified herein. It is the intent that a complete operating system conforming to all applicable codes be installed and that any power supplies, relays, resistors, cards, modules, programming, or other items required to achieve this end result shall be furnished whether or not such item or items are specified herein.
- C. Site and System Investigation: Fire Alarm System bidder shall visit site prior to bid and become thoroughly knowledgeable about existing system and work required to perform work of this section. Failure to discover the equipment, materials, and labor required to complete the extensions will not relieve the contractor from completing the work at no additional cost.

## 1.2 GENERAL REQUIREMENTS

- A. Code Requirements: System and all its components to meet requirements for local alarm system of National Fire Protection Association Standard 72, 2016 Edition, Americans with Disabilities Act (ADA), and Article 760, California Electrical Code, and to be approved by Division of the State Architect for use as school fire alarm system.
- B. System Requirements: All of various equipment components to be complete with all appurtenant accessories required to provide specified facilities and perform specified functions throughout presently planned construction and space; and provisions for expanding system to provide same facilities, and perform same functions in all future planned construction, including space and mountings in control panels and terminal cabinets.
- C. Interruption of Service: Fire alarm system must be kept operational during work of this contract. If operation of system or portion of system is disrupted for connections into system or cutoff for any reason by work of this project, Contractor must provide fire watch. Fire watch must occur 24 hours per day and every day system is down. Fire watch proposed by Contractor must be acceptable to local fire authority and Owner. All costs for fire watch shall be Contractor's responsibility.
- D. Instructions and Manuals:
  - 1. Equipment supplier of systems to demonstrate operation of systems to satisfaction of Owner and furnish Owner three wiring schematics for all items of equipment, installation instructions, and details of all routine maintenance and servicing which must be given systems by Owner. Manuals shall be provided in 3-ring binders, with title page, list of contents, and conspicuous label on cover and shall be delivered to District. Refer to Section 26 05 00 for additional requirements. Submit copy to Architect for approval before delivering to Owner.
  - 2. Supplier shall demonstrate operation of systems and provide training to all end users, administrative staff, and system administrator. Coordinate times of instruction with District, at District's convenience. Supplier shall provide a minimum of two hours of user instructions to clerical staff and four hours of user/maintenance instructions to District maintenance personnel. Instruction periods shall not coincide and shall be scheduled with District, not school staff. District shall provide list of authorized personnel for training sessions.
  - 3. Furnish to District, a printed copy of the fire alarm control panel programming upon completion of final system programming.
- E. Installation of the fire alarm system and equipment shall not be started until submittals, including State Fire Marshal listing numbers for each component of the system, have been submitted to and approved by the Architect. Fire Alarm submittals must be provided.
- F. Contractor Certifications:
  - 1. Fire alarm system installer shall be State certified as a Fire/Life Safety Technician by the Division of Apprenticeship Standards.
  - 2. The contractor installing the fire alarm system must have NICET Certified Technicians on staff. There shall be at least one NICET Level III or IV fire alarm systems certified technician on staff at the local office to review the submittals and plans prior to submission. In addition, the on-site job supervisor for the installing contractor must be a Level II (or higher) NICET certified in fire alarm systems. A minimum of 30% of personnel on-site must be NICET certified.

3. Certificates of all individuals must be included with the submittals. Failure to provide proof of certification will be cause for rejection of the submittals without further review. The rejection of the submittals for this reason will count as a submittal review/rejection.
- G. Submittals: Engineer's drawings and specifications are presented to define the general scope of the work. Contractor's submittal shall not be a duplication of the engineer's drawings but shall be a result of site and system investigation and shall show all the work required to complete the requirements of this section. Submittals shall be complete and include catalog data, shop drawings, one-line diagrams, scaled plan drawings, and certifications. Building plans shall be 1/8"=1'0", and site plans shall be no smaller than 1"=40'. Minimum text height shall be 3/32" high. Contractor shall also submit name of firm he proposes to do work under this Section, addresses, phone numbers, and name of firm's contact, for approval. Such firms shall be factory authorized representatives of the existing system and submittal shall include manufacturer's letter of confirmation. Proposed firm shall furnish all equipment and specialty cables, make all connections to same, and place the systems in operation. Such firms shall have offices and service departments within a 100-mile radius of project and shall have been in business of this type for at least five years. Also, refer to requirement for shop drawings, substitutions, materials, and submittals in Section 26 05 00. Two submittal reviews will be made by the Architect's representative. Subsequent reviews will be charged to the Contractor. A rejection of a submittal or review of a partially presented submittal constitutes one submittal review. Incomplete submittals (such as product data submitted without shop drawings, etc.) will be returned without review.
1. Fire alarm system design and products have been reviewed and approved by DSA. Alterations to design and/or substitutions proposed by the contractor shall require the following to be included with the fire alarm submittal:
    - a. Riser diagram.
    - b. Point-to-Point diagram.
    - c. Mounting detail showing elevations of wall mounted devices.
    - d. List of system components, equipment, and devices, including manufacturer's model number(s) and California State Fire Marshal listing numbers.
    - e. Copies of manufacturer's specification sheets for equipment and devices indicated.
    - f. Voltage drop calculations -- include the following information for the worst case:
      - 1) Point-to-Point or ohms law calculations.
      - 2) Zone used in calculations.
      - 3) Voltage drop percent [not to exceed manufacturer's requirements]. Note: If voltage drop exceeds 10%, indicate manufacturer's listed operating voltage range(s) for equipment and devices.
    - g. Battery type(s), amp hours, and load calculations -- include the following information:
      - 1) Normal Operation: 100% of applicable devices for 24 hours = control panel amps plus list of amps per device which draw power from the panel during standby power condition -- i.e.:
        - a) Zone modules.
        - b) Detectors.
        - c) Other devices [identify].
      - 2) Alarm Condition: 100% of applicable devices for 5 minutes (15 minutes for voice evacuation) = control panel amps plus list of amps per device which draw power from the panel during alarm condition -- i.e.:
        - a) Zone modules.
        - b) Signal modules.
        - c) Detectors.
        - d) Signal devices.
        - e) Annunciator.
        - f) Other devices [identify].
      - 3) Normal Operation + Alarm Condition:
        - a) Total amp hours required.
        - b) Total amp hours provided.
- H. Record Drawings: Refer to General Conditions. Final Inspection will not be made until drawings are received and approved. Record Drawings shall include "As-Built" one-line and wiring diagrams, with

terminations identified, wire color coding schedule, pullbox locations, and conduit routing plans. Record drawings shall include FINAL addresses for all devices.

- I. Guarantee:
1. One firm is to assume full responsibility for performance on all work of this section. Guarantee all equipment against defects in material and workmanship for two years, and provide on-the-premises service during normal working hours for two years, at no cost to purchaser if trouble is not caused by misuse, abuse, or accident, or at current labor rates if so caused. Provide manufacturer's written guarantee for equipment and parts.
  2. Service shall normally be available within 24 hours from service department of authorized distributor of manufacturer by factory trained servicemen.
  3. On-the-premises service at other than normal working hours to also be available, but labor charges for such calls to be paid by purchaser at current labor rates.

## PART 2 - DETAIL REQUIREMENTS AND PRODUCTS

### 2.1 SYSTEM OPERATION

- A. Activation of any manual station or automatic detector (except carbon monoxide) shall cause the operation of all audible and visual signals. In addition to sounding local alarm signals, operation of manual stations or automatic detectors shall activate a digital communicator for telephone leased line reporting to remote SB575 compliant supervisory station. Telephone Company leased lines monitoring contract shall be arranged by the Owner.
- B. The system shall be electrically supervised against open circuits and grounds on the wiring to the alarm-initiating devices. An open or ground in the system shall cause a trouble signal to sound continuously until the system is restored to normal or until the signal is silenced by means of a cut-off switch. When the cut-off switch is thrown to the "off" position, a white pilot light shall be illuminated to show that the trouble signal is off. When the system is restored to normal operation, the trouble signal shall sound again and shall be silenced only by restoring the cut-off switch to its normal position, thereby also extinguishing the pilot light. Open and grounded circuits in the system shall not cause the sounding of false alarms. System shall be capable of initiating fire drill signal from master location. Fire drill signal shall not activate relay for remote reporting facilities.

### 2.2 STANDARD PRODUCTS

- A. Equipment and accessories furnished under the terms of these specifications shall be the standard products of manufacturers specified. All equipment shall be listed by U.L. and State Fire Marshal. Equipment shall be EST and Wheelock and MUST be compatible with the FireWorks Incident Management Platform. EST is District standard and substitutions will not be accepted.
- B. Refer to drawings for devices used.
- C. Control Panel:
1. System Capacity and General Operation:
    - a. The control panel shall have four SLC modules. Each module shall support a maximum of 125 addressable detector addresses and 125 module addresses for a maximum system capacity of 1000 points. The system shall be capable of 3072 annunciation points per system regardless of the number of addressable devices.
    - b. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit 640-character liquid crystal display, individual, color coded system status LEDs, and a QWERTY style alphanumeric keypad for the field programming and control of the fire alarm system. Said LCD shall also support graphic bit maps capable of displaying the company name and logo of either the owner or installing company.
    - c. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel.
  2. The fire alarm control panel(s) shall be a multi-processor based networked system designed specifically for fire, one-way and two-way emergency audio communications, smoke control, and guard patrol applications.
  3. The control panel shall include all required hardware, software and site specific system programming to provide a complete and operational system. The control panel(s) shall be designed such that interactions between any applications can be configured, and modified using software



- provided by the manufacturer. The control panel(s) operational priority shall assure that life safety takes precedence among the activities coordinated by the control panel.
4. The operating controls shall be located in a dead-front steel enclosure behind a locked door with viewing window. All control modules shall be labeled, and all zone locations shall be identified. All panel modules shall be placement supervised for and signal a trouble if damaged or removed.
  5. System Features: Each control panel shall include the following capabilities:
    - a. Supervision of the system electronics, wiring, detection devices and software
    - b. Up to 2500 analog/addressable input/output points
    - c. Network connections with up to 63 other control panels and annunciators.
    - d. Support multiple dialers (DACTs) and modems
    - e. Two communication ports
    - f. An internal audible signal with different patterns to distinguish between alarm, supervisory, trouble and monitor events
    - g. Support multiple 24 VDC and Audio NACs
    - h. User configurable switches and LED indicators to support auxiliary functions
    - i. Log up to 1740 chronological events
    - j. The ability to download all applications and firmware from the configuration computer at a single location on the fire network
    - k. A real-time clock for time stamps and timed event control
    - l. Electronic addressing of intelligent addressable devices
    - m. Provide an independent hardware watchdog to supervise software and CPU operation
    - n. "Dry" alarm, trouble and supervisory relay contacts
    - o. Control panel modules shall plug in to a chassis assembly for ease of maintenance
    - p. Field wiring shall connect to the panel using removable connectors
  6. User Oriented Features: Each control panel shall include the following features:
    - a. An LCD user interface control/display that shall annunciate and control system functions.
    - b. Provide discreet system control switches for reset, alarm silence, panel silence, drill switch, previous message switch, next message switch and details.
    - c. A "lamp test" feature shall verify operation of all visual indicators on the panel.
    - d. An authorized user shall have the ability to operate or modify system functions including system time, date, passwords, holiday dates, restart the system and clear control panel event history file.
    - e. An authorized user shall have the ability to disable/enable devices, zones, actions, timers and sequences.
    - f. An authorized user shall have the ability to activate/restore outputs, actions, sequences, and simulate detector smoke levels.
    - g. An authorized user shall have the ability to enter time and date, reconfigure an external port for download programming, initiate programming and change passwords.
    - h. An authorized user shall have the ability to test the functions of the installed system.
    - i. Service groups shall facilitate one-man walk testing. Service/test groups shall be capable of being configured with any combination of addressable devices, independent of SLC wiring. It shall be possible to program alternate device responses when the device's service group is active. Devices not in an active service group shall process all events normally.
    - j. Provide internal system diagnostics and maintenance user interface controls to display/report the power, communication, and general status of specific panel components, detectors, and modules.
    - k. SLC loop controller diagnostics shall identify common alarm, trouble, ground fault, Class A fault, and map faults. Map faults include wire changes, device type changes by location, device additions/deletions and conventional open, short, and ground conditions. Ground faults on the supervised circuit wiring of remote addressable modules shall be identified by device address.



condition if the batteries fall outside a predetermined range. Power supplies shall incorporate the ability to adjust the charge rate of batteries based on ambient temperatures. The power supply shall automatically disconnect the battery before low voltage damages the battery. Low battery and disconnection of battery power supply conditions shall immediately be announced as battery trouble and identify the specific power supply(s) affected.

- g. Batteries shall utilize sealed lead acid chemistry. Initial battery capacity shall provide 300% of calculated capacity requirements in order to allow for future system expansion.

9. User Interface

a. Panel LCD and Common Controls

- 1) The system shall be designed and equipped to receive, monitor, and annunciate signals from devices and circuits installed throughout the facility.
- 2) Each fire alarm control panel (system node) shall be capable of supporting a backlit LCD display. The display on each system node shall be configurable to *display* the status of any and/or all combinations of all alarm, supervisory, trouble, monitor, or service group event messages on the network. Each LCD display on the system shall be capable of being programmed to allow *control* functions of any combination of nodes on the entire network. The system shall support both 168 character and 960 character LCD displays on the same network.
- 3) The LCD display shall provide separate alarm, trouble, supervisory, and monitor event queues of to minimize operator confusion. Receipt of alarm, trouble, and supervisory signals shall activate integral audible devices at the control panel(s) and at each remote annunciation device. The integral audible devices shall produce a sound output upon activation of not less than 85 dBA at 10 feet.
- 4) The LCD display shall contain the following system status indicators:
  - a) System Power Indicator
  - b) System Test Indicator
  - c) System CPU Fail Indicator
  - d) Ground Fault Indicator
  - e) Disabled Points Indicator
  - f) System Normal Indicator
  - g) System Common Alarm Indicator
  - h) System Common Trouble Indicator
  - i) System Common Supervisory Indicator
  - j) System Common Monitor Event Indicator
- 5) The LCD display shall contain the following system switch/indicators:
  - a) System Reset Switch with Indicator
  - b) System Alarm Silence Switch with Indicator
  - c) System Panel Silence Switch with Indicator
  - d) Drill Switch with Indicator
  - e) Alarm Acknowledge Switch with Indicator
  - f) Trouble Acknowledge Switch with Indicator
  - g) Supervisory Acknowledge Switch with Indicator
  - h) Monitor Acknowledge Switch with Indicator
- 6) The LCD display shall contain the following system function switches:
  - a) System Event Message Queue Scroll Switch.
  - b) Event Details Switch (provides an additional 2000 character message about the device highlighted by the operator.)
  - c) Command Menu Switch
  - d) 10-Digit Keypad with Enter and Backspace switches
- 7) <168 Character Backlit Liquid Crystal Text Display>
- 8) The user interface shall provide a backlit LCD that will allow custom event messages of up to 42 characters. The interface shall provide a minimum of eight lines by 21 characters and provide the emergency user hands free viewing of the first and last highest priority events. The last highest priority event shall always display and update automatically. Events shall be automatically placed in one of four easy

- to access queues. It shall be possible to scroll through and view specific alarm, trouble, supervisory and monitor events separately. Having to scroll through a mixed list of event types shall not be considered as equal. The total number of active and disabled events by type shall be displayed. Visual indication shall be provided of any event type that has not been acknowledged or viewed. It shall be possible to customize the designation of all user interface LEDs and Switches for local language requirements.
- 9) Instructional text messages shall support a maximum of 2,000 characters each.
  - 10) The system 168 character LCD display shall be an EDWARDS model 3-LCD.
- b. Audio Annunciation and Control
- 1) Provide a master one-way emergency audio control unit as part of the main fire alarm control panel. The emergency audio control shall contain a paging microphone and shall be capable of generating and delivering multi-channel audio messages simultaneously over copper and/or fiber media to remote parts of the facility.
  - 2) All audio messages and live pages shall originate at the one-way audio control unit. The one-way audio control unit shall store up to 32 minutes of pre-recorded audio messages digitally as WAV files. These messages shall be automatically directed to various areas in a facility under program control. The unit shall have the capacity to store up to 200 individual audio messages and to simultaneously play back seven (7) different messages in addition to live page message.
  - 3) During non-alarm conditions, the control unit shall continuously distribute a default audio message to all amplifiers, providing total audio path supervision. To enhance system survivability, each remote FACP cabinet containing an amplifier shall play the default audio message in the event of a fire AND a control network system failure.
  - 4) The one-way emergency audio control shall provide control switches to direct live paging messages as follows:
    - a) "All Call" to direct the page messages to all areas in the facility, overriding all other messages and tones.
    - b) "Page to Evacuation Area" to direct the message to the evacuation area(s), overriding all other messages and tones.
    - c) "Page to Alert Area" to direct page messages to the area(s) receiving the alert message and tones, overriding all other messages and tones.
    - d) "Page to Balance Building" to direct page messages to the areas) in the facility NOT receiving either the evacuation area or alert area messages.
    - e) "Page by Phone" switch to select the firefighter's telephone system as the paging source.
  - 5) The system shall automatically deliver a preannounce tone of 1000 Hz for three seconds when the emergency operator presses the microphone PTT key. A 'ready to page' LED shall flash during the preannounce phase, and turn steady when the system is ready for the user's page delivery. The system shall include a page deactivation timer which activates for 3 seconds when the emergency user release the microphone talk key. Should the user subsequently press the microphone key during the deactivation period a page can be delivered immediately. Should the timer complete its cycle the system shall automatically restore emergency signaling and any subsequent paging will be preceded by the pre-announce tone. A VU display shall indicate voice level to the emergency operator.
  - 6) The one-way audio control unit shall be capable of supporting up to 64 remote microphone inputs and a line level audio input.
  - 7) The fire alarm control panels shall support remote cabinets with zoned amplifiers to receive, amplify and distribute messages through speakers over supervised circuits.
  - 8) The master one-way emergency audio control unit shall be an EDWARDS 3-ASU.
- c. Remote Microphone

