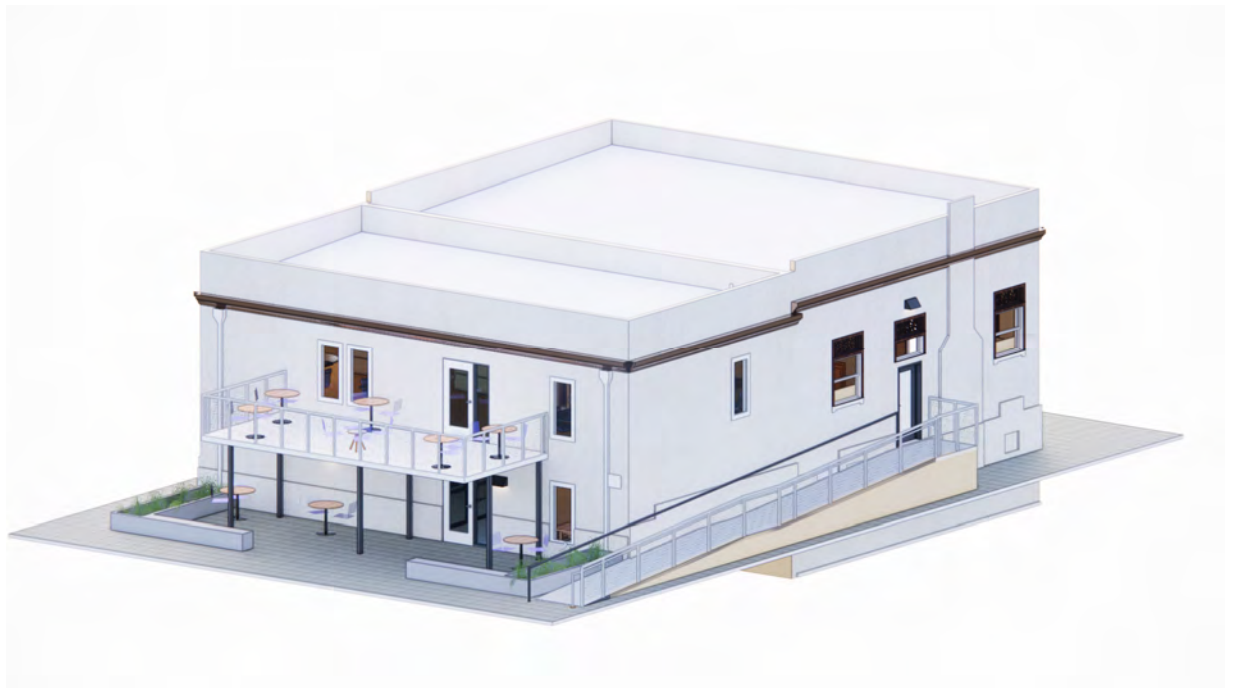


PROJECT MANUAL  
PROJECT NO. 2146



**SISKIYOU ECONOMIC DEVELOPMENT  
CARNEGIE LIBRARY REHABILITATION**  
412 W MINER ST, Yreka CA  
Dec, 2022

ORW ARCHITECTURE, AIA  
29 S. Grape Street  
Medford, OR 97501



# Seals Page

## ORW Project No. 2146

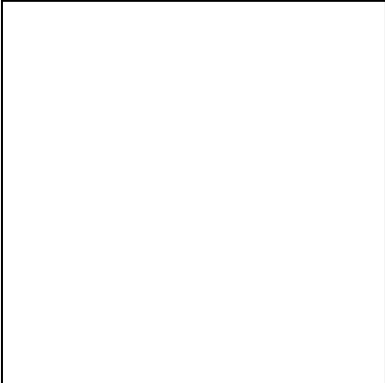
**PROJECT** Carnegie Library Rehabilitation  
Yreka, CA

**ARCHITECT**  
**ORW ARCHITECTURE, AIA**  
29 S Grape Street  
Medford, OR 97501

(541) 779-5237 Ext. 20 Fax: (541) 772-8472  
Contact: J. David Wilkerson II, AIA

- SECTIONS** 00 0110-Table of Contents
- 01 1000-Summary
  - 01 2000-Price and Payment Procedures
  - 01 2500.01 - Substitution Form During Bidding
  - 01 2500.02 - Substitution Form During Construction
  - 01 2500-Substitution Procedures
  - 01 3000-Administrative Requirements
  - 01 3003-Submittal Form
  - 01 4000-Quality Requirements
  - 01 5000-Temporary Facilities and Controls
  - 01 6000-Product Requirements
  - 01 7000-Execution and Closeout Requirements
  - 01 7800-Closeout Submittals
  
  - 02 4100-Demolition
  
  - 03 3511-Concrete Floor Finishes
  - 03 3533-Stamped Concrete Finishing
  
  - 05 5213-Pipe and Tube Railings
  - 05 7000-Decorative Metal
  
  - 06 0120-Maintenance of Finish Carpentry
  - 06 1053-Miscellaneous Rough Carpentry
  - 06 2000-Finish Carpentry
  - 06 4100-Architectural Wood Casework
  - 06 8316-Fiberglass Reinforced Paneling
  
  - 07 0500-Common Work Results for Thermal and Moisture Protection

**SEAL**



- 07 1400-Fluid-Applied Waterproofing
- 07 2100-Thermal Insulation
  
- 08 0500-Common Work Results for Openings
- 08 1213-Hollow Metal Slip-On Frames
- 08 1416-Flush Wood Doors
- 08 1423-Clad Wood Doors
- 08 1433-Stile and Rail Wood Doors
- 08 4313-Aluminum-Framed Storefronts
- 08 5413-Fiberglass Windows
- 08 7100-Door Hardware
- 08 7129-Sliding and Folding Door Hardware
- 08 8000-Glazing
  
- 09 2116-Gypsum Board Assemblies
- 09 6500-Resilient Flooring
- 09 6813-Tile Carpeting
- 09 9113-Exterior Painting
- 09 9123-Interior Painting
- 09 9300-Staining and Transparent Finishing
  
- 10 1423-Panel Signage
- 10 2800-Toilet, Bath, and Laundry Accessories
- 10 4400-Fire Protection Specialties
  
- 12 3600-Countertops

# Seals Page

## DEI Engineers Project No. B22000

**PROJECT** Carnegie Library Rehabilitation  
Yreka, CA

**STRUCTURAL ENGINEERING**

**DEI Engineers**

106 S. Market Street, Suite 2  
Talent, OR 97540  
(541) 897-0021  
Contact: Brian Dunagan, P.E  
brian@deiengineers.com

**SECTIONS**

- 03 00 00 Concrete
- 05 05 23 Metal Fastenings
- 05 12 00 Steel
- 06 11 00 01 Wood Framing
- 06 16 36 01 Wood Panel Product Sheathing

**SEAL**







## Seals Page

### ColeBreit Engineering Project No. 20220412

**PROJECT** Carnegie Library Rehabilitation  
Yreka, CA

#### ELECTRICAL ENGINEER

##### **ColeBreit Engineering**

721 SW Industrial Way, Suite 110  
Bend, OR 977020  
(541) 728-3293  
Contact: Katie Cornelius

Fax: (000) 000-0000

#### SECTIONS

- 26 0000 - Common Work Results for Electrical
- 26 0509 - Equipment Wiring
- 26 0519 - Low-Voltage Electrical Power Conductors and Cables
- 26 0526 - Grounding and Bonding for Electrical Systems
- 26 0529 - Hangers and Supports for Electrical Systems
- 26 0533 - Raceways and Boxes for Electrical Systems
- 26 0553 - Identification for Electrical Systems
- 26 2726 - Wiring Devices
- 26 2813 - Fuses
- 26 2816 - Enclosed Switches and Circuit Breakers
- 26 3323 - Central Battery Equipment for Emergency Lighting
- 26 5000 - General Lighting Provisions

#### SEAL



#### MECHANICAL & PLUMBING ENGINEER

##### **ColeBreit Engineering**

22 Lower Ragsdale Dr., Suite A  
Monterey, CA 93940  
(831) 649-8000  
Contact: Kate Conway

Fax: (831) 649-8038

#### SECTIONS

- 22 0000 - Common Work Results for Electrical
- 22 0516 - Expansion Fittings and Loops for Plumbing Piping
- 22 0517 - Sleeves and Sleeve Seals for Plumbing Piping
- 22 0519 - Meters and Gauges for Plumbing Piping
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#### SEAL



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- D 01 3000 - Administrative Requirements
  - 1. 01 3003 - Submittal Form
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  - F 26 0533 - Raceways and Boxes for Electrical Systems
  - G 26 0553 - Identification for Electrical Systems
  - H 26 2726 - Wiring Devices

- I 26 2813 – Fuses
- J 26 2816 - Enclosed Switches and Circuit Breakers
- K 26 3323 - Central Battery Equipment for Emergency Lighting
- L 26 5000 - General Lighting Provisions

END OF SECTION

SECTION 01 1000  
SUMMARY

## PART 1 GENERAL

## 1.01 PROJECT

- A Project Name: Carnegie Library Rehabilitation
- B Owner's Name: Siskiyou Economic Development.
- C Architect's Name: ORW Architecture.
- D Additional Project contact information is specified on the drawing Title sheet.
- E The Project consists of the alteration of an existing building at 412 W Minor St, Yreka CA.

## 1.02 CONTRACT DESCRIPTION

- A Contract Type: A single prime contract based on Guaranteed Maximum Price (GMP) as described in the Bidding and Procurement documents.

## 1.03 CONDITIONS OF THE CONTRACT

- A The Conditions of the Contract and the General Requirements (Division 1) of these Specifications apply to the work described under each Section hereof. The Contractor shall instruct each subcontractor to incorporate those provisions in their bids.