- 1) The remote microphone shall facilitate live page announcements over the ACU/FACP system from locations distant from the ACU/FACP. It shall be possible to connect up to 63 remote microphones to an ACU/FACP.
  - 2) The remote microphone shall feature a Push-to-Talk switch; local and remote page active LEDs, and a trouble LED.
  - 3) The remote microphone shall operate on filtered-regulated 24 VDC power derived from the panel power supply. Power shall be supplied directly from the ACU/FACP or listed auxiliary power supply, ensuring a reliable and monitored power source.
  - 4) The remote microphone shall be an EDWARDS 3-REMIC series.
10. DACT
- a. The system shall provide off premises communications capability using a Digital Alarm Communications Transmitter (DACT) for sending system events to multiple Central Monitoring Station (CMS) receivers over conventional telephone lines.
  - b. The system shall provide the CMS(s) with point identification of system events using 4/2, Contact ID ID (SIA DC-05) or SIA DCS protocols. The system shall also transmit an alphanumeric system activity message, by event, to a commercial paging system provided by the owner, using TAP Pager protocol and an internal V.32BIS or greater 14.4Kbaud modem.
  - c. The dialer shall support up to 255 individual accounts and to send account information to eight (8) different receivers, each having a primary and secondary telephone access number. System events shall be capable of being directed to one or more receivers depending on event type or location as specified by the system design.
  - d. In the event of a fire alarm panel CPU failure during a fire alarm condition, the DACT degrade mode shall transmit a general fire alarm signal to the CMS.
  - e. The owner shall arrange for two (2) dedicated loop-start phone lines to be terminated using two RJ31X jacks within 5 ft of the main fire alarm control panel.
  - f. The DACT shall be an EDWARDS 3-MODCOM(P).
11. Notification Appliance Circuits
- a. General
    - 1) All notification circuits shall be supervised and power limited. Non-power limited circuits are not acceptable. All notification appliance circuits shall be <Class A (Style "Z")><Class B (Style "Y")>.
    - 2) Initial circuit loading shall not exceed 80% in order to allow for future system expansion.
  - b. 24 VDC Notification Appliance circuits
    - 1) Notification appliance circuits shall have a minimum circuit output rating of 2 amps @ 24 VDC
    - 2) 24VDC NACs shall be polarized and provide both strobe synchronization and a horn silence signals on a single pair of wires.
12. Audio Notification Appliance Circuits
- a. Appliance circuits shall be polarized and have a minimum circuit output rating of 50 watts @ 25V audio, and 35 Audio watts @ 70V audio. notification
13. Audio Amplifiers
- a. Each audio power amplifier shall have integral audio signal de-multiplexers, allowing the amplifier to select any one of eight digitized audio channels as directed by system programming.
  - b. Audio amplifiers shall be power limited and protected from short circuits conditions on the audio circuit wiring. Each amplifier output shall provide a selectable 25/70 Vrms output, suitable for connection to emergency speakers.
  - c. To enhance system survivability in the event of a total loss of audio data communications, all amplifiers shall default to the local "EVAC" tone generator channel. If the local panel has an alarm condition, then all amplifiers will sound the EVAC message on their

speaker circuits. In the event of a loss of the fully digitized, multiplexed audio riser data, the audio amplifiers shall automatically default to an internally generated alarm tone which shall sound a 3-3-3 temporal pattern.

- d. Provide a standby audio amplifier that shall automatically sense the failure of a primary amplifier, and automatically program themselves to select and de-multiplex the same audio information channel of the failed primary amplifier, and fully replace the function of the failed amplifier.
- e. Amplifiers shall also include a 24 VDC notification appliance circuit rated at 24Vdc @ 3.5A for connection of visible (strobe) appliances. This circuit shall be fully programmable.
- f. Provide as minimum, one forty (40) watt audio amplifier per paging zone. Initial amplifier loading shall not exceed 80% in order to allow for future system expansion. Calculations shall assume each speaker is connected at one (1) watt.
- g. Audio amplifiers shall be EDWARDS 3-ZA series devices.

#### D. Sounder Base

- 1. Provide audible detector mounting bases suitable for mounting on a North American 1-gang, 3½ or 4 inch octagon box and 4 inch square box, or European BESA or 1-gang box; at the locations shown on the drawings.
- 2. The bases shall utilize a twist-lock design and provide screw terminals for all field wiring connections.
- 3. Removal of the respective detector shall not affect communications with other detectors.
- 4. The audible base shall support all detector types and shall be capable of single or group operation.
- 5. The audible base shall emit a temporal 3-3-3 fire alarm tone when smoke or heat has been detected. The audible base shall emit a temporal 4-4-4-4 CO alarm tone when CO has been detected. The outputs shall be configurable for low or high output by moving a reversible jumper. The system shall be UL2017 listed for dual signaling for this purpose.
- 6. The audible bases shall provide a UL-268 reverberant room sound output of 90.8 dBA at 10ft (3m) for temporal 3-3-3 fire alarm and 84.1 dBA at 10 ft.(3m) for temporal 4-4-4-4 CO alarm.
- 7. The detector sounder base shall be an EDWARDS SIGA-AB4GT with SIGA-TCDR Temporal Pattern Tone Generator.

E. Refer to drawings for peripheral devices.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION REQUIREMENTS

- A. Electrical Contractor shall retain the services of the duly appointed representative as specified hereinbefore, who shall furnish all equipment, make all connections to same, and place system in operation. Technician and workman employed shall be particularly skilled in this type of work. Fire alarm system contractor shall possess a valid C10 California Electrical Contractors license. Only contractors holding a valid license may perform any fire alarm work.
- B. Detector locations shown on drawings are approximate only. Exact locations shall be coordinated with lighting and mechanical equipment and shall be placed in accordance with NFPA 72 and manufacturer's recommendations (with respect to supply air diffusers, etc.).
- C. Detectors, strobes, and horn/strobes (including mini-horn/strobes) in gymnasiums, multi-purpose rooms, locker rooms, team rooms, and student toilet rooms shall be provided with wire guards.
- D. Coordinate installation of duct detectors with Division 23 contractor. Exact location shall be as required by Division 23.
- E. CO Detectors
  - 1. Ceiling mounted CO detectors should be kept 12" from sidewalls.
  - 2. Wall mounted CO detectors should be at least 48" above the finished floor, but less than 6" from the ceiling.
  - 3. Locate at least 60" from fuel burning appliances.
  - 4. Install CO detectors no closer than 3 ft. from air handling supply air diffusers or return air openings

- F. Fire alarm circuits shall be terminated on screw terminals. Terminal blocks shall be Allen-Bradley Bulletin 1492 with 600V screw terminals for #22 to #10 conductors, mounted to type N22 channel, or approved equal. Submittal shall show internal elevation of terminal cabinets or backboards with equipment laid out.
- G. All cables entering terminal cabinet shall be identified with Brady or E-Z Code wire markers. Upon completion of installation, six copies of one-line "as-built" wiring diagram shall be furnished to Architect.
- H. Each cable run on wiring diagram shall be identified with exact wire marker code (numerical or alphabetical) as appears in terminal cabinets.
- I. Station locations shall be identified by school's actual room numbers and system shall be programmed accordingly. Coordinate actual room numbers with District. Coordinate final programming with District. Contractor shall furnish a printed copy of final programming to District.
- J. End-of-line resistors shall be installed in terminal cabinets, at backboards, or as noted on drawings.
- K. Color code wiring for the system as follows:

	<u>Positive (+)</u>	<u>Negative (-)</u>
FA Visual Indicators	black	white
FA Speakers	black	white
FA Detectors	red	blue
FA Manual Stations	red	blue
Sprinkler Riser Flow Switch	red	blue
Sprinkler Riser Bell	black	white

- L. No splices shall occur in pullboxes. Fire alarm system wiring shall be continuous, without splices, from terminal cabinet to signal cabinet and signal cabinet to devices. All interior pullboxes shall be accessible and locations shall be recorded on "As-Built" drawings.

### 3.2 REMOTE TEST STATIONS

- A. Each duct detector shall be furnished with a key-activated remote test station. If not shown on plans, locate test switch approximately below duct detector and 6" below ceiling (at ceilings or roof structures higher than 10', install test station at +9'6"). Provide 1/2" conduit with cable as required by manufacturer to connect test station to duct detector.

### 3.3 DIGITAL COMMUNICATOR

- A. From communicator in FACP, provide a 1" conduit with two 4-wire, 22-gauge telephone cables to Main Telephone Terminal Backboard. Connect at communicator and at telephone backboard on surface mounted RJ31X jacks.
- B. Contractor shall program the communicator to transmit alarm and trouble per device and module.
- C. Contractor shall provide communicator zone/point information and other items listed hereinbefore to District's Central Station. Coordinate with District.

### 3.4 ACCESS DOORS

- A. Furnish and install access doors wherever required whether shown or not for easy maintenance of fire alarm detectors above ceilings. Access doors shall be sized to allow access to equipment for complete removal and replacement of device

### 3.5 CONSTRUCTION MEETINGS

- A. The Contractor shall schedule construction meetings at the jobsite as follows:
  1. Pre-rough-in meeting shall occur before installation of any boxes, raceways, etc. Exact locations of all detectors and strobes shall be established as recommended by Fire Alarm System subcontractor.
  2. Prewire meeting shall occur after raceways are installed and prior to pulling of any wire or cable.
  3. Pre-termination meeting shall occur after wire and cable has been installed and prior to termination.
- B. Meetings shall be scheduled by the Contractor and shall include the Project Inspector, School's Representative, the electrical subcontractor, and the Fire Alarm System subcontractor as a minimum.

### 3.6 TESTS

- A. One-half to three-quarters of the way through project, District Facilities will set up a meeting (preferably at the school site) with decision makers from Facilities, Police Services, Maintenance, Maintenance Alarm

- Tech, General Contractor, Alarm Sub-contractor, and School Administrator to review the alarm protocol and to identify responsible personnel and timelines for the items listed in paragraph D, which follows.
- B. After all equipment specified herein has been installed and is in operating condition, performance tests shall be conducted by Contractor in accordance with, but not limited to, Table 14.4.3.2, NFPA 72 to verify that installation and components comply with these specifications. Contractor shall furnish competent personnel for these tests. Testing shall be scheduled with the Owner and shall occur after receipt by Architect of Contractor's written certification of completion, record one-line diagram, wiring diagrams, maintenance and operation manuals, and other "As-Built" data required by these specifications.
  - C. Upon completion of the installation of the fire protective signaling equipment and after satisfactory performance tests have been conducted, a satisfactory demonstration of the entire system shall be made in the presence of the Project Inspector. Contractor shall coordinate with Project Inspector and School. Demonstration shall be completed prior to occupancy by School and prior to final testing with Owner.
  - D. After system has been completely tested, the Contractor shall take the following actions with the Owner:
    - 1. The Contractor will schedule a meeting with the Alarm Sub-contractors and Owner's Representatives to determine alarm zone and device nomenclature. The Contractor shall insure that the alarm zone and device nomenclature matches the actual building and room numbers used by the school. Architectural numbering shall not be used. Once confirmed, the Contractor shall demonstrate this to Owner's Representatives.
    - 2. The Contractor shall coordinate with the Owner's representative to determine a date when the alarm system is to be brought on-line. (No alarm system shall be placed on-line on a Friday, weekend, or District holiday.) This date will be scheduled a minimum of seven working days in advance of placing the system on-line, allowing for the one-week familiarization period for Central Station and local fire authority personnel with school site and alarm system.
    - 3. When project is phased, and the different phases are to be brought on-line for monitoring, paragraphs 1. and 2. above shall be performed for each phase.

### 3.7 FIRE ALARM SYSTEM CERTIFICATION

- A. Fire Alarm Certification: Written certification on the forms found in Figures 7.8.2(a) through 7.8.2(l), NFPA 72 shall be submitted by the Contractor to Architect (with copies to Electrical Engineer and DSA) stating for himself and the equipment manufacturer that component parts are as LISTED AND APPROVED BY State Fire Marshal, that the installation conforms in all respects to requirements as set forth in the California Electrical Code, that acceptance testing has been performed in the presence of the Project Inspector. The certificate shall be signed by Contractor before submitting to Project Inspector.

- END OF SECTION -



## **SECTION 31 00 00 - EARTHWORK**

### **PART 1 - GENERAL**

#### **1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS**

- A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

#### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 015000, Construction Facilities and Temporary Controls.
- B. Section 312333, Trenching and Backfilling.
- C. Section 321200, Asphalt Concrete Paving.
- D. Section 321600, Site Concrete.
- E. Section 334000, Site Drainage.

#### **1.03 QUALITY ASSURANCE**

- A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.
- B. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.
- C. The representatives of the Owner's testing lab will not act as supervisor of construction, nor will they direct construction operations. Neither the presence of the Owner's testing lab representatives nor the testing by the Owner's testing lab shall excuse the contractors or subcontractors for defects discovered in their work during or following completion of the project. Correcting of inadequate compaction or moisture content is the sole responsibility of the contractor.
- D. Tests (See Part 3 for Compaction Testing).
- E. Contractor shall be solely responsible for all subgrades built. Failures resulting from inadequate compaction or moisture content are the responsibility of the contractor. Contractor shall be solely responsible for any and all repairs.

#### **1.04 SUBMITTALS**

- A. Refer to Section 013300.
- B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

#### **1.05 WARRANTY**

- A. Refer to General Conditions and Section 017836.

#### **1.06 REFERENCES AND STANDARDS**

- A. General: Site survey, included in the drawings, was prepared by Warren Consulting Engineers, and is the basis for data regarding current conditions. While the survey is deemed generally accurate, there exists discrepancies and variations due to elapsed time, weather, etc. Existing dirt grades may vary 0.2 ft. from that shown.
- B. Geotechnical Engineering Report was prepared by \_\_\_\_\_. Report is entitled \_\_\_\_\_,

and is on file with Architect. Soils information is taken from this Report. Contractor is responsible for any conclusions drawn from this data; should he prefer not to assume such risk he is under obligation to employ his own experts to analyze available information and/or to make additional explorations, at no cost to Owner, upon which to base his conclusions. Neither Owner, Soils Engineer nor Architect guarantees information will be continuous over entire site of work.

- C. Site Visitation: All bidders interfacing with existing conditions shall visit the site prior to bid to verify general conditions of improvements. Discrepancies must be reported prior to the bid for clarification.
- D. ANSI/ASTM D698-00 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.
- E. ANSI/ASTM D1556-00 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- F. ANSI/ASTM D1557-02e2 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
- G. ANSI/ASTM D 3017-05 Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).
- H. ANSI/ASTM D 422-63(2007) E1 Test Method for Particle Size Analysis of Soil.
- I. ANSI/ASTM D 4318-05 Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.
- J. CALTRANS Standard Specifications Section 17.
- K. CAL-OSHA, Title 8, Section 1590 (e).
- L. Any work within the street, highway or right-of-way shall be performed in accordance with the requirement of the governmental agencies having jurisdiction, and shall not begin until all of those governing authorities have been notified.

#### **1.07 DELIVERY, STORAGE AND HANDLING**

- A. Transport, store and handle in strict accord with the local jurisdiction.
- B. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

#### **1.08 PROJECT CONDITIONS**

- A. Existing civil, mechanical and electrical improvements are shown on respective site plans to the extent known. Should the Contractor encounter any deviation between actual conditions and those shown, he is to immediately notify the Architect before continuing work.
- B. Excavation dewatering may be necessary. Contractor shall provide any and all tools, equipment and labor necessary for excavation dewatering no matter what the source. Dewatering shall be continuous until all site utilities are installed and backfilled.

#### **1.09 EXISTING SITE CONDITIONS**

- A. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

#### **1.10 ON SITE UTILITY VERIFICATION AND REPAIR PROCEDURES**

- A. Ground-breaking requirements:

1. All underground work performed by a Contractor must be authorized by the District's Construction Manager or the Low Voltage Consultant prior to start of construction.
  2. The Contractor is to obtain and keep the original School's construction utility site plans on site during all excavation operations. Contractor can contact the District's Construction Manager, Facilities Manager, or the Low Voltage Consultant to procure the drawings.
- B. Underground Utility Locating:
1. The contractor shall hire an Underground Utility Locating Service to locate existing underground utility pathways in areas affected by the scope of work for excavation.
  2. Contractor must use an underground utility locator service with a minimum of 3 years' experience. The equipment operator must have demonstrated experience. Contact Norcal Underground Locating (800/986-6722) or Precision Locating (800/577-7324)
  3. The Underground Utility Locator Service must have the use of equipment with the ability to locate by means of inductive clamping, induction, inductive metal detection, conductive coupling, or TransOnde (Radio detection) to generate signals, passive locating (free scoping) for "hot" electric, and metal detector.
  4. The Underground Utility Locator Service must be able to locate existing utilities at a depth of at least 72".
  5. The Underground Utility Locator Service must be able to locate but are not limited to locating the following types of utility pathways:
    - a) All conduit pathways containing 110 volt or greater 50-60Hz electrical wire.
    - b) All conduit pathways containing an active cable TV system.
    - c) All conduit pathways containing wire or conductor in which a signal can be attached and generated without damaging or triggering the existing systems.
    - d) All empty conduit pathways or pipe in which a signal probe or sonde (miniature transmitter) can be inserted.
    - e) All conduit pathways containing non-conductive cables or wires in which a signal probe or sonde (miniature transmitter) can be inserted.
    - f) All plastic and other nonconductive water lines in which a TransOnde Radio detection) or other "transmitter" can be applied to create a low frequency pressure wave (signal) without damaging or triggering the existing systems.
    - g) All copper or steel waterlines and plastic or steel gas lines
  6. All markings made by the Underground Utility Locator Service or other shall be clear and visible.
  7. The contractor shall maintain all markings made by Underground Utility Locator Service or other throughout the entire length of the project.
  8. The Underground Utility Locator Service shall provide the contractor with two sets of maps showing the location of utilities and average depth. They will be referenced to permanent buildings. Contractor will deliver one copy to the district at no additional charge.
  9. Contractor is responsible to contact Underground Service Alert (U.S.A. 800/227-2600) and receive clearance prior to any excavation operations.
  10. Contractor shall inform the (District's Construction Manager) (Architect) (Owner) no later than five (5) days prior to the date scheduled for the utility locator service to be on site.

## **1.11 PROTECTION**

- A. Adequate protection measures shall be provided to protect workmen and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations.
- B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.
- C. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.
- D. Provide shoring, sheeting, sheet piles and or bracing to prevent caving, erosion or gullyng of sides of excavation.
- E. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The contractor shall make a reasonable effort on a daily basis to keep all excavations and the site free from water during entire progress of work, regardless of cause, source, or nature of water.
- F. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.
- G. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance. Dust control measures shall be in accordance with the local jurisdiction.
- H. Trees: Carefully protect existing trees that are to remain. Provide temporary irrigation as necessary to maintain health of trees.

## **1.12 SEASONAL LIMITS**

- A. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by rains, fill operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.
- B. Excessively wet fill material shall be bladed and aerated per section 3.08, B.

## **1.13 TESTING**

- A. General: Refer to Section 014500 – Quality Requirements.
- B. Geotechnical Engineer: Owner is retaining a Geotechnical Engineer to determine compliance of fill with Specifications, and to direct adjustments in fill operations. Costs of Geotechnical Engineer will be borne by Owner; except those costs incurred for re-tests or re-inspection will be paid by Owner and back charged to Contractor.
  - 1. If Contractor elects to process or mine onsite materials for use as Suitable Fill, Aggregate Sub Base, Aggregate Base, Rock, Crushed Rock or sand the cost of all testing of this material shall be paid for by the Contractor.
  - 2. Testing of import fill for compliance with Department of Toxic Substance Control (DTSC) shall be paid for by the Contractor.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. Engineered Fill Materials: All fill shall be of approved local materials supplemented by imported fill if necessary. "Approved" local materials are defined as local soils tested and approved by Geotechnical Engineer free from debris, and concentrations of clay and organics; and contain rocks no larger than 3-inches in greatest dimension. The soil and rock should be thoroughly blended so that all rock is surrounded by soil. This may require mixing of the soil and rock with a dozer prior to placement and compaction. Clods, rocks, hard lumps or cobbles exceeding 3-inches in final size shall not be allowed in the upper 12 inches of any fill.
- B. Imported Engineered Fill Material: Imported fill may be required to complete work. Proposed import fill material shall meet the above requirements; shall be similar to the native soils. Import fill shall meet the above requirements; shall have plasticity index of 12 or less; an Expansion Index of 20 or less; be free of particles greater than 3-inches in largest dimension; be free of contaminants and have corrosion characteristics within the acceptable limits. All import fill material shall be tested and approved by Soils Engineer prior to transportation to the site. Proposed fill material shall comply with DTSC guidelines to include Phase 1 environmental site assessment and related tests. Refer to the October 2001 DTSC Information Advisory for clean imported fill material.
1. DTSC TESTING: Site work contractor is to coordinate testing with an analytical lab, hired by the owner, licensed by the State of California for the DTSC testing. The costs associated with the testing will be paid by the contractor.
  2. DTSC testing shall include documentation as to the previous land use, location, and history. Soils shall be analyzed for all compounds of concern to ensure the imported soil is uncontaminated and acceptable. Testing shall be performed per the recommendations included in DTSC Imported Fill Advisory ([http://www.dtsc.ca.gov/Schools/upload/SMP\\_FS\\_Cleanfill-Schools.pdf](http://www.dtsc.ca.gov/Schools/upload/SMP_FS_Cleanfill-Schools.pdf)). Soils shall be tested prior to import to the project site.
  3. Lab shall determine geographically which tests and analysis comparison will be appropriate for the testing. (CAM 17 / Title 22); (RWQCB) Regional Water Quality Control Board; or (OEHHA) Office of Environmental Health Hazard Assessment.
  4. Frequency of testing shall be conducted in accordance with DTSC's Imported Fill Advisory as follows;

**Fill Material Sampling Schedule**

**Area of Individual Borrow Area**

**Sampling Requirements**

2 Acres or less

Minimum of 4 samples

2 to 4 Acres

Minimum of 1 sample every ½ Acre

4 to 10 Acres

Minimum of 8 Samples

Greater than 10 Acres

Minimum of 8 locations with 4 subsamples per location

**Volume of Borrow Area Stockpile**

Up to 1,000 Cubic Yards

1 sample per 250 cubic yards

1,000 to 5,000 Cubic Yards

4 samples for the first 1000 cubic Yards + 1 sample per each additional 500 cubic yard

Greater than 5,000 Cubic Yards

12 samples for the first 5,000 cubic yards + 1 sample per each additional 1,000 cubic yards

5. Reports/ Documentation

- a. Results of the testing analysis shall be sent to the Owner; Architect; Project

Inspector, Project Civil Engineer, DTSC, and DSA. Letter shall reference DSA file and application numbers.

- C. Landscape Backfill Material:
  - 1. The top 3" of native topsoil stripped from the site may be used for landscape backfill material.
- D. Water: Furnish all required water for construction purposes, including compaction and dust control. Water shall be potable.
- E. Aggregate Base: Provide Class 2 3/4" Aggregate Base conforming to standard gradation as specified in Cal Trans Standard Specifications, Section 26,-1.02A.

### **PART 3 – EXECUTION**

#### **3.01 INSPECTION LAYOUT AND PREPARATION**

- A. Prior to installation of the work of this Section, carefully inspect and verify by field measurements that installed work of all other trades is complete to the point where this installation may properly commence
- B. Layout all work, establish grades, locate existing underground utilities, set markers and stakes, setup and maintain barricades and protection facilities; all prior to beginning actual earthwork operations. Layout and staking shall be done by a licensed Land Surveyor or Professional Civil Engineer.
- C. Verify that specified items may be installed in accordance with the approved design.
- D. In event of discrepancy, immediately notify Owner and the Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

#### **3.02 PERFORMANCE**

- A. GENERAL:
  - 1. General: Do all grading, excavating and cutting necessary to conform finish grade and contours as shown. All cuts shall be made to true surface of subgrade.
  - 2. Archaeological Artifacts: Should any artifacts of possible historic interest be encountered during earthwork operations, halt all work in area of discovery and immediately contact the Architect for notification of appropriate authorities.
  - 3. Degree of Compaction: Percentage of maximum density, hereinafter specified as degree of compaction required, means density equivalent to that percentage of maximum dry density determined by ASTM D1557 Compaction Test method, and such expressed percentage thereof will be minimum acceptable compaction for specified work.
  - 4. Moisture Content: Moisture content shall be as noted below and as called for on the plans. Moisture content shall be maintained until subgrade is covered by surfacing materials.

#### **3.03 DEMOLITION, DISPOSAL AND DISPOSITION OF UNDESIRABLE MAN-MADE FEATURES**

- A. All other obstructions, such as abandoned utility lines, septic tanks, concrete foundations, and the like shall be removed from site. Excavations resulting from these removal activities shall be cleaned of all loose materials, dish shaped, and widened as necessary to permit access for compaction equipment. Areas exposed by any required over-excavation should be scarified to a depth of 12", moisture-conditioned to near optimum moisture content, and recompacted to at least 90% of the maximum dry density.

### **3.04 TESTING AND OBSERVATION**

- A. All grading and earthwork operations shall be observed by the Geotechnical Engineer or his representative, serving as the representative of the Owner.
- B. Field compaction tests shall be made by the Geotechnical Engineer or his representative. If moisture content and/or compaction are not satisfactory, Contractor will be required to change equipment or procedure or both, as required to obtain specified moisture or compaction. Notify Geotechnical Engineer at least 48 hours in advance of any filling operation.
- C. Earthwork shall not be performed without the notification or approval of the Geotechnical Engineer or his representative. The Contractor shall notify the Geotechnical Engineer at least two (2) working days prior to commencement of any aspect of the site earthwork.
- D. If the Contractor should fail to meet the compaction or design requirements embodied in this document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory, as determined by the Geotechnical Engineer or Architect/Engineer.
- E. After each rain event Geotechnical Engineer shall test fill material for optimum moisture. Do not place any fill material until desired moisture is achieved.

### **3.05 CLEARING AND GRUBBING**

- A. Prior to grading, remove all debris off-site. Remove trees and brush including the root systems. Holes resulting from tree and brush removal should be prepared and backfilled in accordance with paragraphs 3.07, 3.08, 3.09, and 3.10. This may require deepening and/or widening the holes to adequately remove disturbed soil and provide room for compaction equipment. Strip the surface of all organics. Stripping's meeting the requirements of Section 329000 may be used in landscape areas only.

### **3.06 CUTTING**

- A. Building pads that are located within a cut/fill transition area will have to be overexcavated to provide a semi-uniform fill beneath the building pad. The portions of building pads located in cut areas shall be overexcavated to provide no more than 1 foot difference in fill placed in the same building pad.
- B. Do all cutting necessary to bring finish grade to elevations shown on Drawings.
- C. When excavation through roots is necessary, cut roots by hand.
- D. Carefully excavate around existing utilities to avoid unnecessary damage. The contractor shall anticipate and perform hand work near existing utilities as shown on the survey, without additional claims or cost.

### **3.07 STRUCTURAL EXCAVATION**

- A. General: Excavate to bear on firm material at contract depth shown on Structural Drawings.
- B. Footings: All footing excavations shall be of sufficient width for installation of formwork, unless earth will retain its position during concreting. All portions of footings above grade must be formed. In the event that footings are placed against earth, footing widths below grade shall be increased 2 inches from those shown on Drawings and positive protection shall be provided for top corners of trench.
- C. Unsuitable Ground: Any errors in structural excavation, soft ground, or clay soils found when excavating shall be reported to Architect. In no case shall work be built on any such soft or clayey unsuitable surface without direction from the Architect. Restore excavations to proper elevation with engineered fill material compacted to 90% of dry density.

### **3.08 SUBGRADE PREPARATION**

- A. Grade compact and finish all subgrades within a tolerance of 0.10' of grades as indicated on Drawings and so as not to pool water. Subgrade within building pads and concrete walks shall be within 0.05' of grades indicated.
- B. After clearing, grubbing and cutting, subsurface shall be plowed or scarified to a depth of at least 12", until surface is free from ruts, hummocks or other uneven features and uniform and free from large clods. Moisture condition to 2% above optimum moisture content and recompact to at least 90% of the maximum dry density as determined by ASTM Test Method D1557. If the existing soils are at a water content higher than specified, the contractor shall provide multiple daily aerations by ripping, blading, and/or disking to dry the soils to a moisture content where the specified degree of compaction can be achieved. After seven consecutive working days of daily aerations, and the moisture content of the soil remains higher than specified, the contractor shall notify the architect. If the existing soils have a moisture content lower than specified, the contractor shall scarify, rip, water and blade existing soil to achieve specified moisture content. The contractor shall make proper allowance in schedule and methods to complete this work.
- C. Subgrade in areas to receive landscaping shall be compacted to 90%.
- D. Where Contractor over-excavates building pads through error, resulting excavation shall be recompacted as engineered fill at Contractor's expense.

### **3.09 PLACING, SPREADING AND COMPACTING FILL MATERIAL IN BUILDING PAD AND PAVEMENT AREAS**

- A. Selected fill material shall be placed in layers which, when compacted, shall not exceed 6 inches in compacted thickness. Each layer shall be spread evenly and thoroughly mixed to insure uniformity in moisture content.
- B. Selected fill material shall be moisture-conditioned to specified moisture content. Selected fill material shall be unfrozen. When moisture content of fill material is below that specified, add water until proper moisture content is achieved. When moisture content is above that specified, aerate by blading or other methods mentioned in 3.08 B until moisture content is satisfactory.
- C. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to a minimum of 90% as determined by the ASTM D1557 Compaction Test. Compact each layer over its entire area until desired density has been obtained.
- D. Recomposition of Fill in Trenches and Compaction of Fill Adjacent to Walls: Where trenches must be excavated, backfill with material excavated. Place in lifts that when compacted do not exceed 6", moisture conditioned to (optimum)(2% above optimum) moisture content, and compact to a minimum of 90% relative compaction in building pad and paved areas, and to 90% relative compaction in landscape areas.
- E. Jetting of fill materials will not be allowed.

### **3.10 FINAL SUBGRADE COMPACTION**

- A. Building Pads: Upper 12" of all final building pad subgrades shall be uniformly compacted at specified moisture content to at least 90% of maximum dry density, as determined by ASTM D1557 Compaction Test, regardless of whether final subgrade elevation is attained by filling, excavation, or is left at existing grade. After acceptance of final compaction test, contractor shall maintain the required moisture content of subgrade until concrete flatwork is placed.
- B. Asphalt Paved Areas: Upper 8" of all final subgrades supporting pavement sections shall be brought to specified moisture content and shall be uniformly compacted to not less than 95% of maximum dry density, regardless of whether final subgrade elevation is attained by



filling, excavation, or is left at existing grade. After acceptance of final compaction test, contractor shall maintain the required moisture content of subgrade until aggregate base is placed.

- C. Concrete Paved Areas: Upper 12" of all final subgrades supporting concrete flatwork shall be brought to specified moisture content and shall be uniformly compacted to not less than 90% of maximum dry density, regardless of whether final subgrade elevation is attained by filling, excavation, or is left at existing grade. After acceptance of final compaction test, contractor shall maintain the required moisture content of subgrade until aggregate base is placed.
- D. Other Fill and Backfill: Upper 12" of all other final subgrades or finish grades shall be compacted to 90% of maximum dry density.
- E. Gravel Fill: Do not place compacted gravel fill until after underground work and foundations are in place. Compact gravel fill with vibratory plate or similar equipment to preclude settlement.

### **3.11 PLACING, SPREADING, AND COMPACTION OF LANDSCAPE BACKFILL MATERIALS**

- A. All landscaped areas shall receive topsoil. After subgrade under landscape area has been scarified and brought to 90% maximum dry density, top soil shall be placed evenly to depth of 8" at 85% of maximum dry density.
- B. Project Inspector must verify that materials are uniformly spread to minimum depth specified.

### **3.12 SLOPE CONSTRUCTION**

- A. Cut slopes shall be constructed to no steeper than 2:1 (horizontal:vertical). Fill slopes shall be constructed to no steeper than 2:1 (horizontal:vertical). Prior to placement of fill on an existing slope the existing slope shall be benched. The benches shall be in a ratio of 2 horizontal to 1 vertical. The face of the fill slopes shall be compacted as the fill is placed, or the slope may be overbuilt and then cut back to the design grade. Compaction by track walking will not be allowed.