## 1.04 DESCRIPTION OF ALTERATIONS WORK

- A Summary:
  - 1. Site work to provide concrete footings and/or stem walls for ADA ramp, exterior patio and planters, and balcony.
  - 2. Demolishing existing handrail at stair to basement.
  - 3. Demolishing and removing the existing site LP tank.
  - 4. Exterior waterproofing and wall infill to existing exterior below grade openings under new ramp.
  - 5. New exterior steel balcony, guardrails and steel ramp rails.
  - 6. Exterior finishes require cleaning, patching and repair.
  - 7. Interior wall, door and restroom demolition, including removal of load-bearing walls on the second floor to create an open office environment.
  - 8. Repair and re-finishing of existing historic wood finishes.
  - 9. Providing new partitions, exterior and interior frames and doors, new exterior windows, new toilets and kitchen and new flooring, wall and other finishes throughout the building.
  - 10. Providing structural elements for new construction.
  - 11. Providing new mechanical, electrical, lighting and plumbing services.
- B Scope of alterations work is indicated on drawings.

## 1.05 WORK BY OWNER

- A See Section 01 6000 for Owner and Contractor requirements and responsibility's for Owner-Supplied Products.
- B Items noted OFOI (Owner Furnished, Owner Installed) will be supplied and installed by Owner after Substantial Completion. Contractor shall provide utility connections, rough-ins, backing and fasteners as noted or shown in drawings and specifications. Some items include:
  - 1. OFOI items indicated on drawings.
  - 2. Coordinate additional items with Owner prior to start of alterations.
- C Items noted OFCI (Owner Furnished, Contractor Installed) will be supplied by Owner for Contractor installation:
  - 1. OFCI Items indicated on drawings.
  - 2. Coordinate additional items with Owner prior to start of alterations.
  - 3. Owner Responsibilities:
    - a. Arrange for and deliver Owner-reviewed shop drawings, product data, manufacturer's instructions and samples to Contractor.
    - b. Review shop drawings, product data, samples and other submittals. Submit to Architect with notification and any observed discrepancies or problems anticipated due to non-conformance with Contract

Documents.

- c. Receive, pay for and unload products at site.
  - d. Inspect deliveries jointly with Contractor, record shortages and damage or defective items.
  - e. Handle products at site, including uncrating and storage.
  - f. Protect products from damage and from exposure to elements.
  - g. Provide Contractor with information on block-outs, sleeves, backing and/or other necessary elements for installation.
  - h. Assemble, install, connect to utilities, adjust and finish products.
  - i. Arrange installation inspections required by public authorities, warranties and service.
  - j. Repair or replace items damaged by Contractor.
4. Contractor Responsibilities:
- a. Review Owner-reviewed shop drawings, product data and samples.
  - b. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
  - c. Handle, store, install and finish products.
  - d. Repair or replace items damaged after receipt.

#### 1.06 FUTURE WORK

- A Project is designed for future WAP. Refer to Electrical drawings.

#### 1.07 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.

#### 1.08 CONTRACTOR USE OF SITE AND PREMISES

- A Construction Operations: Limited to areas noted on Drawings.  
B Arrange use of site and premises to allow:
  1. Owner occupancy.
  2. Work by Others.
  3. Work by Owner.
- C Provide access to and from site as required by law and by Owner:
  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.
- D Time Restrictions:
  1. Comply with the requirements and restrictions of the applicable ordinances.
- E 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.

#### 1.09 WORK SEQUENCE

- A Contractor will provide construction sequence, or as provided in Division 00.  
B Coordinate construction schedule and operations with Architect.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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 Documentation of changes in Contract Price and Contract Time.
- C Change procedures.
- D Correlation of Contractor submittals based on changes.
- E Procedures for preparation and submittal of application for final payment.

**1.02 RELATED REQUIREMENTS**

- A Owners Division 00 Bidding and Procurement documents.
- B Section 00 7300 - Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.
- C Section 01 2200 - Unit Prices: Monetary values of unit prices; Payment and modification procedures relating to unit prices.
- D Section 013050 - Design-Build Procedures and Requirements: Additional requirements for components and scopes of Work required by others.

**1.03 SCHEDULE OF VALUES**

- A Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.
- B Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- C Forms filled out by hand will not be accepted.
- D Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- E Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization, bonds, insurance, and supervision.
  - 1. Schedule of Values using a contractor supplied breakdown shall submit a draft and have the breakdown approved by the architect. Show reasonable, identifiable and measurable components of the work.
- F 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.
- G Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.
- H 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 AIA G702 and Form AIA G703, edition stipulated in the Agreement.
- 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 one electronic and three hard-copies of each Application for Payment.
- 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. Project record documents as specified in Section 01 7800, for review by Owner which will be returned to the Contractor.
  - 4. Substantiating Data:
    - a. Copies of invoices from each entity performing work or providing materials for the time period.
    - b. Description of materials stored off-site.
    - c. Proof of insurance covering one-hundred percent (100%) replacement cost of off-site stored materials.
- K Payment for products stored off the project site.
  - 1. When delay or added cost to Owner can be avoided by storing Products off Site Owner will make payment to Contractor for such Products provided Contractor shall:
    - a. Locate Storage Facilities within 20 mile of Project Site or within 50 miles of Architect's Office.
    - b. Make Storage Facilities available for Architect's observation.
    - c. Segregate and label Stored Products for specified Project.
    - d. Assume all risk for loss.
    - e. Assume responsibility for exceeding Product "shelf life."
    - f. Protect Stored Products and provide applicable Insurance against their damage, discoloration, and theft, listing the Owner and any Mortgagee as Additional Named Insureds.
    - g. Submit itemized Inventory and Schedule of Values for Stored Products together with Certificate of Insurance.

#### 1.05 MODIFICATION PROCEDURES

- A Form to be used: AIA G701 Change Order.
- B Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to Contract Documents.
- C For minor changes not involving an adjustment to the Contract Price or Contract Time, Architect will issue instructions directly to Contractor on the architect's standard Instruction Bulletin (IB) form.
- D Request for Information (RFI): Requests for information, clarifications, interpretations and changes which may or may not change the contract sum shall be made on a form acceptable to the Owner, Architect and Contractor.
- E The Architect may issue a Request for Information (RFI) including a detailed description of proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change and the period of time during which the requested price will be considered valid. Contractor will prepare and submit estimate within five (5) days.
- F Contractor may propose changes by submitting a Request for Information (RFI) to Architect, describing proposed change and its full effect on the Work. Include a statement describing reason for the change, and effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on Work by separate or other Contractors. Document requested substitutions in accordance with Section 016000.
- G Stipulated Sum/Price Change Order: Based on Proposal Request and Contractor's fixed price quotation or Contractor's request for Change Order as approved by Architect.
- H Unit Price Change Order: For contract unit prices and quantities, the Change Order will be executed on fixed unit price basis. For unit costs or quantities of units of work which are not pre-determined, execute Work under Construction Change Directive. Changes in Contract Sum/Price or Contract Time will be computed as specified for Change Order.

- I Construction Change Directive: Architect may issue directive, on AIA Form G713 Construction Change Directive signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.
  - J 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.
  - K Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
  - L 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 Price.
  - M 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.
  - N Promptly enter changes in Project Record Documents.
- 1.06 APPLICATION FOR FINAL PAYMENT
- A Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Price, 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.
- PART 2 PRODUCTS - NOT USED  
PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500  
SUBSTITUTION PROCEDURES

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A Procedural requirements for proposed substitutions.

## 1.02 RELATED REQUIREMENTS

- A Owners Division 00 Bidding and Procurement documents.
- B Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.
- C Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

## 1.03 DEFINITIONS

- A Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
  - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
    - a. Unavailability.
    - b. Regulatory changes.
  - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.

## PART 2 PRODUCTS - NOT USED

## PART 3 EXECUTION

## 3.01 GENERAL REQUIREMENTS

- A SUBSTITUTION REQUESTS MUST BE MADE THROUGH A GENERAL CONTRACTOR WHO IS BIDDING THE PROJECT.
  - 1. Requests sent directly to the Architect without going through a Bidder will be ignored.
- B A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
  - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
  - 2. Agrees to provide the same warranty for the substitution as for the specified product.
  - 3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
  - 4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
  - 5. Waives claims for additional costs or time extension that may subsequently become apparent.
  - 6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- C Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
  - 1. Note explicitly any non-compliant characteristics.
- D Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
  - 1. Forms included in the Project Manual are adequate for this purpose, and must be used.
- E Limit each request to a single proposed substitution item.

## 3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A Submittal Time Restrictions:
  - 1. Instructions to Bidders specifies time restrictions and the documents required for submitting substitution requests during the bidding period.
- B Submittal Form (before award of contract):
  - 1. Submit substitution requests by completing the form attached to this section. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- C Transmittal: Where possible, transmit all submittals electronically in Adobe PDF format. Submit one copy

1. Exception: Submittals are not allowed for - Scanning and transmittal of paint colors, grain patterns, decorative laminate, tile, items with tints or hues or any finish and color samples which may be inaccurately represented by a computer monitor.
  2. File Size: Electronic attachments to an email must total no more than 10 MB and must be submitted unzipped. For electronic attachments greater than 10 MB, send them in two or more parts by separate emails, denoting "1 of 2" and "2 of 2" in a case of two emails, in the subject lines after other required subject-line information.
  3. Transmittal directly by email requires the use of a 'Read Receipt'. Use of a 'Delivery Receipt' shall not be used on its own.
  4. The burden of proof that proposed substitution request has been received by the Architect is upon the proposer.
- D Where electronic transmission is not possible or allowed, deliver to Architect at business address. Coordinate submission of related items.
1. Submit 3 copies of request for substitution for consideration. Limit each request to one proposed substitution.
  2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
- 3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION
- A Submittal Form (after award of contract):
1. Submit substitution requests by completing the form attached to this section. See this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- B Architect will consider requests for substitutions only within 20 days after date of Agreement.
1. Beyond the period for acceptance, proposals for product substitution may be considered if a specified product becomes unavailable through no fault of Contractor, or if a proposed product provides significant advantages for the Project or significant cost saving for the Owner.
- C Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
    - a. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents
  2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
  3. Bear the costs engendered by proposed substitution of:
    - a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
    - b. Other construction by Owner.
- D Substitutions will not be considered under one or more of the following circumstances:
1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
  2. Without a separate written request.
  3. When acceptance will require revisions to Contract Documents.
- 3.04 RESOLUTION
- A Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B Architect will notify Contractor in writing of decision to accept or reject request.
1. Architect's decision following review of proposed substitution will be noted on the submitted form.
- 3.05 ACCEPTANCE
- A Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, Architects

Instruction Bulletin or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

- A See Section 01 7800 - Closeout Submittals, for closeout submittals.
- B Include completed Substitution Request Forms as part of the Project record.