### **3.14 FINISH GRADING**

- A. At completion of project, site shall be finished graded, as indicated on Drawings. Finish grades shall be "flat graded" to grades shown on the drawing. Mounding of finish grades will not be allowed unless otherwise directed on the landscape drawings. Tolerances for finish grades in drainage swales shall be  $\pm 0.05'$ . Tie in new and existing finish grades. Leave all landscaped areas in finish condition for lawn seeding. Landscaped planters shall be graded uniformly from edge of planter to inlets. If sod is used for turf areas the finish grade on which it is placed shall be lowered to allow for sod thickness.
- B. All landscape areas shall be left free of rock or foreign material as specified in Section 329000.
- C. All landscape areas shall be approved by Architect prior to any planting.

### **3.15 SURPLUS MATERIAL**

- A. Excavated material not required for grading or backfill shall be removed from site at contractor's expense.

### **3.16 CLEANING**

- A. Refer to Section 017400.
- B. Remove from fill all vegetation, wood, form lumber, casual lumber, and shavings, in contact with ground; buried wood will not be permitted in any fill.

END OF SECTION

## **SECTION 31 23 33 – TRENCHING AND BACKFILLING**

### **PART 1 – GENERAL**

#### **1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS**

- A. The general conditions, supplementary conditions and Division 1 are fully applicable to this section as if repeated herein.

#### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 015000, Construction Facilities and Temporary Controls.
- B. Section 310000, Earthwork.
- C. Section 334000, Site Drainage.
- D. Section 330000, Site Utilities.
- E. Section 321200, Asphalt Concrete Paving

#### **1.03 QUALITY ASSURANCE**

- A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.
- B. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.
- C. Contractor / Installer shall have been in business for five (5) years providing/finishing similar size projects and complexity.

#### **1.04 SUBMITTALS**

- A. Refer to Section 013300.
- B. Submit Manufacturers data and shop drawings.

#### **1.05 WARRANTY**

- A. Submit fully executed warranty for work and materials in this section per 017836.

#### **1.06 REFERENCES AND STANDARDS**

- A. California Building Code current edition.
- B. California Plumbing Code current edition.

#### **1.07 DELIVERY, STORAGE AND HANDLING**

- A. Transport, store and handle in strict accord with the local jurisdiction.
- B. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

#### **1.08 PROJECT CONDITIONS**

- A. Contractor shall acquaint himself with all existing site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

- B. Field verify that all components, backing, etc. by others are installed correctly to proceed with installation of products as herein specified.
- C. Trench dewatering may be necessary. Contractor shall provide any and all tools, equipment and labor necessary for trench dewatering no matter what the source. Dewatering shall be continuous until all site utilities are installed and backfilled.

#### **1.09 PROTECTION**

- A. Adequate protection measures shall be provided to protect workers and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations. Repair all trenches in grass areas with new sod (seeding not permitted) and "stake-off" for protection.
- B. Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.
- C. Any construction review of the Contractor's performance conducted by the Architect or Owner is not intended to include review of the adequacy of the Contractor's safety measures, in, on or near the construction site.
- D. Provide shoring, sheeting, sheet piles and or bracing to prevent caving, erosion or gullyng of sides of excavation.
- E. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. Keep all excavations free from water during entire progress of work, regardless of cause, source or nature of water.
- F. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.
- G. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance.
- H. Trees: Carefully protect existing trees which are to remain.

#### **1.10 TRENCH SAFETY PROVISIONS**

- A. General Contractor shall be solely responsible for safety design, construction and coordination with agencies having jurisdiction. If such plan varies from shoring system standards established by Construction Safety Orders, plan shall be prepared by registered civil or structural engineer.
- B. Nothing herein shall be deemed to allow use of shoring, sloping or protective system less effective than that required by Construction Safety Orders of California State Division of Industrial Safety.
- C. When trenching through paved surface, provide steel trench plates to cover open trenches daily until trenches are backfilled.

#### **1.11 SEASONAL LIMITS**

- A. No backfill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by heavy rains, full operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.
- B. Material above optimum moisture shall be processed per section 310000, 3.08, B.

#### **1.12 TESTING**

- A. General: Refer to Section 014500 – Quality Requirements.

## **PART 2 – PRODUCTS**

### **2.01 MATERIALS**

- A. Backfill materials: Pipeline and conduit trench backfill as shown on the plans and as specified below.
1. ¾ inch crush rock.
  2. Native Materials: Soil native to Project Site, free of wood, organics, and other deleterious substances. Rocks shall not be greater than 3-inches.
  3. Sand: Fine granular material, free of organic matter, mica, loam or clay.
  4. Lean Mix Concrete/Controlled Density Backfill: 3 sacks of cement per yard plus sand.
  5. Class 2 aggregate base, ¾" rock, per Caltrans section 26-1.02B
- B. Water: Furnish all required water for construction purposes, including compaction and dust control. Water shall be potable.
- C. Provide other bedding and backfill materials as described and specified in Section 310000, Section 334000 and Divisions 15 and 16.

## **PART 3 – EXECUTION**

### **3.01 INSPECTION**

- A. Verification of Conditions:
1. Examine areas and conditions under which work is to be performed.
  2. Identify conditions detrimental to proper or timely completion of work and coordinate with General Contractor to rectify.

### **3.02 COORDINATION**

- A. General Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

### **3.03 INSTALLATION**

- A. Perform work in accordance with pipe manufacturer's recommendations, as herein specified and in accordance with drawings.

### **3.04 TRENCHING**

- A. Make all trenches open vertical construction with sufficient width to provide free working space at both sides of trench around installed item as required for caulking, joining, backfilling and compacting; not less than 12 inches wider than pipe or conduit diameter, unless otherwise noted.
- B. Carefully excavate around existing utilities to avoid unnecessary damage. The contractor shall anticipate and perform hand work near existing utilities as shown on the survey, without additional claims or cost.
- C. Trench straight and true to line and grade with bottom smooth and free of edges or rock points.

- D. Where depths are not shown on the plans, trench to sufficient depth to give minimum fill above top of installed item measured from finish grade above the utility as follows:
1. Sewer pipe: depth to vary
  2. Storm drain pipe: depth to vary
  3. Water pipe - Fire Supply: 36 inches
  4. Water pipe – Domestic Supply: 30 inches
- E. Where trench through existing pavement saw cut existing pavement in straight lines. Grind existing asphalt on each side of trench 3" wide x ½ the depth of the section. Apply tack coat to vertical surfaces before installing new asphalt. Replace asphalt and concrete pavement sections to matched existing conditions. In concrete pavement provide expansion and control joints to match existing joint layout.

### 3.05 BACKFILL

- A. Pipe Trench Backfill is divided into three zones:
1. Bedding: Layer of material directly under the pipe upon which the pipe is laid.
  2. Pipe Zone: Backfill from the top of the bedding to 6 inches (compacted) over the top of the pipe.
  3. Upper Zone: Backfill between top of Pipe Zone and to surface of subgrade.
- B. Bedding: Type of material and degree of compaction for bedding backfill shall be as defined in the Details and Specifications.
- C. Pipe Zone and Upper Zone Backfill:
1. Type of material and degree of compaction Pipe Zone and Upper Zone Backfill shall be as required by Drawings, Details, & Specifications.
  2. Upper Zone Backfill shall not be placed until conformance of Bedding and Pipe Zone Backfill with specified compaction test requirements has been confirmed.
  3. Backfill shall be brought up at substantially the same rate on both sides of the pipe and care shall be taken so that the pipe is not floated or displaced. Material shall not be dropped directly on pipe.
- D. Backfill Compaction:
1. Backfill shall be placed in layers which, when compacted shall not exceed 6 inches in thickness. Each layer shall be spread evenly and thoroughly mixed to insure uniformity. Do not backfill over, wet, frozen or soft subgrade surfaces. Employ a placement method that does not disturb or damage foundation walls, perimeter drainage, foundation damp-proofing, waterproofing or protective cover.
  2. When moisture content of fill material is below that required to achieve specified density, add water until proper moisture content is achieved. When moisture content is above that required, aerate by blading or other methods until specified moisture content is met, see section 310000, 3.08, B.
  3. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to 90% of maximum dry density while at specified moisture content. Compact each layer over its entire area until desired density has been obtained.
  4. The top 12 inches of subgrade compaction under pavement or building shall be per Earthwork section 310000.

5. Compaction: All backfill operations shall be observed by the Inspector of Record and/or Geotechnical Engineer. Field density tests shall be made to check compaction of fill material. If densities are not satisfactory, Contractor will be required to change equipment or procedure or both, as required to obtain specified densities. Notify Inspector and Architect at least 24 hours in advance of any operation.

E. Backfill in Areas Previously Lime or Cement Treated

1. If trenching is necessary in areas that have been previously lime treated the contractor shall backfill the trench with class 2 aggregate base, with minimum section equal to the lime treated section and compacted to 95%.

**3.06 TRENCH AND SITE RESTORATION**

- A. Finished surface of trenches shall be restored to a condition equal to, or better than the condition as existed prior to excavation work.

**3.07 PROTECTION**

- A. Protect existing surfaces, structures, and utilities from damage. Protect work by others from damage. In the event of damage, immediately repair or replace to satisfaction of Owner.
- B. Repair existing landscaped areas to as new condition. Replant trees, shrubs or groundcover with existing materials if not damaged or with new materials if required. Replace damaged lawn areas with sod, no seeding will be permitted.
- C. Replace damaged pavement with new compatible matching materials. Concrete walks to be removed to nearest expansion joint and entire panel replaced. Asphalt to be cut neatly and replaced with new materials.
- D. Any existing materials removed or damaged due to trenching to be returned to new condition.

**3.08 SURPLUS MATERIAL**

- A. Remove excess excavated material, unused materials, damaged or unsuitable materials from site.

**3.09 CLEANING**

- A. Refer to Section 017400.
- B. Contractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others throughout the project and at the completion of work..
- C. After completion of work in this section, remove all equipment, materials, and debris. Leave entire area in a neat, clean, acceptable condition.

END OF SECTION

**SECTION 32 12 00 – ASPHALT CONCRETE PAVING**

**PART 1 - GENERAL**

**1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS**

- A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 015000, Construction Facilities and Temporary Controls.
- B. Section 310000, Earthwork.
- C. Section 312333, Trenching and Backfilling.
- D. Section 334000, Site Drainage.

**1.03 QUALITY ASSURANCE**

- A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.
- B. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.
- C. The representatives of the Owner's testing lab will not act as supervisor of construction, nor will they direct construction operations. Neither the presence of the Owner's testing lab representatives nor the testing by the Owner's testing lab shall excuse the contractors or subcontractors for defects discovered in their work during or following completion of the project. Correcting inadequate compaction is the sole responsibility of the contractor.
- D. Contractor shall provide verification that asphalt mix temperature meets the requirements of this specification at time of application.
- E. Contractor shall be solely responsible for all subgrades built. Any repairs resulting from inadequate compaction are the responsibility of the contractor.
- F. Sieve analysis from testing laboratories identifying rock/sand percentages within the asphalt mix shall have a testing date within 90 days of contract signing.
- G. Sieve analysis from a testing laboratory identifying rock/sand percentages within the class 2 aggregate base rock shall have a testing date within 90 days of contract signing.

**1.04 SUBMITTALS**

- A. Refer to Section 013300.
- B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

**1.05 WARRANTY**

- A. Refer to General Conditions and Section 017836.

**1.06 REFERENCES AND STANDARDS**

- A. ANSI/ASTM D698-00 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.
- B. ANSI/ASTM D1556-00 - Test Method for Density of Soil in Place by the Sand-Cone



Method.

- C. ANSI/ASTM D1557-02 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
- D. ANSI/ASTM D 3017-05 Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).
- E. ANSI/ASTM D 422-63 Test Method for Particle Size Analysis of Soil.
- F. ANSI/ASTM D 4318-05 Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.
- G. CALTRANS Standard Specifications.
- H. CAL-OSHA, Title 8, Section 1590 (e).
- I. Any work within the street, highway or right-of-way shall be performed in accordance with the requirement of the governmental agencies having jurisdiction, and shall not begin until all of those governing authorities have been notified.

#### **1.07 DELIVERY, STORAGE AND HANDLING**

- A. Transport, store and handle in strict accord with the local jurisdiction.
- B. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

#### **1.08 PROJECT CONDITIONS**

- A. Environmental Requirements:
  - 1. Base Course: Do not lay base course on muddy subgrade, during wet weather, or when atmospheric temperature is below 40 degrees F.
  - 2. Asphalt Surfacing: Do not apply asphaltic surfacing on wet base, during wet weather, or when atmospheric temperature is below 50 degrees F.

#### **1.09 EXISTING SITE CONDITIONS**

- A. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

#### **1.10 PROTECTION**

- A. Adequate protection measures shall be provided to protect workmen and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations.
- B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.
- C. Any construction review of the Contractor's performance conducted by the owner's representative is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.
- D. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The contractor shall make a reasonable effort on a daily basis to keep all excavations and the site free from water during entire progress

of work, regardless of cause, source, or nature of water.

- E. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.
- F. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance. Dust control measures shall be in accordance with the local jurisdiction.

#### **1.11 SEASONAL LIMITS**

- A. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by rains, fill operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.

#### **1.12 TESTING**

- A. General: Refer to Section 014000 – Quality Requirements.
- B. Geotechnical Engineer: Owner is retaining a Geotechnical Engineer to determine compliance of fill with Specifications, and to direct adjustments in fill operations. Costs of Geotechnical Engineer will be borne by Owner; except those costs incurred for re-tests or re-inspection will be paid by Owner and backcharged to Contractor.

### **PART 2 - PRODUCTS**

#### **2.01 MATERIALS**

- A. Sterilant: Soil sterilizer shall be CIBA GEIGY's PramatoI 25-E, Treflan EC or Thompson-Hayward Casoron.
  - 1. Soil sterilizer shall be applied in strict accordance with manufacturer's instructions.
- B. Base Course Aggregate: State Specifications, Section 26, Class 2 aggregate base (3/4" max.).
- C. Asphalt Binder: Steam-refined paving asphalt conforming to State Specifications, Section 92, viscosity grade PG 64-10. Asphalt binder additives for WMA per Caltrans approved list of manufacturer's.
- D. Liquid Asphalt Tack Coat: Per CALTRANS section 94.
- E. Surface Course Aggregate: Mineral aggregates for Type "B" asphalt concrete, conforming to State Specifications 39-2.02, Type B, 1/2" maximum, medium grading. 3/8" maximum grading at Playcourt.
- F. Seal Coat: shall be a pre-mixed asphalt emulsion blended with select fillers and fibers such as:
  - 1. "Park-Top No. 302", Western Colloid Products.
  - 2. "OverKote", Reed and Gram.
  - 3. "Drivewalk", Conoco Oil.
- G. Wood Headers and Stakes: Pressure treated.
- H. Pavement Marking: Colors as directed by Architect. Colors of painted traffic stripes and pavement markings must comply with ASTM D 6628.
  - 1. Waterborne traffic line - colors white, yellow and red, State specification PTWB-01R3.
  - 2. Waterborne traffic line for the international symbol of accessibility and other curb markings – blue, red and green, Federal specification TT-P-1952F.
- I. Precast Concrete Bumpers: 3000 psi at 28 day minimum strength; 48" length unless

otherwise indicated; provide with steel dowel anchors and concrete epoxy.

- J. Pavement Epoxy; K-Lite; KtepX-590; Ennis Epoxy HPS2 or an approved equal.
- K. Crack Filler;
  - 1. Cracks up to ½": QPR model CAR08, 10oz asphalt crack filler; Star STA-FLEX Trowel Grade crack filler or approved equal.
  - 2. Cracks ¼" – 1": "Docal 1100 Viscolastic, distributed by Conoco, Inc., Elk Grove, CA, (916) 685-9253, or approved equal.
  - 3. Cracks greater than 1": Hot Mix, Topeka.
- L. Reclaimed Asphalt Paugment (RAP). HMA Type A or Type B may be produced using RAP providing it does not exceed 15% of the aggregate blend.

## **2.02 MIXES**

- A. General: Plant mixed conforming to State Specifications, Section 39, Type B, ½" maximum, medium grading. 3/8" maximum grading shall be used at hardcourt.
- B. Temperature of Hot Mix Asphalt: Not less than 275 degrees F nor more than 325 degrees F when added to aggregate.
- C. Temperature of Hot Mix Aggregate: Not less than 250 degrees F nor more than 325 degrees F when asphalt is added.
- D. Temperature of Hot Mix Asphalt Concrete: Asphalt shall be not less than 285 degrees at time of application, nor more than 350 degrees. Asphalt not meeting the required temperature shall not be used.
- E. Temperature of Warm Mix Asphalt: Mixing and placement; Per the approved manufactures heat range recommendations for mixing and placement.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION OF CONDITIONS**

- A. Conditions of Work in Place: Subsurfaces which are to receive materials specified under this Section shall be carefully examined before beginning work hereunder, and any defects therein shall be reported, in writing, to the Architect. Work shall not be started until such defects have been corrected. Starting of work shall imply acceptance of conditions as they exist.

### **3.02 PREPARATION**

- A. Sub-Grade: Clean, shape and compact to hard surface free from elevations or depressions exceeding 0.05' in 10' from true plan. Compact per Section 310000. Compaction and moisture content shall be verified immediately prior to placement of aggregate base. Proof roll subbase in presence of geotechnical engineer prior to placement of aggregate base.
- B. Cleaning: Existing surfaces and new surface shall be clean of all dirt, sand, oil or grease. All cracks shall be cleaned and free of all debris and vegetation. Hose down entire area with a strong jet of water to remove all debris.

### **3.03 INSTALLATION**

- A. Headers:
  - 1. General: Install as edging to asphalt paving, except where adjoining existing pavement, concrete curbs, walks or building.

2. Existing Headers: Remove existing headers where new paving will join existing. Saw cut existing asphalt to provide clean edge.

3. Lines and Levels: Install true to line and grade. Cut off tops of stakes 2-inches below top of header so they will not be visible on completion of job.

B. Asphalt Paving:

1. Base Course: Install in accord with State Specifications, Section 26. Compact to relative compaction of not less than 95%, ASTM D1557. The material shall be deposited on the subgrade in such a manner as to provide a uniform section of material within five percent tolerance of the predetermined required depth. Deposition will be by spreader box or bottom dump truck to prevent segregation of the material. The material so deposited on the subgrade shall have sufficient moisture which, in the opinion of the Architect is adequate to prevent excessive segregation. It shall then be immediately spread to its planned grade and cross section. Undue segregation of material, excessive drifting or spotting of material will not be permitted. If in the opinion of the site geotechnical engineer, the material is unsuitably segregated, it shall be removed or completely reworked to provide the desired uniformity of the material.
  - a. Moisture content and compaction of base material shall be tested immediately prior to placement of asphalt paving.
2. Sterilant: Apply specified material at manufacturer's recommended rate. Applicator of sterilant material shall be responsible for determining location of all planter areas. Apply specified material over entire base course area just prior to application of asphalt. Follow manufacturer's printed directions.
3. Liquid Asphalt Tack Coat: Apply as "tack coat" to all vertical surfaces of existing paving, curbs, walks, and construction joints in surfacing against which paving is to be placed.
4. Asphalt Concrete Surface Course:
  - a. Comply with State Specifications, 39-6 except as modified below.
    - 1) Final gradation shall be smooth, uniform and free of ruts, humps, depressions or irregularities, with a minimum density of 95% of the test maximum density determined by California Test Methods #304 and 375. Maximum variation 1/8 inch in 10' when measured with steel straightedge in any one direction. Test paved areas for proper drainage by applying water to cover area. Correct portions that do not drain properly by patching with plant mix. In no case shall accessible parking spaces or loading and unloading areas exceed 2% slope in any direction.
    - 2) Asphalt material shall be delivered to the project site in a covered condition to maintain acceptable temperature. Onsite inspector shall verify temperature of asphalt upon truck arrival to the site.
5. Placement and adjustment of Frames, Covers, Boxes and Grates: The Contractor shall set and adjust to finish grade all proposed and existing frames, covers, boxes, and grates of all manholes, drop inlets, drain boxes, valves, cleanouts, electrical boxes and other appurtenant structures prior to placement of asphaltic concrete.
6. Water Testing: All paved areas shall be water tested, to check drainage, in the presence of the project inspector prior to placement of seal coat. The surface of asphalt paving shall not vary more than 1/8 inch above or below the grade established on the plans. If variations in grade are present, they will be corrected by overlaying paving and/or pavement removal and replacement as directed by the Architect.
7. Patching: Cut existing paving square and plumb at all edges to be joined by new paving. In trenches; grind existing asphalt on each side of trench 3" wide x 1/2 the depth of the section. Apply tack coat to vertical surfaces before installing new work.

Warp carefully to flush surface, with seal over joints, and feather edge. Sawcut, remove and patch existing paving where cutting is necessary for installation of piping or conduits under Divisions 2, 15 and 16.

C. Seal Coat:

1. Seal coat shall be applied no sooner than 30 days from time of asphalt placement.
2. Surface Preparation: surface and cracks shall be clean of all dirt, sand, oil or grease. All cracks shall be filled to a level condition after curing. Make multiple fill applications until a level condition is achieved. Failure to do so will be the reason for rejection. Hose down entire area with a strong jet of water to remove all debris. Remove soft, loose, or otherwise damaged areas of asphalt concrete to full depth of damage and replace with compacted hot mix asphalt concrete as specified herein. Minor holes and imperfections may be patched using hot mix asphalt or mastic using sand/SS-1-H. Use wire brush for removal of oil and grease; prime with shellac or synthetic resin as recommended by manufacturer of pavement sealer material.
3. Seal Coat Seal Application: Thoroughly mix materials and apply in the presence of the onsite inspector. Failure to do so will be cause for rejection. Apply in accordance with manufacturer's written instructions.
  - a. The minimum application rate for each applied coat shall be 30gals per 1000 sq. ft. Two coats of sealcoat will be required.
  - b. Clean-Up and Precautions: As recommended by pavement sealer material manufacturer.

D. Pavement Marking: pavement markings shall be done only after the seal coat has thoroughly dried. Existing surfaces to be striped with traffic paint shall be cleaned of dust, dirt, grime, oil, rust or other contaminants which will impair the quality of work or interfere with proper bond of paint coats. Surfaces shall be thoroughly cleaned by whatever means necessary that will satisfactorily accomplish the purpose without damage to asphalt concrete. Provide measured layouts, temporary markings, templates, and other means necessary to provide required marking. Prepare and apply paint in accordance with manufacturer's instructions; paint shall be applied by spray and shall achieve complete coverage free from voids and thin spots. Where indicated on the Drawings, paint parking stall strips, lettering, arrows, accessible symbols, playfield markings, etc. on asphalt concrete paving. Paint strips shall be 4 inches wide (except otherwise indicated) and applied with two (2) coats of herein specified Traffic Line Paint; white (except as otherwise specified or indicated).

1. Paints shall be delivered to the site in unopened containers.
  - a. Paint shall not be diluted, or watered down.
  - b. Paint shall be applied in 10-12 wet mil thickness (4-6 mil dried). Each coat thickness shall be verified by the project inspector.
2. International Accessible Symbol: Symbol shall be white figures on a blue background. Blue shall be equal to color No. 15090 in Fed. Std. 595c. Lines and symbols shall be accurately formed and true to line and form; lines shall be straight and uniform in width. Painted edges shall be clean cut and free from raggedness, and corners shall be cut sharp and square. Tolerances: Apply striping within a tolerance 1/2 inch in 50 feet. Apply markings and striping to widths indicated with a tolerance of 1/4 inch on straight sections and 1/2 inch on curved sections.

E. Colors: As directed by Architect

F. Precast Concrete Bumpers: Install in location where shown, using steel rebar dowels, and epoxy.

**3.04 DEFECTIVE ASPHALT;**

Defective asphalt is as described below.

- A. Exposed rock pockets on the finished surface that lack the # 8- #200 fines that is required per the sieve analysis.
- B. Asphalt not placed to the design grades.
- C. Asphalt that ponds water.
- D. Asphalt that was compacted below the minimum required temperature and is cracked.
- E. Asphalt that fails to meet the minimum compaction requirements.
- F. Asphalt that lacks the minimum thickness required per plan.
- G. New asphalt contaminated by a petroleum product, or spilled paint.
- H. Asphalt that has depressions, cracks, scored divits from dumpster wheels, heavy equipment use, heavy construction products,
- I. Asphalt placed on pumping, unstable sub-grades.

**3.05 CLEANING**

- A. Refer to Section 017400.
- B. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.
- C. Clean excess material from surface of all concrete walks and utility structures.

END OF SECTION

**SECTION 32 16 00 – SITE CONCRETE**

**PART 1 - GENERAL**

**1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS**

- A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 014500, Testing Lab Services.
- B. Section 310000, Earthwork.

**1.03 QUALITY ASSURANCE**

- A. Use only new materials and products.
- B. Use materials and products of one manufacturer whenever possible.
- C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.
- D. Sieve analysis from testing laboratories identifying rock/sand percentages within the concrete mix; or class 2 aggregate base shall have the current project name and project location identified on the report. Outdated analytical reports greater than 90 days old will not be accepted

**1.04 SUBMITTALS**

- A. Refer to Section 133300.
- B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.
- C. Materials list: Submit to the Architect a complete list of all materials proposed to be used in this portion of the work. Submitted items should include but are not limited to sand, gravel, admixtures, surface treatments, coloring agents, sealers, fibers, cast-in-place accessories, forming and curing products and concrete mix designs.
- D. With concrete submittal, provide documented history of mix design performance.

**1.05 WARRANTY**

- A. Refer to General Conditions and Section 017836.

**1.06 REFERENCES AND STANDARDS**

- A. California Building Code, latest edition.
- B. ACI Standards, ACI 211.1, ACI 318-14, ACI 302, IR-04, ACI 301-16, ACI 305R-10, ACI 306R-16, ACI 308-16.
- C. ASTM C-94, Specification for Ready-Mixed Concrete.
- D. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice (latest edition).
- E. ASTM – American Society for Testing and Materials.

**1.07 DELIVERY, STORAGE AND HANDLING**

- A. Deliver undamaged products to job in manufacturer's sealed containers and/or original



bundles with tags and labels intact.

- B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the work.
- C. Transport, store and handle in strict accord with the manufacturer's written recommendations.
- D. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.
- E. Store cement in weather tight building, permitting easy inspection and identification. Protect from dampness. Lumpy or stale cement will be rejected.
- F. Aggregates: Prevent excessive segregation, or contamination with other materials or other sizes of aggregate. Use only one supply source for each aggregate stock pile.

#### **1.08 TESTING**

- A. General: Refer to Section 014000 – Quality Requirements.
- B. Cement and Reinforcing shall be tested in accordance with CBC Section 1910A. Testing of reinforcing may be waived in accordance with Section 1910A.2 when approved by the Structural Engineer and DSA.

#### **1.09 ADEQUACY AND INSPECTION**

- A. Design, erect, support, brace and maintain formwork and shoring to safely support all vertical and lateral loads that might be applied until such loads can be carried by concrete.
- B. Notify Inspector, Architect and DSA at least 48 hours prior to placing of concrete.

#### **1.10 PROTECTION**

- A. Finish surfaces shall be protected at all times from concrete pour. Inspect forming against such work and establish tight leak-proof seal before concrete is poured. Finish work damaged, defaced or vandalized during the course of construction shall be replaced by contractor at contractor expense.

#### **1.11 FIELD MEASUREMENTS**

- A. Make and be responsible for all field dimensions necessary for proper fitting, slopes and completion of work. Report discrepancies to Architect before proceeding.

### **PART 2 - PRODUCTS**

#### **2.01 MATERIALS**

- A. Cement: Portland cement, ASTM C150, Type II, per ACI 318-14 Section 26.4.
- B. Concrete Aggregates: Normal weight aggregates shall conform to ASTM C33, except as modified by this section. Combined grading shall meet limits of ASTM C33. Lightweight aggregate shall conform to ASTM C330, suitably processed, washed and screened, and shall consist of durable particles without adherent coatings.
- C. Water: Clean and free from deleterious amounts of acids, alkalis, scale, or organic materials and per ACI 318-14 Section 26.4.1.3.1.
- D. Fly Ash: Western Fly Ash, conforming to ASTM C618 for Class N or Class F materials (Class C is not permitted). Not more than 15% (by mass) may be substituted for portland cement.
- E. Water Reducing Admixture: Admixture to improve placing, reduce water cement ratio, and

ultimate shrinkage may be used. Provide WRDA 64 by Grace Construction Products or approved equal. Admixture shall conform to ASTM C494 and ACI 318-14 Section 26.4.1.4.19(a). Such admixture must receive prior approval by the Architect, Structural Engineer, and the Testing Lab, and shall be included in original design mix.

- F. Air-entraining Admixture: Daravair 1000 by Grace Construction Products or approved equal. Admixture must conform to ASTM C260 and ACI 318-14, section 26.4.1.4.
- G. Exterior Flatwork Expansion Joint Sealant: 1-part polyurethane sealant, Sikaflex -1c SL or approved equal.
- H. Surface Retarder (for exposed aggregate finishes): Rugasol-S by Sika Corporation or approved equal.
- I. Form Coating: Material which will leave no residue on concrete surface that will interfere with surface coating, as approved by the Architect.
- J. Expansion Joint Material: Preformed 3/8" fiber material, full depth of concrete section, with bituminous binder manufactured for use as concrete expansion joint material, as accepted by the Architect.
- K. Reinforcement Bars: New billet steel deformed bars conforming to requirements of ASTM A615 or ASTM A706; Grade 60. Dowels for installation through expansion joints or construction joints to existing sidewalks or concrete features shall be smooth or shall be sleeved on one end for slippage.
- L. Reinforcing supports: Galvanized metal chairs or spacers or metal hangers, accurately placed 3'-0" O.C.E.W. Staggered and each support securely fastened to steel reinforcement in place. Bottom bars in footings may be supported with 3" concrete blocks with embedded wire ties. Concrete supports without wire ties will not be allowed.
- M. Truncated Domes: Vitrified Polymer Composite (VPC), Cast-In-Place Detectable/Tactile Warning Surface Tiles; "Armor-Tile", "Access Tile Tactile Systems", or approved equal. Tiles shall comply with Americans with Disabilities Act and the California Code of Regulations (CCR) Title 24, Part 2, Chapter 11B. Install tiles as recommended by manufacturer.
  - 1. Color: As selected by the Architect.
- N. Curing Compound (for exterior slabs only): Burke Aqua Resin Cure by Burke by Edoco, 1100 Clear by W.R. Meadows or accepted equal. Water based membrane-forming concrete curing compound meeting ASTM C 309 and C1315.
- O. Concrete Bonding Agent: Weld-Crete by Larson Products Corp., Daraweld C by Grace Construction Products or accepted equal.
- P. Patching Mortar: Meadow-Crete GPS, one-component, trowel applied, polymer enhanced, shrinkage-compensated, fiber reinforced, cementitious repair mortar for horizontal, vertical and overhead applications as manufactured by W.R. Meadows or accepted equal.
- Q. Non-shrink Grout: Masterflow 713 Plus by Master Builders or approved equal. Premixed, non-metallic, no chlorides, non-staining and non-shrinking per CRD-C621, Corps of Engineers Specification and ASTM C 1107, Grades B and C.
- R. Aggregate Base: Class 2 AB per Caltrans specification section 26-1.02A.
- S. Joint sealant for expansion joints: Single component silicone sealant, Type S, ASTM D5893
- T. Pre- Formed plastic Expansion Joint; W.R. Meadows 3/8" "Snap Cap", Tex-Trude expansion joint cap, or an approved equal.
- U. Adhesive Anchoring (Epoxy): Hilty HIT-HY 200 Safe Set, or approved equal.

## **2.02 CONCRETE DESIGN AND CLASS**

- A. Class "B": Concrete shall have 1" max. size aggregate, shall have 3000 psi min. at 28 day strength with a maximum water to cementitious ratio no greater than 0.50. Use for exterior slabs, including walks, vehicular paved surfaces, manhole bases, poured-in-place drop inlets, curbs, valley gutters, curb & gutter and other concrete of like nature.
- B. Slump Limits: Provide concrete, at point of final discharge, of proper consistency determined by Test Method ASTM C143 with a slumps of 4" plus or minus 1".
- C. Mix Design: All concrete used in this work will be designed for strength in accordance with provisions of ASI 318-14 Section 26.4. Should the Contractor desire to pump concrete, a modified mix design will need to be submitted for review. Fly ash may be used in concrete to improve workability in amounts up to 15% of the total cementitious weight.
- D. Air Entrainment; Per the Local Jurisdiction minimum requirements, or 4.5% minimum.

## **2.03 MIXING OF CONCRETE**

- A. Conform to requirements of CBC, Chapter 19A.
- B. All concrete shall be mixed until there is uniform distribution of material and mass is uniform and homogenous; mixer must be discharged completely before the mixer is recharged.
- C. Concrete shall be Ready-mixed Concrete: Mix and deliver in accordance with the requirements set forth in ASTM C94 and ACI 301. Batch Plant inspection may be waived in accordance with CBC Section 1705A.3.3.1, when approved by Structural Engineer and DSA.
  - 1. Approved Testing Laboratory shall check the first batching at the start of the work and furnish mix proportions to the Licensed Weighmaster.
  - 2. Licensed Weighmaster to positively identify materials as to quantity and to certify to each load by ticket.
  - 3. Ticket shall be transmitted to Project Inspector by truck driver with load identified thereon. Project Inspector will not accept load without load ticket identifying mix and will keep daily record of pours, identifying each truck, its load and time of receipt and will transmit two copies of record to DSA.
  - 4. At end of project, Weighmaster shall furnish affidavit to DSA on form satisfactory to DSA, certifying that all concrete furnished conforms in every particular and to proportions established by mix designs.
  - 5. Placement of concrete shall occur as rapidly as possible after batching and in a manner which will assure that the required quality of the concrete is maintained. In no case may concrete be placed more than 90 minutes from batch time.
  - 6. Water may be added to the mix only if neither the maximum permissible water-cement ratio nor the maximum slump is exceeded. In no case shall more than 10 gallons of water shall be added to a full 9 yard load, or 1 gal. per yard on remaining concrete within the drum providing load tag indicates at time of mixing at plant will allow for additional water.