3.07 ATTACHMENTS

- A A facsimile of the Substitution Request Forms required to be used are included after this section.

END OF SECTION

# Substitution Request Form (During Procurement)

---

## IDENTIFICATION:

Owner: \_\_\_\_\_  
Design Professional: \_\_\_\_\_  
Project Name: \_\_\_\_\_  
Project Number: \_\_\_\_\_ Date: \_\_\_\_\_

---

## REFERENCE:

Specification Title: \_\_\_\_\_  
Specification No.: \_\_\_\_\_ Page: \_\_\_\_\_ Article/ Paragraph: \_\_\_\_\_

---

## DESCRIPTION:

Manufacturer's Name: \_\_\_\_\_ Model No: \_\_\_\_\_  
Trade Name: \_\_\_\_\_  
Proposed Substitution General Description: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

---

## CERTIFICATION:

The Submitting Undersigned certifies:

- Proposed substitution has been investigated and determined that it meets or exceeds the quality level of the specified product.
  - Same warranty will be furnished for proposed substitution as for specified product.
  - Same maintenance service and source of replacement parts, as applicable, is available.
  - Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
  - Proposed substitution does not affect dimensions and functional clearances.
  - Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- 

Submitted and Signed by: \_\_\_\_\_  
Name Title

Firm: \_\_\_\_\_  
Address: \_\_\_\_\_  
Telephone: \_\_\_\_\_

---

## ATTACHED SUPPORTING DATA:

Drawings     Product Data     Samples     Tests     Reports     \_\_\_\_\_

---

## A/E's REVIEW AND ACTION:

- Substitution approved - Make submittals in accordance with Specification Section 01 2500.
- Substitution approved as noted - Make submittals in accordance with Specification Section 01 2500.
- Substitution rejected - Use specified materials.
- Substitution Request received too late - Use specified materials.

Signed by: \_\_\_\_\_  
Name Title Date

# Substitution Request Form (During Construction)

---

## IDENTIFICATION:

Owner: \_\_\_\_\_  
Contractor: \_\_\_\_\_  
Design Professional: \_\_\_\_\_  
Project Name: \_\_\_\_\_  
Project Number: \_\_\_\_\_  
Substitution Reason:  For Cause  For Convenience Date: \_\_\_\_\_

---

## REFERENCE:

Substitution Request Title: \_\_\_\_\_  
Substitution Request No.: \_\_\_\_\_  
Specification Title: \_\_\_\_\_  
Specification No.: \_\_\_\_\_ Page: \_\_\_\_\_ Article/ Paragraph: \_\_\_\_\_

---

## DESCRIPTION:

Manufacturer's Name: \_\_\_\_\_ Model No: \_\_\_\_\_  
Trade Name: \_\_\_\_\_ Installer: \_\_\_\_\_  
Proposed Substitution General Description: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

---

## EXPLANATION:

Reason for not providing specified item: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Differences between proposed substitution and specified item: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Proposed substitution affects other parts of work as follows: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Savings to Owner for accepting substitution: \_\_\_\_\_  
Change to Contract Time due to accepting substitution: \_\_\_\_\_

---

**CERTIFICATION:**

The Submitting Undersigned certifies:

- Proposed substitution has been investigated and determined that it meets or exceeds the quality level of the specified product.
  - Same warranty will be furnished for proposed substitution as for specified product.
  - Same maintenance service and source of replacement parts, as applicable, is available.
  - Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
  - Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
  - Proposed substitution does not affect dimensions and functional clearances.
  - Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
  - Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.
- 

Submitted and Signed by: \_\_\_\_\_  
Name Title

Firm: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone: \_\_\_\_\_

---

**ATTACHED SUPPORTING DATA:**

- Drawings     Product Data     Samples     Tests     Reports     \_\_\_\_\_

---

**A/E's REVIEW AND ACTION:**

- Substitution approved - Make submittals in accordance with Specification Section 01 2500.
- Substitution approved as noted - Make submittals in accordance with Specification Section 01 2500.
- Substitution rejected - Use specified materials.
- Substitution Request received too late - Use specified materials.

Signed by: \_\_\_\_\_ Date: \_\_\_\_\_  
Name Title

---

**ADDITIONAL COMMENTS:**

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- Owner     Design Professional     Contractor     Installer     Manufacturer     \_\_\_\_\_



SECTION 01 3000  
ADMINISTRATIVE REQUIREMENTS

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A General administrative requirements.
- B Electronic Punch List Ticket Management System.
- C Preconstruction meeting.
- D Site mobilization meeting.
- E Progress meetings.
- F Construction progress schedule.
- G Contractor's daily reports.
- H Progress photographs.
- I Coordination drawings.
- J Number of copies of submittals.
- K Requests for Interpretation (RFI) procedures.
- L Submittal procedures.
- M Special procedures

## 1.02 RELATED REQUIREMENTS

- A Owners Division 00 Bidding and Procurement documents.
- B Section 01 6000 - Product Requirements: General product requirements.
- 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 GENERAL ADMINISTRATIVE REQUIREMENTS

- A Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B Coordinate allocation of mobilization areas of site; for field offices and sheds, for [project] access, traffic, and parking facilities.
- C During construction, coordinate use of site and facilities through the Architect.
- D Comply with procedures for project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
  - 1. Emails from the General Contractor, the Client (or a source under the control of either) to Architectural consultants shall be copied to the Architect.
  - 2. Emails from Architect, the Client (or a source under the control of either) to the General Contractors sub-contractors shall be copied to the General Contractor.
  - 3. Submittals issued by email shall follow Section 013000.
- E Make the following types of submittals to Architect:
  - 1. Requests for Interpretation (RFI).
  - 2. Requests for substitution.
  - 3. Review: Shop drawings, product data, and samples, color selections.
  - 4. Information: Test and inspection reports.
  - 5. Information: Design data.
  - 6. Information: Manufacturer's instructions and field reports.
  - 7. Applications for payment and change order requests.
  - 8. Progress schedules.
  - 9. Coordination drawings.
  - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
  - 11. Closeout submittals.

## PART 2 PRODUCTS - NOT USED

## PART 3 EXECUTION

## 3.01 ELECTRONIC PUNCH LIST TICKET MANAGEMENT SYSTEM

- A Provide software which is a collaborative web and mobile-based punch list ticket management system, to be utilized to document construction deficiencies, assign responsible parties, and to track a ticket's status through its completion.
1. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
  2. The Contractor will be responsible for coordinating Punch list Service, including providing drawings, room lists, setting up room views and inviting users to participate in the system.
- B Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the contract sum.
1. Contractor is to include cost for room setup assistance based on the number of rooms in the project, including corridors, exterior areas and building elevations.
  2. Punch list service is to be provided at a suppliers professional rate, with a minimum 3 month duration. Contractor is to determine how many months of service will be needed for the punch list duration.
- C Punch list service:
1. Innovations 10.01; Punch10.01 : [www.innovations1001.com](http://www.innovations1001.com).
  2. ProCore: [www.procore.com](http://www.procore.com).
- D Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.
- E Project Closeout: Contractor will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for the Architect.
1. Coordinate inspections and assessments with sections 017000 and 017800.

## 3.02 PRECONSTRUCTION MEETING

- A Architect will schedule a meeting after Notice of Award.
- B Attendance Required:
1. Owner.
  2. Architect.
  3. Contractor.
  4. Contractor's Superintendent.
  5. Special Consultants.
  6. Major Subcontractors.
- C 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. Submission of initial Submittal schedule.
  6. Designation of personnel representing the parties to Contract, [\_\_\_\_\_] and Architect.
  7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
    - a. Confirm substantial completion date, based on the notice to proceed date and accepted bid proposal.
  8. Submission of monthly estimated construction costs cash flow over duration of project.
  9. Scheduling and work sequencing.
  10. Scheduling activities of a Geotechnical Engineer.
  11. Miscellaneous administrative issues.
  12. Use of premises by Owner and Contractor.
  13. Owner's requirements and occupancy.

14. Construction facilities and controls provided by Owner.
  15. Temporary utilities provided by Owner.
  16. Security and housekeeping procedures.
  17. Procedures for testing.
  18. Procedures for maintaining record documents.
  19. Requirements for start-up of equipment.
  20. Inspection and acceptance of equipment put into service during construction period.
- D Where separate Site Mobilization Meetings are not scheduled, items on that agenda shall be discussed during the preconstruction meeting.
- E Contractor to record minutes and distribute copies within two business days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
- 3.03 SITE MOBILIZATION MEETING
- A Contractor will schedule a meeting at the Project site prior to Contractor occupancy.
- B Attendance Required:
1. Contractor.
  2. Owner.
  3. Architect.
  4. Special consultants.
  5. Contractor's superintendent.
  6. Major subcontractors.
- C Agenda:
1. Use of premises by Owner and Contractor.
  2. Owner's requirements and occupancy prior to completion.
  3. Construction facilities and controls provided by Owner.
  4. Temporary utilities provided by Owner.
  5. Survey and building layout.
  6. Security and housekeeping procedures.
  7. Schedules.
  8. Application for payment procedures.
  9. Procedures for testing.
  10. Procedures for maintaining record documents.
  11. Requirements for start-up of equipment.
  12. Inspection and acceptance of equipment put into service during construction period.
- D Contractor to record minutes and distribute copies within two business days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
- 3.04 PROGRESS MEETINGS
- A Contractor shall schedule and administer meetings throughout progress of the Work at regular intervals, dates and location as confirmed by Contractor, Architect and Owner.
- B Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C Attendance Required:
1. Contractor.
  2. Owner.
  3. Architect.
  4. Special consultants.
  5. Contractor's superintendent.
  6. Major subcontractors.
  7. Others as appropriate to agenda topics for each meeting.
- D 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 RFIs log and status of responses.
  7. Review of off-site fabrication and delivery schedules.
  8. Review Construction Schedule. Identify items adversely affecting schedule and corrective measures needed to maintain Schedule.
  9. Corrective measures to regain projected schedules.
  10. Planned progress during succeeding work period.
  11. Coordination of projected progress.
  12. Maintenance of quality and work standards.
  13. Effect of proposed changes and/or RFI's on progress schedule and coordination.
  14. Other business relating to work.
- E General Contractor will Record minutes and distribute copies within two business days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
- 3.05 CONSTRUCTION PROGRESS SCHEDULE
- A Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 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.
- 3.06 DAILY CONSTRUCTION REPORTS
- A The log shall be available to the Owner and Architect on request.
  - B Prepare a daily construction report recording the following information concerning events at Project site and project progress:
    1. Date.
    2. High and low temperatures, and general weather conditions.
    3. List of subcontractors at Project site.
    4. Approximate count of personnel at Project site.
    5. Safety, environmental, or industrial relations incidents.
    6. Meetings and significant decisions.
    7. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
    8. Directives and requests of Authority(s) Having Jurisdiction (AHJ).
    9. Testing and/or inspections performed.
    10. Work accomplished.
    11. Include other information the Owner or Architect may reasonably require.
    12. Signature of Contractor's authorized representative.
- 3.07 PROGRESS PHOTOGRAPHS
- A Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
  - B Photography Type: Digital; electronic files.
  - C Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.

- D In addition to periodic, recurring views, take photographs of each of the following events:
1. Completion of site clearing.
  2. Excavations in progress.
  3. Foundations in progress and upon completion.
  4. Structural framing in progress and upon completion.
  5. Enclosure of building, upon completion.
- E Views:
1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
  2. Consult with Architect for instructions on views required.
  3. Provide factual presentation.
  4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
  5. Point of View Sketch: Provide sketch identifying point of view of each photograph.
- F Digital Photographs: 24 bit color, minimum resolution of 1280 by 960 ("1 megapixel"), in JPG format; provide files unaltered by photo editing software.
1. Delivery Medium: Download link.
  2. File Naming: Include project identification, date and time of view, and view identification.
  3. Point of View Sketch: Include digital copy of point of view sketch with each electronic submittal; include point of view identification in each photo file name.
  4. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
- 3.08 COORDINATION DRAWINGS
- A Provide information required for preparation of coordination drawings.
- B Review drawings prior to submission to Architect.
- 3.09 REQUESTS FOR INTERPRETATION (RFI)
- A Definition: A request seeking one of the following:
1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
  2. A resolution to an issue which has arisen due to field conditions and affects design intent.
- B Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.
- C Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
1. Prepare a separate RFI for each specific item.
    - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
    - b. Do not forward requests which solely require internal coordination between subcontractors.
  2. Prepare in a format and with content acceptable to the Architect.
    - a. Provide space for response and signatures, revision for re-submission, and distribute as required under submittal procedures.
  3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- D Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.

2. Unacceptable Uses for RFIs: Do not use RFIs to request the following:
  - a. Approval of submittals (use procedures specified elsewhere in this section).
  - b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
  - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
  - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
  - a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.
- E Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
  1. Official Project name and number, and any additional required identifiers established in Contract Documents.
  2. Owner's, Architect's, and Contractor's names.
  3. Discrete and consecutive RFI number, and descriptive subject/title.
  4. Issue date, and requested reply date.
  5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
  6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
  7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
- F Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- G RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
  1. Indicate current status of every RFI. Update log promptly and on a regular basis.
  2. Note dates of when each request is made, and when a response is received.
  3. Highlight items requiring priority or expedited response.
  4. Highlight items for which a timely response has not been received to date.
  5. Identify and include improper or frivolous RFIs.
- H Submit as an electronic submission as required under submittal procedures.
- I Review Time: Architect will respond and return RFIs to Contractor within five (5) calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
  1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
  2. Upon request from the Architect, the Contractor shall allow extensions of up to 10 business days for individual RFI's.
- J Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
  1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R

suffix to the original number.

2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

### 3.10 SUBMITTAL SCHEDULE

A Submit to Architect for review a schedule for submittals in tabular format.

1. Submit at the same time as the preliminary schedule.
2. Coordinate with Contractor's construction schedule and schedule of values.
3. Format schedule to allow tracking of status of submittals throughout duration of construction.
4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
  - a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

### 3.11 SUBMITTALS FOR REVIEW

A When the following are specified in individual sections, submit them for review:

1. Product data.
2. Shop drawings.
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 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.

E Submittals for color selection:

1. Contractor shall review specifications and drawings and coordinate submittal schedule for all products requiring color selection and or confirmation. All such submittals shall be forwarded to the Architect for review and coordination within 30 days after Notice to Proceed.
2. Architect will not review submitted products until all submittals requiring color selection and or confirmation are received by the Architect. After complete submittal is received, the Architect shall be required to respond as set forth in SUBMITTAL PROCEDURES.
3. This may include items in Divisions such as, but not limited to:
  - a. 03 through 14.

### 3.12 SUBMITTALS FOR INFORMATION

A When the following are specified in individual sections, submit them for information:

1. Design data.
2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

- B Submit for Architect's knowledge as contract administrator or for Owner.

### 3.13 SUBMITTALS FOR PROJECT CLOSEOUT

- A Comply with the Architect's *Scheduling Requirements* in Section 01 7000 - Execution and Closeout Requirements.
- B Submit Correction Punch List for Substantial Completion.
- C Submit Final Correction Punch List for Substantial Completion.
- D 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.
  - 4. Bonds.
  - 5. Other types as indicated.
- E Submit for Owner's benefit during and after project completion.

### 3.14 NUMBER OF COPIES OF SUBMITTALS

- A One copy submitted electronically. Where electronic submittals are not possible, submit documents for review:
  - 1. Small Size Sheets, Not Larger Than 8-1/2 by 11 inches: Submit the number of copies that Contractor requires, plus two copies that will be retained by Architect.
  - 2. Larger Sheets, Not Larger Than 36 by 48 inches: Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.
- B Documents for Information: Submit two copies.
- C Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
  - 1. After review, produce duplicates.
  - 2. Retained samples will not be returned to Contractor unless specifically so stated.

### 3.15 SUBMITTAL PROCEDURES

- A General Requirements:
  - 1. Use a separate transmittal for each item.
  - 2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
  - 3. Transmit using approved form.
    - a. Use the Architect form provided in section 013003.
  - 4. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
  - 5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
  - 6. 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.
    - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
  - 7. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
    - a. Send submittals in electronic format via email to Architect.
    - b. Submit all items electronically in Adobe PDF format.
      - 1) Exception: Submittals are not allowed for:
        - (a) Transmittal of scanned paint colors, grain patterns, decorative laminate, tile, items with tints or hues or any finish and color samples which may be inaccurately represented by a computer monitor
      - 2) File Size: Electronic attachments to an email must total no more than 10 MB and must be submitted unzipped. For electronic attachments greater than 10 MB, send them in two or more



- parts by separate emails, denoting "1 of 2" and "2 of 2" in a case of two emails, in the subject lines after other required subject-line information.
- 3) Transmittal directly by email requires the use of a 'Read Receipt'. Use of a 'Delivery Receipt' shall not be used on its own.
  - 4) The burden of proof that proposed substitution request has been received by the Architect is upon the proposer.
  - 5) Where electronic transmission is not possible or allowed, deliver to Architect at business address. Coordinate submission of related items.
8. Schedule submittals to expedite the Project, and coordinate submission of related items.
    - a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
    - b. Upon request from the Architect, or Architects Consultant, the Contractor shall allow extensions of up to 30 business days for individual submittals.
  9. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
  10. Provide space for Contractor and Architect review stamps.
  11. When revised for resubmission, identify all changes made since previous submission.
  12. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
  13. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
  14. Submittals not requested will be recognized, and will be returned "Not Reviewed",
- B Product Data Procedures:
1. Submit only information required by individual specification sections.
  2. Collect required information into a single submittal.
  3. Submit concurrently with related shop drawing submittal.
  4. Do not submit (Material) Safety Data Sheets for materials or products.
- C Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
  2. Do not reproduce Contract Documents to create shop drawings.
  3. Contract documents distributed in digital data form will be limited to PDF format, or as required by the Prime agreement and Conditions.
  4. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D Samples Procedures:
1. Transmit related items together as single package.
  2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
- 3.16 SUBMITTAL REVIEW
- A Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B Submittals for Information: Architect will not acknowledge receipt, and take no other action.
- C Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.
- D Architect's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
    - a. None - N/A "No Exception Taken", or language with same legal meaning.
    - b. None - N/A "Note markings/attachments", or language with same legal meaning.
      - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
  2. Not Authorizing fabrication, delivery, and installation:
    - a. "Revise and Resubmit".