## **2.04 MATERIALS TESTING**

- A. Materials testing of concrete and continuous batch plant inspection may be waived in accordance CBC Sections 1704A.4.4 when approved by Structural Engineer and DSA.
- B. Testing of concrete shall be performed per article 3.07 of this specification.

## **2.05 EQUIPMENT**

- A. Handling and mixing of concrete: Project Inspector may order removal of any equipment which in his opinion is insufficient or in any way unsuitable.

### **PART 3 - EXECUTION**

#### **3.01 APPROVAL OF FORMS AND REINFORCEMENTS**

- A. Forms and reinforcements are subject to approval by the Project Inspector, and notice of readiness to place first pour shall be given to DSA, Architect and Structural Engineer 48 hours prior to placement of concrete. Before placing concrete, clean tools, equipment and remove all debris from areas to receive concrete. Clean all reinforcing and other embedded items off all coatings oil, and mud that may impair bond with concrete.
- B. All reinforcing steel and or W.W.F. shall be adequately supported by approved devices on centers close enough to prevent any sagging.
- C. All reinforcing bar lap splices shall be staggered a minimum of 5 ft.
- D. Additional reinforcing steel shall be placed around all utility boxes, valve boxes, manhole frames and covers that are located within the concrete placements.
  - 1. The bars shall be placed so that there will be a minimum of 1 ½" clearance and a maximum of 3" clearance. The reinforcing steel shall be placed mid-depth of concrete slab.
- E. At all right angles or intersections of concrete walks, additional 2'x2' #5, 90 degree bars shall be added at all inside corners for additional crack control. The bars shall be placed 2" from concrete forms and supports at mid-depth of slab.

#### **3.02 PROTECTION**

- A. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
- B. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.
- C. Sub-Grade in vehicular concrete paved areas: Subgrade shall be clean, shaped and compact to hard surface free from elevations or depressions exceeding 0.05' in 10' from true plan. Compact per Section 310000. Compaction and moisture content shall be verified immediately prior to placement of concrete. Proof roll subbase in presence of geotechnical engineer prior to placement of aggregate base.

#### **3.03 CLEANING**

- A. Reinforcement and all other embedded items at time of placing concrete to be free of rust, dirt oil or any other coatings that would impair bond to concrete.
- B. Remove all wood chips, sawdust, dirt, loose concrete and other debris just before concrete is to be poured. Use compressed air for inaccessible areas. Remove all standing water from excavations.

#### **3.04 FORMING**

- A. Form material shall be straight, true, sound and able to withstand deformation due to loading and effects of moist curing. Materials which have warped or delaminated, or require more than minor patching of contact surfaces, shall not be reused.
- B. Build forms to shapes, lines, grades and dimensions indicated. Construct form work to maintain tolerances required by ACI 301. Forms shall be substantial, tight to prevent leakage of concrete, and properly braced and tied together to maintain position and shape. Butt joints tightly and locate on solid backing. Chamfer corners where indicated. Form

bevels, grooves and recesses to neat, straight lines. Construct forms for easy removal without hammering, wedging or prying against concrete.

- C. Space clamps, ties, hangers and other form accessories so that working capacities are not exceeded by loads imposed from concrete or concreting operations.
- D. Build openings into vertical forms at regular intervals if necessary to facilitate concrete placement, and at bottoms of forms to permit cleaning and inspection.
- E. Build in securely braced temporary bulkheads, keyed as required, at planned locations of construction joints.
- F. Slope tie-wires downward to outside of wall.
- G. Brace, anchor and support all cast-in items to prevent displacement or distortion.
- H. During and immediately after concrete placing, tighten forms, posts and shores. Readjust to maintain grades, levels and camber.
- I. Concrete paving, Curbs, Curb and Gutters, Ramps:
  - 1. Expansion Joints: Install at locations indicated, and so that maximum distance between joints is 20' for exterior concrete unless otherwise shown. Expansion joint material shall be full depth of concrete section. Recess for backer rod and sealant where required. Expansion joints shall not exceed ¼ inch depth measured from finish surface to top of felt or sealant, and ½ inch width.
  - 2. Curbs, Valley Gutter, and Curb & Gutter: Install expansion joints at 60' on center, except when placing adjacent to concrete walks, the expansion joints shall align with the expansion joints shown for the concrete walks. Expansion joint material shall be full depth of concrete section. Recess for backer rod and sealant will be required.
  - 3. Isolation Joints: 3/8" felt between walls and exterior slabs or walks so that paved areas are isolated from all vertical features, unless specifically noted otherwise on plans.
  - 4. Exterior Concrete Paving: Install expansion joints at 20' on center maximum, both directions, unless shown otherwise on plans.
  - 5. Ramps; whether shown or not all ramps shall have control joints and expansion joints.
    - a. Control joints on ramps shall be aligned and be placed in between with the vertical posts for the handrails. The curbs, if required shall have control joints that align with the handrail posts.
    - b. Expansion joints shall be placed at the upper, intermediate, and bottom landings.

### **3.05 FORM COATING**

- A. Before placement of reinforcing steel, coat faces of all forms to prevent absorption of moisture from concrete and to facilitate removal of forms. Apply specified material in conformance with manufacturer's written directions.
- B. Before re-using form material, inspect, clean thoroughly and recoat.
- C. Seal all cut edges.

### **3.06 INSTALLATION**

- A. General: Reinforcement shall be accurately placed at locations indicated on the drawings within required tolerances and providing required clearances. Reinforcement shall be secured prior to placement of concrete such that tolerances and clearances are maintained. Coverage shall be in accordance with Section 1907A.7 of the CBC. Keep a

person on the job to maintain position of reinforcing as concrete is placed. Reinforcement must be in place before concreting is begun. Install dowels as shown on drawings. Give notice whenever pipes, conduits, sleeves, and other construction interferes with placement; obtain method of procedure to resolve interferences. All expansion and construction joints in concrete shall have dowels of size and spacing as shown, or as approved by Architect.

B. Placing Tolerances:

1. Per ACI 301 or CRSI/WCRSI Recommended Practice for Placing Reinforcing Bars, unless otherwise shown.
2. Clear distance between parallel bars in a layer shall be no less than 1", the maximum bar diameter not 1 ½ times the maximum size of coarse aggregate.

C. Splices:

1. General: Unless otherwise shown on drawings, splice top reinforcing at midspan between supports, splice bottom reinforcing at supports and stagger splices at adjacent splices 5 foot minimum. Bar laps shall be wired together. Reinforcing steel laps shall be as follows:
  - a. Lap splices in concrete: Lap splice lengths shall not be less than 62 bar diameter for No. 5 bar, 56" minimum for No. 6 bars. No. 4 bar shall have a minimum of 24" splice. 93 bar diameters for No. 7 bars and larger.
  - b. All splices shall be staggered at 5 feet minimum.

**3.07 INSPECTION**

- A. Approval of reinforcing steel, after installation, must be received from Inspector. Architect, Structural Engineer and DSA must be notified 48 hrs. in advance of beginning of concrete placement operations.
- B. Slope of concrete forms and finish condition shall be checked with a two foot (2') digital level.

**3.08 PLACING OF CONCRETE**

- A. Adjacent finish surfaces shall be protected at all times during the concrete pour and finishing. Verify that all formwork is tight and leak-proof before concrete is poured. Finish work defaced during the concrete pour and finishing shall be replaced at no extra cost to the owner.
- B. Transport concrete from mixer to place of final deposit as rapidly as practicable by methods which will prevent separation or loss of ingredients. Deposit as close as practicable in final position to avoid re-handling or flowing. Partially hardened concrete must not be deposited in work. Concrete shall not be wheeled directly on top of reinforcing steel.
- C. Placing: Once started, continue concrete pour continuously until section is complete between predetermined construction joints. Prevent splashing of concrete onto adjacent forms or reinforcement and remove such accumulation of hardened or partially hardened concrete from forms or reinforcement before work proceeds in that area. Free fall of concrete shall not to exceed 4'-0" in height. If necessary, provide lower openings in forms to inject concrete and to reduce fall height.
- D. Remove form spreaders as placing of concrete progresses.
- E. Place footings as monolithic and in one continuous pour.
- F. Keep excavations free of standing water, but moisture condition sub-grade before concrete placement.

- G. Compacting: All concrete shall be compacted by mechanical vibrators. Concrete shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms. Vibrating shall not be applied to concrete which has already begun to initially set nor shall it be continued so long as to cause segregation of materials.
- H. Grout under column bearing plates: Dry pack with specified Non-shrink Grout, as recommended by manufacturer. Use as little water as practicable. Ram grout solid into place.
- I. Concrete Flatwork:
  - 1. All flatwork shall be formed and finished to required line and grades. Flatwork shall be true and flat with a maximum tolerance of 1/8" in 10' for flatness. Flatwork which is not flat and are outside of the maximum specified tolerances shall be made level by the Contractor at no additional expense to the Owner.
  - 2. Thoroughly water and soak the flatwork subgrade as required to achieve required moisture content prior to the concrete pour. Provide damming as required to keep water within the formed area and to allow for proper saturation of the subgrade.
  - 3. Concrete vibrator shall be used to assist concrete placement. Contractor shall have spare concrete vibrator on site during concrete placement.
- J. Placing in hot weather: Comply with ACI 305R-10. Concrete shall not exceed 85 degrees F at time of placement. Concrete shall be delivered, placed and finished in a sufficiently short period of time to avoid surface dry checking. Concrete shall be kept wet continuously after tempering until implementation of curing compound procedure in accordance with this specification.
- K. Placing in cold weather: Comply with ACI 306R-16. Protect from frost or freezing. No antifreeze admixtures are permitted. When deposited concrete during freezing or near-freezing weather, mix shall have temperature of at least 50 degrees F but not more than 90 degrees F. Concrete shall be maintained at temperature of at least 50 degrees F for not less than 72 hours after placing or until it has thoroughly hardened. Provide necessary thermal coverings for any flat work exposed to freezing temperatures.
- L. Horizontal construction joint: Keep exposed concrete face of construction joints continuously moist from time of initial set until placing of concrete; thoroughly clean contact surface by chipping entire surface not earlier than 5 days after initial pour to expose clean hard aggregate solidly embedded, or by approved method that will assure equal bond, such as green cutting. If contact surface becomes contaminated with soil, sawdust or other foreign matter, clean entire surface and re-chip entire surface to assure proper adhesion.

### **3.09 CONCRETE FINISHES**

- A. Concrete Slab Finishing: Finish slab as required by ACI 302.1R. Use manual screeds, vibrating screeds to place concrete level and smooth. Use "jitterbugs" or other special tools designed for the purpose of forcing the coarse aggregate below the surface leaving a thick layer of mortar 1 inch in thickness. Surface shall be free from trowel marks, depressions, ridges or other blemishes. Tolerance for flatness shall be 1/8" in 10'. Provide final finish as follows:
  - 1. Flatwork, medium broom finish: Typical finish to be used at all exterior walks, stairs and ramps. Brooming direction shall run perpendicular to slope to form non-slip surface.
  - 2. Under no circumstances can water be added to the top surface of freshly placed concrete.
- B. Curb Finishing: Steel trowel.

- C. Joints and Edges: Mark-off exposed joints, where indicated, with ¼" radius x 1" deep jointer or edging tool. Joints to be clean, cut straight, parallel or square with respect to concrete walk edge. Tool all edges of exposed expansion and contraction joints, walk edges, and wherever concrete walk adjoins other material or vertical surfaces.
  - 1. The expansion joints shall be full depth as shown in the plan details. Failure to do so will result in non-compliance and shall be immediately machine cut by the contractor at his expense.

### **3.10 CURING**

- A. Cured Concrete in Forms: Keep forms and top on concrete between forms continuously wet until removal of forms, 7 days minimum. Maintain exposed concrete in a continuous wet condition for 14 days following removal of forms.
- B. Flatwork/Variable Height Curbs, Curb and gutter, Valley Gutter: Cure utilizing Curing Compound. If applicable, the Contractor shall verify that the approved Curing Compound is compatible with the approved colorant system. Upon completion of job, wash clean per manufacturer's recommendations.
  - 1. Curing compound shall be applied in a wet puddling application. Spotty applications shall be reason for rejection and possibly concrete removal and replacement at the contractor's expense with no compensation from the owner.
- C. No Curing Compound shall be applied to areas scheduled to receive resilient track surface including, curbs, ramps, run ways, etc.

### **3.11 DEFECTIVE CONCRETE**

- A. Determination of defective concrete shall be made by the Architect or Engineer. His opinion shall be final in identifying areas to be replaced, repaired or patched.
- B. The Owner reserves the right to survey the flatwork, if it is determined to be outside of the maximum tolerance for flatness. If the flatwork is found to be out of tolerance, then the Contractor will be required to replace concrete. The Contractor will be responsible for reimbursing the Owner for any surveying costs incurred. Determination of flatwork flatness, surveying and any remedial work must be completed far enough in advance so that the project schedule is maintained, delays are avoided and the new flatwork or flatwork repairs are properly cured.
- C. As directed by Architect, cut out and replace defective concrete. All defective concrete shall be removed from the site. No patching is to be done until surfaces have been examined by Architect and permission to begin patching has been provided.
- D. Permission to patch any area shall not be considered waiver of right, by the Owner, to require removal of defective work, if patching does not, in opinion of Architect, satisfactorily restore quality and appearance of surface.
- E. Defective concrete is:
  - 1. Concrete that does not match the approved mix design for the given installation type.
  - 2. Concrete not meeting specified 28-day strength.
  - 3. Concrete which contains rock pockets, voids, spalls, transverse cracks, exposed reinforcing, or other such defects which adversely affect strength, durability or appearance.
  - 4. Concrete which is incorrectly formed, out of alignment or not plumb or level.
  - 5. Concrete containing embedded wood or debris.
  - 6. Concrete having large or excessive patched voids which were not completed under



Architect's direction.

7. Concrete not containing required embedded items.
  8. Excessive Shrinkage, Traverse cracking, Cracking, Curling; or Defective Finish. Remove and replace if repair to an acceptable condition is not feasible.
  9. Concrete that is unsuitable for placement or has set in truck drum for longer than 90 minutes from the time it was batched.
  10. Expansion joint felt that is not isolating the full depth of the concrete section, and recessed as required for backer rod and sealant where required.
  11. Concrete that is excessively wet or excessively dry and will not meet the minimum or maximum slump required per mix design.
  12. Finished concrete with oil stains from equipment use, and or rust spots that cannot be removed.
  13. Control joints (weakened planed joints) that do not meet the required minimum depth shown on the drawings.
- F. Patching: Install specified Patching Mortar per manufacturer's recommendations. REPAIRS TO DEFECTIVE CONCRETE WHICH AFFECT THE STRENGTH OF ANY STRUCTURAL CONCRETE MEMBER OR COMPONENT ARE SUBJECT TO APPROVAL BY THE ARCHITECT AND DSA.

### **3.12 CONCRETE TESTING**

- A. Comply with CBC Section 1903A, 1905A.1.16, 1910A and 1705A.3 and as specified in B. below. Costs of tests will be borne by the Owner.
- B. Four identical cylinder samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, or not less than once for each 50 cubic yards of concrete, or not less than once for each 2,000 square feet of surface area for slabs or walls. In addition, samples for strength tests for each class of concrete shall be taken for seven-day tests at the beginning of the concrete work or whenever the mix or aggregate is changed.
- C. Strength tests will be conducted by the Testing Lab on one cylinder at seven (7) days and two cylinders at twenty-eight (28) days. The fourth remaining cylinder will be available for testing at fifty-six (56) days if the 28-day cylinder test results do not meet the required design strength.
- D. On a given project, if the total volume of concrete is such that the frequency of testing required by paragraph B. above would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.
- E. Cost of retests and coring due to low strength or defective concrete will be paid by Owner and back-charged to the Contractor.
- F. Each truck shall be tested for slump before concrete is placed.

### **3.13 REMOVAL OF FORMS**

- A. Remove without damage to concrete surfaces.
- B. Sequence and timing of form removal shall insure complete safety of concrete structure.
- C. Forms shall remain in place for not less than the following periods of time. These periods represent cumulative number of days during which temperature of air in contact with concrete is 60 degrees F and above.

1. Vertical forms of foundations, walls and all other forms not covered below: 5 days.
  2. Slab edge screeds or forms: 7 days.
  3. Concrete columns and beam soffits: 28 days.
- D. Concrete shall not be subjected to superimposed loads (structure or construction equipment) until it has attained its full design strength and not for a period of at least 21 days after placing. Concrete systems shall not be subjected to construction loads in excess of design loads.

**3.14 CLEANING**

- A. Refer to Section 017400.
- B. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.
- C. Clean excess material from surface of all concrete walks and utility structures.
- D. Power wash all concrete surfaces to remove stains, dried mud, tire marks, and rust spots.

END OF SECTION

## **SECTION 33 00 00 – SITE UTILITIES**

### **PART 1 - GENERAL**

#### **1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS**

- A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

#### **1.02 SCOPE OF WORK**

- A. The work includes, but is not necessarily limited to, the following:
  - 1. Domestic water piping system.
  - 2. Fire protection piping systems.
  - 3. Sewer piping system.
- B. Other items that may be specified or shown on the Drawings.

#### **1.03 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 015000, Construction Facilities and Temporary Controls.
- B. Section 312333, Trenching and Backfilling.
- C. Section 321600, Site Concrete.
- D. Section 330000, Earthwork.

#### **1.04 QUALITY ASSURANCE**

- A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the drawings to be salvaged and re-used.
  - 1. Sun damaged or discolored PVC pipe will be rejected.
- B. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.
- C. The representatives of the Owner's testing lab will not act as supervisor of construction, nor will they direct construction operations. Neither the presence of the Owner's testing lab representatives nor the testing by the Owner's testing lab shall excuse the contractors or subcontractors for defects or deficiencies discovered in their work during or following completion of the project. Correcting inadequate compaction is the sole responsibility of the contractor.
- D. Contractor shall be solely responsible for all subgrades built. Any repairs resulting from inadequate compaction or incorrect grades will be the responsibility of the contractor.
- E. Per 2010 NFPA 13 provide Contractor's material and test certificate to the Owner, Architect, Project Inspector and Local Fire Authority.

#### **1.05 SUBMITTALS**

- A. Refer to Section 013300.
- B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.
- C. Provide sieve analysis from accredited testing lab on pipe bedding material. Analysis shall

have a current date not older than project contract signing date.

- D. Substitution: Provide all data of proposed material being submitted as a substitution. Provide comparison with specified product data and identify all differences. Failure to provide comparison will be reason for rejection.

#### **1.06 FEES, PERMITS, AND UTILITY SERVICES**

- A. Obtain and pay for permits and service charges required for installation of Work. Arrange for required inspections and secure written approvals from authorities having jurisdiction.
- B. Upon completion of work within right-of-way, provide copies of written final approval to the Architect.

#### **1.07 WARRANTY**

- A. Refer to General Conditions and Section 017836.

#### **1.08 REFERENCES AND STANDARDS**

- A. ANSI/ASTM D698-00 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.
- B. ANSI/ASTM D1556-00 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- C. ANSI/ASTM D1557-02 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
- D. ANSI/ASTM D 3017-05 Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).
- E. ANSI/ASTM D 422-63 Test Method for Particle Size Analysis of Soil.
- F. ANSI/ASTM D 4318-05 Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.
- G. CALTRANS Standard Specifications.
- H. CAL-OSHA, Title 8, Section 1590 (e).
- I. Any work within the street, highway or right-of-way shall be performed in accordance with the requirement of the governmental agencies having jurisdiction, and shall not begin until all of those governing authorities have been notified.
- J. NFPA 13, 24 and 25, latest editions.
- K. California State Health and Safety Code Section 116875, Lead Free Public Water Systems.
- L. California Plumbing Code, latest edition.

#### **1.09 DELIVERY, STORAGE AND HANDLING**

- A. Transport, store and handle in strict accord with the local jurisdiction.
- B. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

#### **1.10 PROJECT CONDITIONS**

- A. Existing civil, mechanical and electrical improvements are shown on respective site plans to the extent known. Should the Contractor encounter any deviation between actual conditions and those shown, he is to immediately notify the Architect before continuing work.

#### **1.11 EXISTING SITE CONDITIONS**

- A. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

#### **1.12 PROTECTION**

- A. Adequate protection measures shall be provided to protect workmen and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations.
- B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.
- C. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.
- D. Provide shoring, sheeting, sheet piles and or bracing to prevent caving, erosion or gulying of sides of excavation.
- E. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The contractor shall make a reasonable effort on a daily basis to provide pumps and all equipment necessary to keep all excavations and the site free from water during entire progress of work, regardless of cause, source, or nature of water.
- F. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.
- G. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance. Dust control measures shall be in accordance with the local jurisdiction.
- H. Trees: Carefully protect existing trees that are to remain. Provide temporary irrigation as necessary to maintain health of trees.

#### **1.13 SEASONAL LIMITS**

- A. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by rains, fill operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.

#### **1.14 RECORD DRAWINGS**

- A. Keep a daily record of all pipe placed in ground, verified by Project Inspector.
- B. Upon completion of this Contract, furnish one tracing showing all outside utility lines, piping, etc., installed under this Contract. Locate and dimension all work with reference to permanent landmarks.
- C. All symbols and designations used in preparing "RECORD" drawings shall match those used in Contract drawings.
- D. Properly identify on as-builts and provide dimensions for all stubs for future connections. Provide concrete markers 6" dia. 12" deep, flush with finish grade at the ends of all stubbed pipes.

## **PART 2 – PRODUCTS**

### **2.01 MATERIALS - GENERAL**

- A. Provide each item listed herein or shown on drawings of quality noted or approved equal. All material shall be new, full weight, standard in all respects and in first-class condition. Insofar as possible, all materials used shall be of same brand or manufacture throughout for each class of material or equipment. Materials shall be of domestic manufacture and shall be tested within Continental United States.
- B. Grade or quality of materials desired is indicated by trade names or catalog numbers stated herein.
- C. Dimensions, sizes, and capacities shown are minimum and shall not be changed without permission of Architect.
- D. All materials in this section used for any public water system or domestic water for human consumption shall be lead free.
  - 1. For the purposes of this section, “lead free” means not more than 0.2 percent lead when used with respect to solder and flux and not more than 8 percent when used with respect to pipes and pipe fittings.
  - 2. All pipe, pipe or plumbing fitting or fixtures, solder, or flux shall be certified by an independent American National Standards Institute (ANSI) accredited third party, including, but not limited to, NSF International, as being in compliance with this section.
- E. All materials used for fire system piping shall be UL and FM approved.

### **2.02 VALVE BOXES**

- A. Provide at each valve or cock in ground a Christy, Brooks, or equal to Christy G05CT, concrete valve box with cover marked for service, domestic water shall be marked “Water” and fire supply shall be marked “Fire”. Furnish extension handles for each size square nut valve, and provide “fork” handle for each size of “wheel handle” valve as required. Do not locate valve boxes in walk, or covered passages, curbs, or curb & gutters, unless necessary. If valve location is within concrete or asphalt paved surface valve box shall be as detailed on plans for such condition. Provide valve box extensions as required to set bottom of valve box to bottom of piping in which valve is installed. Provide Owner with set of special wrenches and/or tools as required for operation of valves.

### **2.03 PIPES AND FITTINGS**

- A. Sanitary Sewer: PVC sewer pipe and fittings with Ring-Tite joints, ASTM D3034 SDR35.
- B. Domestic water Lines 3 1/2” and smaller: Type K copper tubing, hard temper, with wrought copper fittings or Schedule 80 PVC.
- C. Water lines 4” and larger: AWWA C-900 Class 150/DR18 with rubber gasket joints.
- D. Fire lines 4” and larger: AWWA C-900 Class 200/DR14 with rubber gasket joints.
- E. Solder: Lead Free. 95/5; 95% Tin / 5% Antimony.
- F. Ductile Iron Pipe; AWWA Class 51, Cement Lined
- G. Ductile Iron Pipe Fittings; AWWA C110, C153, Ebba Iron, Star Romac, Sigma, or approved equal.
- H. PVC Mechanical Fittings; Ebba Iron, , Star; Romac; Sigma or approved equal.
- I. Ductile Iron Pipe/PVC C-900 Pipe Restrained Fittings; Ebba Iron # 3800 Mega Coupling,

Ebba Iron 1100CH Split Restrained Harness for pipe couplings. StarGrip Series 4000

- J. Ductile Iron Pipe/PVC C900, C905 Restrained Degreedand Blind Cap Fittings, Mega Lug; Sigma; Romac; or an approved equal
- K. Mechanical Fitting Bolts; Bolts and nuts shall be carbon steel with a minimum 60,000 psi tensile strength conforming to ASTM A 307, Grade A. Bolts shall be standard ANSI B1.1 Class 2A course threads. Nuts shall conform to ASTM A 563 and be standard ANSI B1.1, Class 2A course thread. All bolts and nuts shall be zinc coated.
- L. Fasteners Anti-Rust Coatings; After assembly, coat all fasteners with an Asphaltic Bituminous coatings conforming to latest edition NFPA 24.
- M. Ductile Iron Pipe Wrap; 8 mil polyethylene pipe wrap conforming to ANSI/AWWA C105/A21.5 standards.
- N. Pipe Insulation; Pipe exposed to atmospheric conditions ½" thru 4" NPT; Johns Manville rigid fiberglass insulation, Micro Lok HP; Owens Corning Fiberglas SSL II; Conforming to ASTM C 612, Type 1A or type 1B.
- O. Aluminum field applied pipe insulation jacket; comply with ASTM B209, ASTM C1729, ASTM C1371 Manufacturers; Childers Metals; ITW Insulation Systems Aluminum Jacketing; or an approved equal.
  - 1. Finish shall be flat mill finish
  - 2. Factory Fabricated Fitting Covers; 45 and 90 degree elbows, tee's, valve covers, end caps, unions, shall be of the same thickness and finish of jacket.
  - 3. The fittings shall be composed of 2-pieces
  - 4. Adhesives; per the manufacturers requirements
  - 5. Joint Sealant; shall be silicone, and shall be aluminum in color.

#### **2.04 SANITARY SEWER MANHOLES**

- A. Shall be constructed as shown on plan details.

#### **2.05 CLEANOUTS**

- A. Cleanouts of same diameter as pipe up to 8" in size shall be installed in all horizontal soil and waste lines where indicated and at all points of change in direction. Cleanouts shall be located not less than 18" from building so as to provide sufficient space for rodding. No horizontal run over 100 feet shall be without cleanout whether shown on drawings or not.
- B. All cleanout boxes shall be traffic rated with labeled lid, Christy G05CT or approved equal. Lid shall be vandal proof with stainless steel screws

#### **2.06 UNIONS**

- A. Furnish and install one union at each threaded or soldered connection to equipment and 2 unions, one on each side of valves on pipes ½" to 3".
- B. Locate unions so that piping can be easily disconnected for removal of equipment or valve. Provide type specified in following schedule:

##### Type of Pipe Union

Steel Pipe:	150 lb. Screwed malleable ground joint, brass, brass-to-iron seat, black or galvanized to match pipe.
Copper tubing:	Brass ground joint with sweat connections.
PVC Sch 80 pipe:	PVC union, FIPT X FIPT

## **2.07 VALVES**

- A. Provide valves as shown and other valves necessary to segregate branches or units. Furnish valves suitable for service intended. Valves shall be properly packed and lubricated. Valves shall be non-rising stem. Place unions adjacent to each threaded or sweat fitting valve. Install valves with bonnets vertical. All valves shall be lead free.
- B. Valves ½" thru 2"; shall be made of bronze, full size of pipe and lead free. Nibco S-113-FL Series; American G-300 Series; Matco 511 FL Series; Apollo 102T-FL Series. Brass valves of brass parts within valves will not be accepted.
- C. Valves, 2 ½" thru 3" shall be class 150; Shall be made of bronze, full size of pipe; Jenkins Fig. 2310 J; Lunkenheimer Fig. 2153; Crane Fig. 437; Stockham Fig. B-128.
- D. Valves, Flanged; 4" thru 12" Ductile Iron Resilient Wedge Gate Valve; Nibco F 609 RW; American 2500 Series; Kennedy 8561; Mueller 2360 Series.

## **2.07 FIRE HYDRANTS**

- A. Clow 960 Factory Painted or per Local Jurisdiction Requirements, or an approved equal, 36" minimum bury, two 2-1/2" hose nozzles, one 4-1/2" pumper nozzle, intermediate section to serve as break-off flange with check valve. Hydrant shall conform to, and installation shall comply with the Local Jurisdiction.

## **2.08 POST INDICATOR**

- A. Post Indicator shall be Mueller Co. A-20806 (adjustable) with tamper switch or an approved equal.

## **2.09 BACKFLOW PREVENTERS**

### **Double Check Valve, Double Check Detector and Reduced Pressure Backflow Preventers**

- A. Backflow preventers shall be as approved by the local agency and by the State of California's Department of Health Services most recent list of approved reduced pressure backflow preventers. All approved backflow preventers shall have ductile iron bodies.
  - 1. Provide Backflow preventer blankets with locking device. Weatherguard R-30 insulated or equal.
  - 2. Provide ball valve at all test ports with brass plug in valve.
  - 3. Provide a minimum of 2 valve tamper switches on fire prevention Backflows.

## **2.10 TAPPING SLEEVE**

- A. Shall be used on pipe sizes 6" thru 12" and shall be made with stainless steel material including stainless steel bolts. Flanges shall be ductile iron or high carbon steel. Gaskets shall seal full circumference of pipe. Shall be manufactured for operating pressure of 200 psi, and shall pass test pressure of 300 psi. Romac SST series; Smithblair 662; Mueller H304; Ford "FAST" tapping sleeve.

## **2.11 SERVICE SADDLES**

- A. Shall be used on pipe size 2" thru 4". Body shall be made from ductile iron with epoxy coating or bronze. Cascade Style CSC-1; A.Y. McDonald model 3891 AWWA/3892 FNPT; Smith-Blair #317; Ford S70, S71, S90, (style B).

## **2.12 TRACER WIRE**

- A. No. 10 THW solid copper wire. Solder all joints



## **PART 3 - EXECUTION**

### **3.01 DRAWINGS AND COORDINATION**

- A. General arrangement and location of piping, etc., are shown on Drawings or herein specified. Install work in accord therewith, except for minor changes that may be necessary on account of other work or existing conditions. Before excavation, carefully examine other work that may conflict with this work. Install this work in harmony with other craft and at proper time to avoid delay of work.
- B. Verify invert elevations at points of connection to existing systems prior to any excavation. If invert elevations differ from that shown on drawings, notify Architect immediately.
- C. In advance of construction, work out minor changes if conflicts occur with electrical or mechanical. Relocate services to suit actual conditions and work of other trades to avoid conflict therewith. Any adjustments or additional fittings to make adjustments shall not be cause for additional costs to the owner.
- D. Execute any work or apparatus shown on drawings and not mentioned in specifications, or vice versa. Omission from Drawings or Specifications of any minor details of construction, installation, materials, or essential specialties does not relieve Contractor of furnishing same in place complete.
- E. Graded pipes shall take precedence. If conflict should occur while placing the domestic water and fire service piping, the contractor shall provide any and all fittings necessary to route the water lines over such conflicting pipes at no additional costs to the owner.

### **3.02 ACCESS**

- A. Continuously check for clearance and accessibility of equipment or materials specified herein to be placed. No allowance of any kind shall be made for negligence on part of Contractor to foresee means of installing his equipment or materials into proper position.

### **3.03 EXCAVATING AND BACKFILLING**

- A. Excavation and Bedding:
  - 1. General: Trench straight and true to line and grade with bottom smooth and free of irregularities or rock points. Trench width to be a minimum of 12" wider than outside diameter of pipe. Follow manufacturer's recommendations for use of each kind and type of pipe.
  - 2. Bedding: Provide a bedding as noted on drawing details for the full length of the pipe. Bedding shall have a minimum thickness beneath the pipe of 4" or 1/8 the outside diameter of the pipe, which ever is greater. Provide bell holes and depressions for pipe joints only of size required to properly make joint.
- B. Laying of Pipe:
  - 1. General: Inspect pipe prior to placing. Sun damaged pipe will be rejected. Set aside any defective or damaged material. Do not place pipe in water nor place pipe when trenches or weather are unsuitable. Lay pipe bell upgrade, true to line and grade.
    - a. Sewer pipe shall be laid in strict conformity to the prescribed line and grade, with grade bars set and each pipe length checked to the grade line. Three consecutive points on the same rate of slope shall be used at all times to detect any variation from a straight grade. In any case of discrepancy, work shall be stopped and the discrepancy immediately reported to the Owner's Representatives. In addition, when requested by the Owner's Representative, a string line shall be used in the bottom of the trench to insure a straight alignment of the sewer pipe between manholes. The maximum deviation from grade shall not be in excess of 1/4 inch. In returning the pipe to grade, no more

than ¼" depression shall result.

- b. The Contractor shall expose the end of existing pipe to be extended, for verification of alignment and elevation, prior to trenching for any pipe which may be affected. All costs of such excavation and backfill shall be included in the price paid for the various items of work.
  - c. A temporary plug, mechanical type shall be installed on sewer pipe at the point of connection to existing facilities. If connecting to a public facility the plug shall conform to the requirements of the local jurisdiction. This plug shall remain in place until the completion of the balling and flushing operation.
2. Bell and Spigot Joints: Lubricate inside of bells and outside of spigots with soap solution. Wedge joints tight. Bell of bell and spigot pipe to be pointed upgrade.
- C. Backfilling:
1. General: Do not start backfill operations until required testing has been accomplished.
  2. Compaction and Grading: Remainder of backfill shall be in accordance with Section 312333 – TRENCHING AND BACKFILLING.
  3. If trenching in area previously lime or cement treated backfill top of trench section, same depth as lime or cement treatment with Class 2 Aggregate Base compacted to 95% minimum relative compaction.