- 1) Resubmit revised item, with review notations acknowledged and incorporated.
  - 2) Non-responsive resubmittals may be rejected.
- b. "Rejected and Resubmit".
- 1) Submit item complying with requirements of Contract Documents.

### 3.17 SPECIAL PROCEDURES

- A Coordinate as required, during the Work with various Sections.
1. Remove debris and abandoned items from area and from concealed spaces.
  2. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
  3. Where change of plane of 1/4 inch or more occurs, submit recommendation for providing smooth transition; to Architect for review.
  4. Finish surfaces as specified in individual product sections.
  5. Cut, move, or remove items as necessary for:
    - a. Access to alterations and renovation Work. Replace and restore at completion.
    - b. Working in manner to minimize damage and to permit restoring products and finishes to original or specified condition.
  6. Materials: As specified in product sections; match existing with new products and salvaged products for patching and extending work.
  7. Employ original, skilled and experienced installer to perform alteration work.
  8. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.
  9. Prepare surface and remove surface finishes to permit installation of new work and finishes.
  10. Refinish existing visible surfaces to remain in renovated rooms and spaces, to renewed condition for each material, with neat transition to adjacent finishes.
  11. Where new Work abuts or aligns with existing, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.
  12. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and submit recommendation to Architect for review.
  13. Trim existing doors to clear new floor finish. Refinish trim to original condition.
  14. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.

END OF SECTION

SECTION 01 3003  
SUBMITTAL FORM

COMPANY NAME: \_\_\_\_\_

COMPANY ADDRESS: \_\_\_\_\_

\_\_\_\_\_

=====

PROJECT:

JOB# / NAME: CARNEGIE LIBRARY REHABILITATION

ADDRESS: 412 W MINER ST, YREKA, CALIFORNIA 96097

=====

SPEC SECTION NO.: \_\_\_\_\_

SUBMITTAL NO.: \_\_\_\_\_

REVISION NO.: \_\_\_\_\_

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

SUBMITTAL TITLE: \_\_\_\_\_

SPEC SECTION TITLE: \_\_\_\_\_

SUPPLIER NAME: \_\_\_\_\_

| CONTRACTOR   | CONTRACTOR'S REVIEW   |
|--|---|
| SUPERINTENDENT/REVIEWERS NAME<br><br>_____<br><br><br><br><br><br> | REVIEWED PER PLANS AND SPECIFICATIONS<br><br>____REVIEWED ____ MAKE CORRECTIONS NOTED<br><br>____REJECTED ____ REVISE AND RESUBMIT<br><br>COMMENT: _____<br>_____<br>_____<br>_____ |

**(TURN PAGE FOR ARCHITECT AND ENGINEER STAMPS)**

|  |                   |
|--|-------------------|
| ORW ARCHITECTURE   | ARCHITECT'S STAMP |
| ONE OF THE FOLLOWING:<br>ANDREW L. OWEN, AIA<br>J. DAVID WILKERSON II, AIA<br>JEFFREY J. BENDER, AIA |                   |
| ENGINEER   | ENGINEERS STAMP   |
|  |                   |

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 Contractor's construction-related professional design services.
- F Contractor's design-related professional design services.
- G Control of installation.
- H Mock-ups.
- I Tolerances.
- J Manufacturers' field services.
- K Defect Assessment.

## 1.02 RELATED REQUIREMENTS

- A Owners Division 00 Bidding and Procurement documents.
- B Section 01 3000 - Administrative Requirements: Submittal procedures.
- C Section 01 4219 - Reference Standards.
- D Section 01 6000 - Product Requirements: Requirements for material and product quality.

## 1.03 REFERENCE STANDARDS

- A IAS AC89 - Accreditation Criteria for Testing Laboratories 2021.

## 1.04 DEFINITIONS

- A Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.
- B Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
  - 1. Design Services Types Required:
    - a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor's sole responsibilities for construction means, methods, techniques, sequences, and procedures.
    - b. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.
      - 1) These services are also known as Design-Build (D-B) services.
      - 2) Design-Build components are a portion of the Work that must be designed, engineered and constructed by the General Contractor. All Design-Build work must comply with regulations and provide complete operational systems that perform their intended use. Design-Build work requires that the General Contractor generate all information (Drawings, Specification, Etc.) that are required to obtain permits, schedule inspections, and pay all fees which are required.
- C Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

## 1.05 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

- A Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
  - 1. Temporary sheeting, shoring, or supports.
  - 2. Temporary scaffolding.

3. Temporary bracing.
  4. Temporary falsework for support of spanning or arched structures.
  5. Temporary foundation underpinning.
  6. Temporary stairs or steps required for construction access only.
  7. Temporary hoist(s) and rigging.
  8. Investigation of soil conditions to support construction equipment.
- 1.06 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES
- A General Performance Requirements:
1. Comply with Regulations.
  2. Provide complete, operational systems that perform their intended use.
  3. Engineer Design-Build components for gravity, lateral and seismic loads.
    - a. Load criteria is indicated in Structural Drawings.
    - b. Provide services of a qualified engineer.
  4. Engineer Design-Build components for mechanical, electrical or plumbing:
    - a. Design requirements are outlined in the Specifications for the applicable division and on drawings.
    - b. Provide services of a qualified engineer.
  5. Execute the design intent as indicated in Project Drawings and Specifications.
  6. Deferred Submittals required by Design-Build work shall be submitted by the General Contractor to the building department.
  7. Obtain Permits and inspections and pay fees required by Permit Authority.
- B Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
1. Owner's Responsibilities: The Owner will not pay for progress delays, additional Work, additional products, restocking, or reworking required by Contractor's failure to coordinate Design-Build work with other Project work.
- C Scheduling
1. Schedule design process and submittals required for Design-Build components to fit within Construction Schedule.
  2. Allow adequate time for Permit Authority review. Contact Permit Authority for time estimate and coordination of schedule.
  3. If Architect's approval of Shop Drawings is required prior to application for permit, schedule and sequence Shop Drawing review prior to review of permit submittal. Allow time specified in Section 013000.
- D Base design on performance and/or design criteria indicated in individual specification sections.
1. Submit a Request for Interpretation to Architect if the criteria indicated are not sufficient to perform required design services.
- E Scope of Contractor's Professional Design Services: Provide for the following items of work:
1. Not used.
- 1.07 SUBMITTALS
- A See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
    - a. Full name.
    - b. Professional licensure information.
    - c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.
- C Preliminary Design: Submit to Architect drawings and product data that describe Contractor's design prior to performing engineering calculations and Shop Drawings.

1. Architect will evaluate proposed design and comment on conformance with intent of Contract Documents.
  2. Preliminary review is for aesthetic and general function concerns and will not constitute approval of engineering;
  3. Purpose of this submittal is to avoid engineering and detailing an unacceptable proposal.
  4. Resubmissions: Clearly identified as such, with all changes made since the original submittal clearly marked.
- D Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
  2. Include required product data and shop drawings.
    - a. Product submittals are in addition to submittals for permit and design data.
  3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
  4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.
- E Permit Review: Submit Design-Build documents to Permit Authority for review and approval.
1. When Permit Authority requires review by Architect or Architect's consultant, allow 14 days for Architect's review. Submit documents to Architect and pick-up documents when review is complete. Make corrections noted by Architect.
  2. Obtain permits prior to executing work component.
  3. Comply with Permit Authority requirements.
  4. Execute corrections to Design-Build work required by Permit Authority at no cost to Owner and prior to Substantial Completion.
    - a. Notify Architect of changes required by Permit Authority as soon as they are known.
  5. Include design criteria, design assumptions, structural calculations, fabrication and construction details, required clearances, and interface requirements.
    - a. Design-Build drawings are in addition to Shop Drawings.
  6. Affix Design Professional's seal for State License on Submittals as required by state.
- F 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.
- G 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.
  - H 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.
  - I Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
    1. Submit report 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.
  - J Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
    1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
    2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.
- 1.08 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.
- 1.09 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 Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
  - E Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.
- 1.10 TESTING AND INSPECTION AGENCIES AND SERVICES
- A Owner will employ services of an independent testing agency to perform specified testing and inspection described in specification sections and special inspections and Testing required by the Authority having Jurisdiction.
  - B Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- 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.
    - 1. Securement shall be in accordance with applicable codes.
- 3.02 MOCK-UPS
- A Before installing portions of the Work where mock-ups are required, for each form of construction and finish required to conform to the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
  - B Mock-up Size and Location: Coordinate size and location of mock-up with Architect prior to the installation, or construction, of mock-up.
  - C Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
  - D Notify Architect and related Consultant fifteen (15) working days in advance of dates and times when mock-ups will be constructed.
    - 1. *Schedule Mock-up review to coincide with regular Progress Meetings in Section 013000.*
  - E Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.
  - F Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
  - G Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
  - H Obtain Architect's *written* approval of mock-ups before starting work, fabrication, or construction.
    - 1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.
    - 2. Make corrections as necessary until Architect's approval is issued.
  - I Architect will use accepted mock-ups as a comparison standard for the remaining Work.
  - J Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.
- 3.03 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.
- 3.04 TESTING AND INSPECTION
- A See individual specification sections for testing and inspection 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 if required.
    - 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.
- 3.05 MANUFACTURERS' FIELD SERVICES
- A When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
- B Submit qualifications of observer to Architect 30 days in advance of required observations.
1. Observer subject to approval of Architect.
- C Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- 3.06 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 Individual specification sections may modify these options or may identify specific formula or percentage sum/price reduction.
- D Authority of Architect to assess defects and identify payment adjustments, are final.
- E Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:
1. Products wasted or disposed of in a manner that is not acceptable.
  2. Products determined as unacceptable before or after placement.
  3. Products not completely unloaded from transporting vehicle.
  4. Products placed beyond lines and levels of required Work.
  5. Products remaining on hand after completion of the Work.
  6. Loading, hauling, and disposing of rejected products.
- END OF SECTION

SECTION 01 5000  
TEMPORARY FACILITIES AND CONTROLS

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A Dewatering
- B Temporary utilities.
- C Temporary telecommunications services.
- D Temporary sanitary facilities.
- E Temporary Controls: Barriers, enclosures, and fencing.
- F Existing Tree Protection
- G Security requirements.
- H Vehicular access and parking.
- I Waste removal facilities and services.
- J Project identification sign.
- K Field offices.
- L Smoking Area

## 1.02 DEWATERING

- A Provide temporary means and methods for dewatering all temporary facilities and controls.
- B Maintain temporary facilities in operable condition.

## 1.03 TEMPORARY UTILITIES

- A Existing facilities may be used.
- B New permanent facilities may be used.
- C Use trigger-operated nozzles for water hoses, to avoid waste of water.
- D Lighting
  - 1. Provide and maintain lighting of sufficient luminescence for construction operations.
  - 2. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps for specified lighting levels.
  - 3. Provide breakage-protective devices around lighting fixtures.
  - 4. Permanent building lighting may be utilized during construction. Contractor shall replace luminaries at Substantial Completion.
- E Heating
  - 1. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations.
  - 2. Prior to operation of permanent equipment for temporary heating purposes, obtain Architects approval, verify installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts. If permanent equipment is used during construction, prior to Final Acceptance replace all filters and restore systems components to "like new" condition
  - 3. Maintain minimum ambient temperature of 50 degrees F minimum in areas where construction is in progress, unless indicated otherwise in product sections.
- F Ventilation
  - 1. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
  - 2. Provide temporary fan units as required to maintain clean air for construction operations.
- G Water

## 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. Telephone: One line, minimum; Provide, maintain, service to field office at time of project mobilization.
  2. Internet Connections: Minimum of one; DSL modem or faster.
  3. Email: Account/address reserved for project use.
- 1.05 TEMPORARY SANITARY FACILITIES
- A Provide at the time of mobilization and maintain sanitary facilities and privacy enclosures until the date of Substantial Completion. Provide facilities approved for use at construction sites by OSHA and the Jackson County Health Department. Provide at time of project mobilization.
  - B Maintain daily in clean and sanitary condition.
- 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.
  - E Traffic Controls: Make provisions for sequencing and barricading to prevent interference with the normal flow of pedestrians and vehicles either on or around the site. This shall include, among other things, flagmen and/or traffic plates across trenches to provide uninterrupted traffic flow.
- 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.
  - C Provide project Fencing Screen.
- 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 SECURITY
- A Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
  - B Coordinate with Owner's security program.
- 1.10 VEHICULAR ACCESS AND PARKING
- 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 Existing on-site roads may be used for construction traffic.
  - F Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.
  - G Existing parking areas may be used for construction parking.
    1. Coordinate parking with the Owner prior to start of construction.
    2. No materials may be stored at the existing parking location.
  - H Do not allow vehicle parking on existing pavement.
- 1.11 WASTE REMOVAL
- A See Section 024100 - Demolition, 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 weekly.
- 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.

#### 1.12 PROJECT IDENTIFICATION

- A Provide project identification sign of design, construction, and location approved by Architect.
- B Fencing Screen: Provide project specific, full height fencing mesh, for temporary fencing with Owner, Architect and General Contractor recognition, and project graphics. Layout of recognition and graphics shall be approved by architect prior to fabrication.
  - 1. Fencing screen shall be manufactured from Vinyl Coated Polyester Mesh with UV additives. Fencing screen can be obtained from [www.fencescreen.com](http://www.fencescreen.com).
  - 2. Obtain project graphic from Architect; Other graphics provided shall be submitted and approved by the architect prior to fabrication.
- C Where the Owner determines that a fencing screen is not required, the contractor shall:
  - 1. Erect ORW Architecture's banner on site, at location established by ORW Architecture.
  - 2. Maintain sign in good condition, and on display for duration of project. Re-fasten or re-erect sign if it becomes dislodged. Notify Architect is sign is damaged beyond maintenance.
- D No other signs are allowed without Owner permission except those required by law.

#### 1.13 FIELD OFFICES

- A Office: If the General Contractor determines that a field office is required it shall be weathertight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture and drawing display table.
- B Provide space for Project meetings, with table and chairs to accommodate 6 persons.
- C Locate offices a minimum distance of 30 feet from existing and new structures.

#### 1.14 TEMPORARY FIRE PROTECTION

- A Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations."
  - 1. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, and access routes for fighting fires.
  - 2. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

#### 1.15 SMOKING AREA

- A Maintain designated area on site for smoking. Locate to not affect adjacent property owners or others on site who object to airborne smoke.

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

- A Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B Remove underground installations to a minimum depth of 2 feet.
- C Clean and repair damage caused by installation or use of temporary work.
- D Restore existing facilities used during construction to original condition.
- E Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 6000  
PRODUCT REQUIREMENTS

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A General product requirements.
- B Re-use of existing products.
- C Transportation, handling, storage and protection.
- D Product option requirements.
- E Substitution limitations.
- F Procedures for Owner-supplied products.
- G 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.

**1.03 REFERENCE STANDARDS**

- A 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 within 15 days after date of Agreement.
  - 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 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.
- D 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 QUALITY ASSURANCE**

- A Reused Products: Materials and equipment previously used in this or other construction, salvaged and refurbished as specified.
  - 1. Wood fabricated from timber abandoned in transit after harvesting is considered reused, not recycled.
  - 2. Acceptable Evidence: Information about the origin or source, from Contractor or supplier.

**PART 2 PRODUCTS****2.01 EXISTING PRODUCTS**

- A Do not use materials and equipment removed from existing premises unless specifically required or permitted by 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.
- D Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is required.

1. See drawings for list of items required to be salvaged for reuse and relocation.
2. If reuse of other existing materials or equipment is desired, submit substitution request.

## 2.02 NEW PRODUCTS

- A Provide new products unless specifically required or permitted by 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.
  2. Made using or containing CFC's or HCFC's.
  3. Made of wood from newly cut old growth timber.
  4. Containing lead, cadmium, or asbestos.
- C Where other criteria are met, Contractor shall give preference to products that:
  1. Are extracted, harvested, and/or manufactured closer to the location of the project.
  2. Have longer documented life span under normal use.
  3. Result in less construction waste.
  4. Are made of vegetable materials that are rapidly renewable.
  5. Have a published GreenScreen Chemical Hazard Analysis.
- D Provide interchangeable components by the same manufacture for components being replaced.
- E Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.
- F Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

## 2.03 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.
- D For all products:
  1. Any proposed systems from other manufacturers shall closely match the pattern(s) as designed.
  2. The architect will review the aesthetic component of a substitution request and shall have final decision on product acceptance.
  3. Submit samples and receive written approval from the architect at least 10 days prior to bid date.

## 2.04 MAINTENANCE MATERIALS

- A Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B Deliver and place in location as directed by Owner; obtain receipt prior to final payment.

## PART 3 EXECUTION

### 3.01 SUBSTITUTION LIMITATIONS

- A See Section 01 2500 - Substitution Procedures.

### 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 Provide protection of stored materials and products against theft, casualty, or deterioration.
- B 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.
  1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.
- C Store and protect products in accordance with manufacturers' instructions.
- D Store with seals and labels intact and legible.
- E Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.
- F Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- G For exterior storage of fabricated products, place on sloped supports above ground.
- H Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- I Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- J Comply with manufacturer's warranty conditions, if any.
- K Do not store products directly on the ground.
- L Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- M Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- N Prevent contact with material that may cause corrosion, discoloration, or staining.
- O Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- P Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 7000  
EXECUTION AND CLOSEOUT REQUIREMENTS

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A Examination, preparation, and general installation procedures.
- B Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
- C Pre-installation meetings.
- D Cutting and patching, including extending existing work, transitions, adjustments and repair of damaged surfaces.
- E Surveying for laying out the work.
- F Cleaning and protection.
- G Starting of systems and equipment.
- H Demonstration and instruction of Owner personnel.
- I Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- J 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.
  - 1. Execution of Electronic Punch List System.
- 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, ventilating and other facilities
- G Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- H Section 02 4100 - Demolition: Demolition of structures and parts thereof.
- I Section 02 4100 - Demolition: Salvage requirements.
- J Individual Product Specification Sections:
  - 1. Cutting and patching incidental to work of the Section.
  - 2. Advance notification to other sections of openings required in work of those sections.
  - 3. Limitations on cutting structural members.

## 1.03 DEFINITIONS

- A Punch list: Generic term for a list of construction corrections produced at a Preliminary Inspection, Final Inspection or Final Assessment of the construction work.

## 1.04 REFERENCE STANDARDS

- A NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations 2022, with Errata (2021).

## 1.05 ADMINISTRATIVE REQUIREMENTS

- A Cutting of any structural element is not permitted unless written approval is obtained from the Architect and the Office of Statewide Health Planning and Development (OSHDP).

## 1.06 SUBMITTALS

- A See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
  - 1. On request, submit documentation verifying accuracy of survey work.
  - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
  - 3. Submit surveys and survey logs for the project record.
- C Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.

1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
  2. Identify demolition firm and submit qualifications.
  3. Include a summary of safety procedures.
- D 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.
  6. Include in request:
    - a. Identification of Project.
    - b. Location and description of affected work.
    - c. Necessity for cutting or alteration.
    - d. Description of proposed work and products to be used.
    - e. Alternatives to cutting and patching.
    - f. Effect on work of Owner or separate Contractor.
    - g. Written permission of affected separate Contractor.
    - h. Date and time work will be executed.
- E Project Record Documents: Accurately record actual locations of capped and active utilities.
- 1.07 QUALIFICATIONS
- A For demolition work, employ a firm specializing in the type of work required.
1. Minimum of five (5) years of experience.
- B For surveying work, employ a land surveyor registered in Oregon and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,
- C For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in Oregon. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.
- D For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in Oregon.
- 1.08 PROJECT CONDITIONS
- A Use of explosives is not permitted.
- B Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- C Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
- D Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
1. Outdoors: Limit conduct of especially noisy exterior work to the city ordinance the project is located.
- E Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
1. Pest Control Service: Monthly treatments.
- F Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

## 1.09 COORDINATION

- A All demolition, cutting and patching work is to be coordinated by the General Contractor.
- B Coordinate alterations and renovations to expedite completion.
- C 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.
- D Notify affected utility companies and comply with their requirements.
- E 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.
- F 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.
- G In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- H Coordinate completion and clean-up of work of separate sections.
- I 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 012500 - Substitution Procedures.