### **3.04 INSTALLATION OF WATER PIPING**

- A. Immediately cap or plug ends of, and opening in, pipe and fittings to exclude dirt until final connections made. Use reducing fittings where any change in pipe size occurs. Bushings shall not be used.
- B. General: Should existing conditions or other work prevent the running of pipes or the setting of equipment at the points indicated by drawings, changes as authorized by the Architect shall be made without additional cost to the Owner.
- C. All bolts used on mechanical fittings shall be thoroughly coated with an asphaltic bituminous coating conforming to 2016 NFPA 24, 10.4.1.1.
- D. All buried metal shall be incased with 8 mil polyethylene wrap so that no soil is in contact with metal. Ends of polyethylene wrap shall be taped to provide seal with pipe.
- E. Do not install water lines in same trench with non-metallic sewer lines unless bottom of water pipe at all points is at least 12" above top of sewer line and water line is placed on solid shelf excavated at one side of common trench with a minimum of 12 inch horizontal separation.
- F. Under no circumstance shall a fitting be located directly under a structural footing without prior approval from the Architect.
- G. In locations where existing domestic pipe is rerouted, the new pipe shall be assembled using restrained fittings at all joints including factory pipe joints. Tapped restrained blind flanges shall be temporarily installed at each end of the assembled pipes until testing and chlorination is completed and approved.

### **3.05 CLOSING IN OF UNINSPECTED WORK**

- A. Do not allow or cause work installed to be covered up or enclosed before it has been inspected, tested, and approved. Should work be enclosed or covered up before it has been approved, uncover work at own expense. After it has been inspected, tested and approved, make repairs necessary to restore work of other contractors to condition in which it was found at time of cutting.

**3.06 CARE AND CLEANING**

- A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in new condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures and trim that are installed as part of this work. Leave systems and equipment in satisfactory new operating condition.
- B. Drain and flush piping to remove grease and foreign matter.
- C. Sewer piping shall be balled and flushed.
- D. Clean out and remove surplus materials and debris resulting from the work, including surplus excavated material.
- E. Flush fire service piping 3 times in the presence of the project inspector. Each flushing shall be 3 minutes minimum.

**3.07 SEWER INTERNAL INSPECTIONS**

- A. Upon completion of construction and prior to final inspection, the Contractor shall clean the entire new pipeline of all dirt and debris. Any dirt or debris in previously existing pipes or ditches in the area, which resulted from the new installation, shall also be removed. Pipes shall be cleaned by the controlled balling and flushing method. Temporary plugs shall be installed and maintained during cleaning operations at points of connection to existing facilities to prevent water, dirt, and debris from entering the existing facility.

**3.08 TEST OF PIPING**

- A. Pressure Test piping at completion of roughing-in, in accord with following schedule, and show no loss in pressure or visible leaks after minimum duration or four (4) hours at test pressures indicated.
- B. Chlorination tests shall be performed after all fixtures and any required mechanical devices are installed and the entire system is complete and closed up.
- C. In cases where new domestic water piping is assembled for re-routing of existing domestic water pipe, the contractor shall perform the following testing prior to connecting the new water pipe to the existing system.
  - 1. The pipe shall be pressure tested and per the test schedule.
  - 2. The pipe shall be pressure tested down within the trench.
  - 3. The contractor shall dig a temporary ditch below the existing pipe to drain to a sump that is lower than the bottom of the trench and to the side of the trench. The sump shall be 30% larger than the total volume of water within the testing pipe assembly.
  - 4. After pressure testing and chlorination has taken place and accepted, the contractor shall drain the pipe into the sump and pump the sump out as it is filling.
  - 5. The temporary test fittings at each end of the pipe assembly shall be removed and the final restrained couplings installed.
  - 6. The existing piping shall be cut and the water within the pipe shall drain below the pipe to the temporary sump. Pump the sump as it is being filled up. Take extreme caution not to contaminate the existing pipe with any contaminants within the trench.
  - 7. Before making the final coupling connections, the restrained couplings at each end of the new pipe shall be thoroughly swabbed inside the fitting with a solution of chlorine mixed with water at a rate of 1 part chlorine to 4 parts potable water.
  - 8. After final connections are made, a visual inspection shall be made after fittings are wiped off. If after 1 hr, no noticeable drips are noted the pipe can be backfilled.

9. The contractor shall flush all water piping affected by chlorination until it is within acceptable levels approved by certified testing lab.

TEST SCHEDULE

<u>System Tested</u>	<u>Test Pressure PSIG Test With</u>
Public Water Mains	Per local jurisdiction requirements.
Private Domestic Water Piping:	150 Lbs. Water 4 hrs.
Fire Protection Piping:	200 Lbs. Water pressure, 4 hrs duration with no pressure loss.
Sanitary Sewer Piping:	Sewer system shall be tested for leakage per local jurisdiction requirements.

- D. Testing equipment, materials, and labor shall be furnished by contractor.

**3.09 WATER SYSTEM STERILIZATION**

- A. Public Water Mains: Shall be flushed and disinfected per the local jurisdiction requirements
- B. Clean and disinfect all site water systems connected to the domestic water systems in accordance with AWWA Standard C651 and as required by the local Building and Health Department Codes, and EPA.
  1. Clean and disinfect industrial water system in addition to the domestic water system.
  2. Disinfect existing piping systems as required to provide continuous disinfection upstream to existing valves. At Contractors option, valves may be provided to isolate the existing piping system from the new piping system.
- C. Domestic water sterilization shall be performed by a licensed “qualified applicator” as required by CAL-EPA Pesticide Enforcement Branch for disinfecting and sterilizing drinking water.
- D. Disinfecting Agent: Chlorine product that is a registered product with Cal-EPA for use in California potable water lines, such as Bacticide, CAL-EPA Registration No. 37982-20001.
- E. Contractor to provide a 1” service valve connected to the system at a point within 2’-0” of its junction with the water supply line. After sterilization is complete Contractor to provide cap at valve.
- F. Sterilization Procedure to be as follows:
  1. Flush pipe system by opening all outlets and letting water flow through the system until clear water flows from all outlets.
  2. Inject disinfecting agent to provide a minimum chlorine residual concentration of at least 50 parts per million (ppm) of free chlorine at each outlet.
  3. Provide sign at all outlets which reads “Water Sterilization in Progress – Do not operate”. Remove signs at conclusion of test.
  4. Close all outlets and valves, including valve connecting to water supply line and 1” service valve. Retain treated water in pipe for a minimum of twenty-four hours. Should chlorine residual at pipe extremities be less than 50 PPM at this time, pipe shall be re-chlorinated. As an option, the water systems may be filled with a water-chlorine solution containing a minimum of 200 PPM of chlorine and allowed to stand for three hours.

5. After chlorination, flush lines of chlorinated water and refill from domestic supply. Continue flushing until residual chlorine is less than or equal to 0.2 ppm, or a residual the same as that of the test water.
- G. Chemical and bacteriological tests shall be conducted by a state-certified laboratory and approved by the local authorities having jurisdiction.
- H. Submit written report to Health Department as required by State Regulations. Provide a copy of report to Architect prior to completion of project.
- I. The costs of sterilization and laboratory testing shall be paid for by the contractor.

**3.10 CLEANING**

- A. Refer to Section 017400.
- B. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.

END OF SECTION

## **SECTION 33 40 00 – SITE DRAINAGE**

### **PART 1 - GENERAL**

#### **1.01 INCLUSION OF OTHER CONTRACT DOCUMENTS**

- A. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.

#### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 015000, Construction Facilities and Temporary Controls.
- B. Section 312333, Trenching and Backfilling.
- C. Section 321200, Asphalt Concrete Paving.
- D. Section 321600, Site Concrete

#### **1.03 QUALITY ASSURANCE**

- A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.
- B. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.
- C. The representatives of the Owner's testing lab will not act as supervisor of construction, nor will they direct construction operations. Neither the presence of the Owner's testing lab representatives nor the testing by the Owner's testing lab shall excuse the contractors or subcontractors for defects discovered in their work during or following completion of the project. Correcting inadequate compaction is the sole responsibility of the contractor.
- D. Contractor shall be solely responsible for all subgrades built. Any repairs resulting from inadequate compaction are the responsibility of the contractor.

#### **1.04 SUBMITTALS**

- A. Refer to Section 013300.
- B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.

#### **1.05 WARRANTY**

- A. Refer to General Conditions and Section 017836.

#### **1.06 REFERENCES AND STANDARDS**

- A. ANSI/ASTM D698-00 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.
- B. ANSI/ASTM D1556-00 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- C. ANSI/ASTM D1557-02 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
- D. ANSI/ASTM D 3017-05 Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).
- E. ANSI/ASTM D 422-63 Test Method for Particle Size Analysis of Soil.

- F. ANSI/ASTM D 4318-05 Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.
- G. CALTRANS Standard Specifications.
- H. CAL-OSHA, Title 8, Section 1590 (e).
- I. Any work within the street, highway or right-of-way shall be performed in accordance with the requirement of the governmental agencies having jurisdiction, and shall not begin until all of those governing authorities have been notified.
- J. California Plumbing Code current edition.

**1.07 DELIVERY, STORAGE AND HANDLING**

- A. Transport, store and handle in strict accord with the local jurisdiction.
- B. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

**1.08 PROJECT CONDITIONS**

- A. Existing civil, mechanical and electrical improvements are shown on respective site plans to the extent known. Should the Contractor encounter any deviation between actual conditions and those shown, he is to immediately notify the Architect before continuing work.

**1.09 EXISTING SITE CONDITIONS**

- A. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

**1.10 PROTECTION**

- A. Adequate protection measures shall be provided to protect workmen and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations.
- B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.
- C. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.
- D. Provide shoring, sheeting, sheet piles and/or bracing to prevent caving, erosion or gullyng of sides of excavation.
- E. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The contractor shall make a reasonable effort on a daily basis to provide pumps and all equipment necessary to keep all excavations and the site free from water during entire progress of work, regardless of cause, source, or nature of water.
- F. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.
- G. The site and adjacent influenced areas shall be watered as required to suppress dust

nuisance. Dust control measures shall be in accordance with the local jurisdiction.

H. Trees: Carefully protect existing trees that are to remain.

#### **1.11 SEASONAL LIMITS**

A. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by rains, fill operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.

#### **1.12 TESTING**

A. General: Refer to Section 014000 – Quality Requirements.

B. Geotechnical Engineer: Owner is retaining a Geotechnical Engineer to determine compliance of fill with Specifications, and to direct adjustments in fill operations. Costs of Geotechnical Engineer will be borne by Owner; except those costs incurred for re-tests or re-inspection will be paid by Owner and backcharged to Contractor.

#### **1.13 RECORD DRAWINGS**

A. Keep a daily record of all pipe placed in ground, verified by Project Inspector.

B. Upon completion of this Contract, furnish one tracing showing all outside utility lines, piping, etc., installed under this Contract. Locate and dimension all work with reference to permanent landmarks.

C. All symbols and designations used in preparing "RECORD" drawings shall match those used in Contract drawings.

D. Properly identify all stubs for future connections, as to location and use, by setting of concrete marker at finished grade in the manner suitable to Architect.

### **PART 2 - PRODUCTS**

#### **2.01 MATERIALS**

A. Pipe: Use one of the following, unless noted on the Drawings otherwise.

1. Polyvinyl Chloride Pipe (PVC): SDR35 conforming to ASTM D3034 with elastomeric joints conforming to ASTM D3212. Sun damaged pipe will be rejected.

2. High density polyethylene pipe (HDPE): The pipe shall be corrugated exterior/smooth interior pipe and water tight per ASTM D3212 with water tight gasket fittings.

B. Perforated Pipe (for subdrains): Shall be ADS N12 pipe, 3 hole, ASTM F 405, AASHTO M 252; PVC ASTM D3034 SDR-35 storm drain pipe

C. Manhole: Shall be as shown on the drawing details.

D. Drop Inlet: Shall be as shown on the drawing details.

E. Curb Inlet: Shall be as shown on the drawing details.

F. Mortar: For pipe connections to concrete drainage structures, conform to ASTM C270 type N mortar. Place within one half hour after adding water.

G. Crushed Rock: Imported washed crushed rock. Minimum 100% passing 3/4 inch sieve.

H. Trench drain: Polycast, Polydrain or equal and as shown on drawings.

I. Area Drains: Shall be as shown on the drawing details.

J. Floor Drains: Shall be as shown on the drawing details.

K. Clean-outs: Shall be as shown on the drawing details.



- L. Planter drains: Shall be as detailed on the drawing details.
- M. Filter Fabric: Mirafi 140N.

### **PART 3 - EXECUTION**

#### **3.01 INSPECTION LAYOUT AND PREPARATION**

- A. Prior to installation of the work of this Section, carefully inspect and verify by field measurements that installed work of all other trades is complete to the point where this installation may properly commence
- B. Layout all work, establish grades, locate existing underground utilities, set markers and stakes, setup and maintain barricades and protection facilities; all prior to beginning actual earthwork operations. Layout and staking shall be done by a licensed Land Surveyor or Professional Civil Engineer.
- C. Verify that specified items may be installed in accordance with the approved design.
- D. In event of discrepancy, immediately notify Owner and the Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

#### **3.02 INSTALLATION**

- A. General: Installation shall be in strict conformance with referenced standards, the manufacturer's written directions, as shown on the drawings and as herein specified.
- B. Verify invert elevations at points of connection to existing systems prior to any excavation. If invert elevations differ from that shown on drawings, notify Architect immediately.
- C. Excavation and Bedding:
  - 1. General: Trench straight and true to line and grade with bottom smooth and free of irregularities or rock points. Trench width in accordance with pipe manufacturer's recommendations and as per the drawings. Follow manufacturer's recommendations for use of each kind and type of pipe.
  - 2. Bedding: Provide bedding as detailed on plans for the full length of the pipe. Bedding shall have a minimum thickness beneath the pipe of 4" or 1/8 the outside diameter of the pipe, whichever is greater. Provide bell holes and depressions for pipe joints only of size required to properly make joint.
  - 3. If the trenches for the site drainage fall within areas to be lime treated, the piping shall be installed prior to any lime treatment operations.
    - a. If additional piping is added to previously lime treated areas, the contractor shall backfill the trench with class 2 aggregate base and compact to 95%.
- D. Laying of Pipe:
  - 1. General: Inspect pipe prior to placing. Set aside any defective or damaged material. Do not place pipe in water nor place pipe when trenches or weather are unsuitable. Lay pipe upgrade, true to line and grade.
  - 2. Bell and Spigot Joints: Lubricate inside of bells and outside of spigots with soap solution or as recommended by manufacture. Wedge joints tight. Bell of bell and spigot pipe to be pointed upgrade.
  - 3. Pipe shall be bedded uniformly throughout its length.
  - 4. Pipe elevation shall be within 0.02 feet of design elevation as shown on plans.
  - 5. Off Site Work: All work beyond the property lines shall be done in strict conformance

with the requirements of the governing agency.

E. Backfilling:

1. General: Do not start backfill operations until required testing has been accomplished.
2. Trenches and Excavations: Backfill with material as detailed on plans, filling both sides of the pipe at the same time, carefully tamping to hold pipe in place without movement. Refer to Section 312333 – TRENCHING AND BACKFILLING for fill above this layer.

F. Grouting of Pipes: Grout pipes smooth and water tight at drop inlet, manholes, and curb inlets. Grout back side of hood at curb inlets all grouting shall be smooth and consistent.

G. Off Site Work: All work beyond the property lines shall be done in strict conformance with the requirements of the local agency.

H. Cutting and Patching: Remove and replace existing surface features per applicable specification section (i.e. asphaltic concrete or concrete paving) where pipe is installed in areas of existing improvements.

**3.03 TOLERANCES**

A. Storm Drain structure grates

1. In landscape and lawn areas +/- 0.05'.
2. In sidewalk and asphalt pavement +/-0.025'.
3. In curb and gutter application +/-0.0125'.

B. Cleanout Boxes and Lids

1. In landscape areas; 0.10 higher than surrounding finish grade, +/-0.05'.
2. In sidewalks and asphalt pavement; Flush with surrounding finish grade, +/-0.025'.

**3.03 DEWATERING**

A. Contractor to provide trench dewatering as necessary, no matter what the source is, at no additional cost to the owner.

B. If the previously excavated material from trenching is too wet to achieve trench backfill compaction the contractor shall make a reasonable effort to aerate and dry the material per section 310000, 3.08, B

**3.04 FLUSHING**

A. The Contractor shall thoroughly ball and flush the storm drain system to remove all dirt and debris. Discharge water to an approved location.

**3.05 CLEANING**

A. Refer to Section 017400.

B. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.

C. Clean the dirt, rocks, and debris from the drop inlets and storm drain manholes.

END OF SECTION