## 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 Test materials to be used in repairs for compatibility with existing materials; do not use incompatible materials.
- B Clean substrate surfaces prior to applying next material or substance.
- C Seal cracks or openings of substrate prior to applying next material or substance.
- D Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.
- E Provide supports to assure structural integrity of surroundings; devices and methods to protect other portions of Project from damage.

### 3.03 PREINSTALLATION MEETINGS

- A When required in individual specification sections, convene a preinstallation meeting at a predetermined location prior to commencing work of the section.

- B Require attendance of parties directly affecting, or affected by, work of the specific section.
- C Notify Architect 14 days in advance of meeting date.
  - 1. *Schedule preinstallation meetings to coincide with regular Progress Meetings in Section 013000.*
- D Prepare agenda and preside at meeting:
  - 1. Review conditions of examination, preparation and installation procedures.
  - 2. Review coordination with related work.
- E Record minutes and distribute copies within two business days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

#### 3.04 LAYING OUT THE WORK

- A Verify locations of survey control points, set-backs and easements; confirm drawing dimensions and elevations prior to starting work.
- B Promptly notify Architect of any discrepancies discovered.
- C Contractor shall locate and protect survey control and reference points.
- D Control datum for survey is that established by Owner provided survey.
- E Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- F Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- G Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- H Utilize recognized engineering survey practices.
- I Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- J Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
  - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
  - 2. Grid or axis for structures.
  - 3. Building foundation, column locations, ground floor elevations.
- K Periodically verify layouts by same means.
- L Maintain a complete and accurate log of control and survey work as it progresses.
- M On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work are in conformance with the Contract Documents.

#### 3.05 GENERAL INSTALLATION REQUIREMENTS

- A Cutting and patching necessary for completing new work is to be accomplished by the trade or trades directly involved unless otherwise designated by the General Contractor. Each subcontractor is responsible for ascertaining the extent of demolition and patching required to perform his installations and determining with the General Contractor that work which will be allocated to him.
- B 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.
  - 1. Where no specification section exists to match existing
- C Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- D Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- E Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- F Make neat transitions between different surfaces, maintaining texture and appearance.

#### 3.06 ALTERATIONS

- A Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.

1. Verify that construction and utility arrangements are as indicated.
  2. Report discrepancies to Architect before disturbing existing installation.
  3. Beginning of alterations work constitutes acceptance of existing conditions.
- B Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
  2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- C Remove existing work as indicated and as required to accomplish new work.
1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
  2. Remove items indicated on drawings.
  3. Relocate items indicated on drawings.
  4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
  5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- D Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
  2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
  3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
    - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
    - b. Provide temporary connections as required to maintain existing systems in service.
  4. Verify that abandoned services serve only abandoned facilities.
  5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- E Protect existing work to remain.
1. Protect finishes indicated to remain on the drawings.
  2. Prevent movement of structure; provide shoring and bracing if necessary.
  3. Perform cutting to accomplish removals neatly and as specified for cutting new work.
  4. Repair adjacent construction and finishes damaged during removal work.
- F Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
  2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
  3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
  4. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.
- G Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- H Refinish existing surfaces as indicated:

1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
  2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
  - I Clean existing systems and equipment.
  - J Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
  - K Do not begin new construction in alterations areas before demolition is complete.
  - L Comply with all other applicable requirements of this section.
- 3.07 CUTTING AND PATCHING
- A Whenever possible, execute the work by methods that avoid cutting or patching.
  - B See Alterations article above for additional requirements.
  - C 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.
    9. Uncover work to install ill-timed work.
  - D 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.
  - E Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
  - F Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
  - G Restore work with new products in accordance with requirements of Contract Documents.
  - H Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
  - I 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.
  - J 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. If finish cannot be matched, refinish entire surface to nearest intersections.
    4. 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.
- 3.08 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.
- 3.09 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 protection from elements for areas which may be exposed by uncovering work.

- E Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
  - F Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
  - G 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.
  - H Remove protective coverings when no longer needed; reuse or recycle coverings if possible.
- 3.10 SYSTEM STARTUP
- A Coordinate schedule for start-up of various equipment and systems.
  - B Notify Architect and Owner seven days prior to start-up of each item.
  - C 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.
  - D Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
  - E Verify that wiring and support components for equipment are complete and tested.
  - F Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
  - G When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
  - H Submit a written report that equipment or system has been properly installed and is functioning correctly.
- 3.11 DEMONSTRATION AND INSTRUCTION
- A Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.
  - B Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
  - C For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
  - D Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.
  - E Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
  - F The amount of time required for instruction on each item of equipment and system is that specified in individual sections.
- 3.12 ADJUSTING
- A Adjust operating products and equipment to ensure smooth and unhindered operation.
- 3.13 FINAL CLEANING
- A Execute final cleaning prior to final project assessment.
    - 1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
  - B Use cleaning materials that are nonhazardous.
  - C 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.
  - D Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
  - E Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
  - F Replace filters of operating equipment.
  - G Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
  - H Clean site; sweep paved areas, rake clean landscaped surfaces.
  - I Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.



J Clean Owner-occupied areas of work.

### 3.14 CLOSEOUT PROCEDURES

A Procure Electronic Punch List Ticket Management System as specified in Section 013000.

B Make submittals that are required by governing or other authorities.

1. Provide copies to Architect and Owner.

C Preliminary Review Procedure:

1. Perform Contractors preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's comprehensive list of items to be completed or corrected.

2. 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.

3. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

a. *Scheduling Requirement:* Provide two week period, after the submitting the certification, and prior to Substantial Completion, for the Architect to perform the Substantial Completion punch list.

D Substantial Review Procedure:

1. Conduct Substantial Completion inspection with Architect using the Contractors Certified Punch list. Architect will identify additional items found during the review and submit a Substantial Punch List to the contractor. Contractor will create a comprehensive Final Correction Punch List containing Architect's and Contractor's list of items identified to be completed or corrected and submit to Architect.

2. Contractor will correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

3. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion Final inspection.

a. *Scheduling Requirement:* Provide two week period, after the submitting the certification, and prior to Substantial Completion, for the Architect to perform the Substantial Completion punch list.

4. Owner will occupy all of the building as specified in Section 01 1000.

E Final Review Procedure:

1. Conduct Final Completion inspection with Architect using the Final Correction Punch List. Identify Work still to be completed or corrected and submit revised Final Corrected Punch List to Architect to be included in the Certificate of Substantial Completion.

a. *Scheduling Requirement:* Provide two week period, after the submitting the corrected punch list, and prior to Final Completion, for the Architect to perform the Final Inspection.

F Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

### 3.15 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

SECTION 01 7800  
CLOSEOUT SUBMITTALS

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A Project record documents.
- B Operation and maintenance data.
- C Warranties and bonds.

## 1.02 RELATED REQUIREMENTS

- A Owners Division 00 Bidding and Procurement documents.
- 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 SUBMITTALS

- A Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B Operation and Maintenance Data:
  - 1. Submit one copy of preliminary draft or proposed formats and outlines of contents, *in digital PDF format*, 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, in digital PDF format, 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 one set of revised final documents in final form, and in digital PDF format, 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.
    - a. Revisions shall be 'to scale' of the original construction documents.
  - 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, not less than weekly.
- 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 main 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.
- G Submit documents to Architect with claim for final Application for Payment.
- 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.
- F Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.
- G Provide a listing of Maintenance Materials and location in facility for Owner's use in maintenance of project.
1. For each product delivered, include copy of the Owners receipt as record of requirement completion.
- 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 Contractor's coordination drawings, with color coded piping diagrams as installed.
  - M Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
  - N Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
  - O Include test and balancing reports.
  - P 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 Prepare data in the form of an instructional manual.
  - E Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
  - F Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
  - G Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
  - H 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.
  - I 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.
  - J Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
  - K Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
  - L Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
  - M 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. Certificates.
  - c. Photocopies of warranties and bonds.
- N Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.
- O 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 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 Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- F Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- G Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- H Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 02 4100  
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Selective demolition of building elements for alteration purposes.
- B Salvage requirements of existing items.

1.02 RELATED REQUIREMENTS

- A Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.
- B Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- C Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- D Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- E Section 31 2323 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.03 SUBMITTALS

- A See Section 01 3000 - Administrative Requirements for submittal procedures.
- B Site Plan: Indicate:
  - 1. Vegetation to be protected.
  - 2. Areas for temporary construction and field offices.
  - 3. Areas for temporary and permanent placement of removed materials.
- C Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
  - 1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
- D Demolition firm qualifications.
- E Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.04 QUALITY ASSURANCE

- A Demolition Firm Qualifications: Company specializing in the type of work required.

PART 2 PRODUCTS

2.01 MATERIALS

- A Fill Material: See Section 31 2323.

PART 3 EXECUTION

3.01 DEMOLITION

- A Remove paving and curbs required to accomplish new work.
- B Remove other items indicated, for removal.
- C Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
  - 1. Perform Work in accordance with the Ordinances of the Authority having Jurisdiction.
  - 2. Comply with the requirements of the insurance carriers providing coverage for this work.
  - 3. Obtain required permits.
  - 4. Comply with applicable requirements of NFPA 241.
  - 5. Use of explosives is not permitted.
  - 6. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
  - 7. Provide, erect, and maintain temporary barriers and security devices.

8. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
  9. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
  10. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
  11. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
  12. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- B Do not begin removal until receipt of notification to proceed from Owner.
- C Protect existing structures and other elements to remain in place and not removed.
1. Provide bracing and shoring.
  2. Prevent movement or settlement of adjacent structures.
  3. Stop work immediately if adjacent structures appear to be in danger.
- D Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- E Hazardous Materials:
1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.
- F Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.
- 3.03 EXISTING UTILITIES
- A Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.
- B Protect existing utilities to remain from damage.
- C Do not disrupt public utilities without permit from authority having jurisdiction.
- D Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- 3.04 SELECTIVE DEMOLITION FOR ALTERATIONS
- A Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
1. Verify construction and utility arrangements are as indicated.
  2. Report discrepancies to Architect before disturbing existing installation.
  3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.
1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
  2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- C Remove existing work as indicated and required to accomplish new work.
1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction indicated.
  2. Remove or relocate items indicated on drawings.
- D Services including, but not limited to, HVAC, Plumbing, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.

1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
  2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
  3. See Section 01 1000 - Summary for limitations on outages and required notifications.
  4. Verify that abandoned services serve only abandoned facilities before removal.
  5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.
- E Protect existing work to remain.
1. Prevent movement of structure. Provide shoring and bracing as required.
  2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
  3. Repair adjacent construction and finishes damaged during removal work.
  4. Patch to match new work.
- F Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
  2. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
  3. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
  4. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
  5. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
  6. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.
- 3.05 SALVAGE REQUIREMENTS
- A Coordinate with Architect to identify building components and equipment required to be removed and delivered to Owner.
- B Tag components and equipment designated for salvage.
- C Protect designated salvage items from demolition operations until items can be removed.
- D Carefully remove building components and equipment indicated to be salvaged.
- E Disassemble as required to permit removal from building.
- F Package small and loose parts to avoid loss.
- G Mark equipment and packaged parts to permit identification and consolidation of components of each salvaged item.
- H Prepare assembly instructions consistent with disassembled parts. Package assembly instructions in protective envelope and securely attach to each disassembled salvaged item
- I Deliver salvaged items to Owner. Obtain signed receipt from Owner.
- J Salvaged items damaged or destroyed in the process of salvage, or any salvaged not performed shall be compensated to the Owner, by one of the methods listed here, as approved by the Architect:
1. Contractor shall replace items to Owner with an identical material in finish, quality and purpose of equal quantity.
  2. The Architect will issue a document in accordance with Section 012000 - Price and Payment Procedures, Modification Procedures, which will define the requirements
- 3.06 DEBRIS AND WASTE REMOVAL
- A Remove debris, junk, and trash from site.
- B Leave site in clean condition, ready for subsequent work.
- C Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION



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

**PART 1 GENERAL****1.01 DESCRIPTION**

- A Work Included: Provide cast-in-place concrete, including formwork and reinforcement, where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B Related Work: Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 01 of these Specifications.

**1.02 QUALITY ASSURANCE**

- A Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B Comply with "Specifications for Structural Concrete for Buildings," ACI 301, except as may be modified herein.
- C Do not commence placement of concrete until mix designs have been reviewed and approved by Architect and all governmental agencies having jurisdiction, and until copies of the approved mix designs are at the job site and the batch plant.

**1.03 SUBMITTALS**

- A Submit the following submittals in accordance with the requirements in Section 01 33 00.
- B Certifications:
  - 1. Cement: Mill certificate of Inspection and Compliance.
  - 2. Aggregate: Sampling and tests as enumerated in ASTM C-33.
- C Mix Design:
  - 1. The design of the mixes shall be established by an approved Testing Laboratory, paid for by the Contractor. Once a mix design is approved the proportions of the mix shall not be changed without approval of the Architect.
  - 2. The proportions of aggregate to cement for any concrete shall be such as to produce a mixture which will work readily into the corners and angles of the forms and around reinforcement with the method of placing employed, but without permitting the materials to segregate or excess free water to collect on the surface. Slump shall not exceed the values required for the strength and use intended.
  - 3. The methods of measuring concrete materials shall be such that the proportions can be accurately controlled and easily checked at any time during the work. Measurement of materials for Ready Mixed Concrete shall conform to the "Standard Specification for Ready Mixed Concrete" ASTM C- 94. All materials shall be proportioned by weight.

**PART 2- PRODUCTS****2.01 FORMS**

- A Design, erect, support, brace, and maintain formwork so it will safely support vertical and lateral loads which might be applied until such loads can be supported safely by the concrete structure.
- B Construct forms to the exact sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, grades, and level and plumb work in the finished structure.

**2.02 REINFORCEMENT**

- A Comply with the Following as Minimums:

1. Bars: ASTM A615, grade 60 unless otherwise shown on the Drawings, using deformed bars for number 3 and larger. If bars require welding, use material conforming to ASTM A706.
  2. Welded Wire Fabric: ASTM A185
  3. Bending: ACI 318.
- B Fabricate reinforcement to the required shapes and dimensions, within fabrication tolerances stated in the CRSI "Manual of Standard Practices".
- C Do not use reinforcement having any of the following defects:
1. Bar lengths, depths, or bends exceeding the specified fabricating tolerances;
  2. Bends or kinks not indicated on the Drawings or required for this work;
  3. Bars with cross-section reduced due to excessive rust or other causes.

### 2.03 CONCRETE

- A Comply with the following as minimums:
1. Portland Cement: ASTM C150, type II, low alkali.
  2. Aggregate, General:
    - A ASTM C30, uniformly graded and clean;
    - B Do not use aggregate known to cause excessive shrinkage.
  3. Aggregate, Coarse: Crushed rock or washed gravel with minimum size between 3/4" and 1-1/2", and with a maximum size number 4.
  4. Aggregate, Fine: Natural washed sand of hard and durable particles varying from fine to particles passing a 3/8" screen, of which at least 12% shall pass a 50-mesh screen.
  5. Water: Clean and potable.
- B Provide concrete with the compressive strengths shown on the Drawings. When such strengths are not shown on the Drawings, provide the following as minimums:
1. Concrete Footings: 3,000 psi
  2. Concrete Walls: 3,000 psi
  3. Concrete Walks & Slabs-on-Grade: 4,000 psi
- C For exterior concrete, provide air entrainment of  $6 \pm 1\%$  using an air entraining admixture.
- D Maximum slump using water only is 4". Additional slump may be induced using a "Super Plasticizer".

### 2.04 OTHER MATERIALS

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

## PART 3 - EXECUTION

### 3.01 SURFACE CONDITIONS

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

### 3.02 REINFORCING

- A Comply with the following, as well as the specified standards, for details and methods of reinforcing placement and supports.
1. Clean reinforcement and remove loose dust and mill scale, earth, and other materials which reduce bond or destroy bond with concrete.
  2. Position, support, and secure reinforcement against displacement by forms, construction, and the concrete placement operations.
  3. Placement of reinforcement to obtain the required coverages for concrete protection.
  4. Install welded wire fabric in as long lengths as practicable, lapping adjoining pieces one full mesh minimum.
  5. Unless otherwise shown on the Drawings, or required by governmental agencies having jurisdiction, lap bars 24 diameters minimum.

### 3.03 EMBEDDED ITEMS

- A Do not embed piping, other than electrical conduit, in structural concrete.
1. Locate conduit to maintain maximum strength of the structure.
  2. Increase the thickness of the concrete if the outside diameter of the conduit exceeds 30% of the thickness of the concrete.
- B Set bolts, inserts, and other required items in the concrete, accurately secured so they will not be displaced, and in the precise locations needed.

### 3.04 MIXING CONCRETE

- A Transit mix the concrete in accordance with provisions of ASTM C94.
- B Mixing Water:
1. At the batch plant, withhold 2-1/2 gal of water per cu. yd. of concrete.
  2. Upon arrival at the job site, add all or part of the withheld water (as required for proper slump) before the concrete is discharged from the mixer.
  3. Mix not less than five minutes after the withheld water has been added, and not less than one minute of that time immediately prior to discharge of the batch.
  4. Unless otherwise directed, provide 15 minutes total mixing time per batch after first addition of water.
- C Do not use concrete that has stood for over 30 minutes after leaving the mixer, or concrete that is not placed within 60 minutes after water is first introduced into the mix.

### 3.05 PLACING CONCRETE

- A Preparation:
1. Remove foreign mater accumulated in the forms.
  2. Rigidly close openings left in the formwork.
  3. Wet wood forms sufficiently to tighten up cracks. Wet other material sufficiently to maintain workability of the concrete tools.
  4. Use only clean tools.
- B Conveying:
1. Perform concrete placing at such a rate that concrete which is being integrated with fresh concrete is still plastic.

2. Deposit concrete as nearly as practicable in its final location so as to avoid separation due to rehandling and flowing.
3. Do not use concrete which becomes non-plastic and unworkable, or does not meet required quality control limits, or has been contaminated by foreign materials.
4. Remove rejected concrete from the job site.

C Placing Concrete in Forms:

1. Deposit concrete in horizontal layers not deeper than 24", and avoid inclined construction joints.
2. Remove temporary spreaders in forms when concrete has reached the elevation of the spreaders.

D Placing Concrete Slabs:

1. Deposit and consolidate concrete slabs in a continuous operation within limits of construction joints, until the placing of a panel or section is completed.
2. Bring slab surfaces to the correct level with a straightedge, and then strike off.
3. Use bullfloats or darbies to smooth the surface, leaving the surface free from bumps and hollows.
4. Do not sprinkle water on the plastic surface. Do not disturb the slab surface prior to start of finishing operations.

### 3.06 CONSOLIDATION

A General:

1. Consolidate each layer of concrete immediately after placing, by use of internal concrete vibrators supplemented by hand spading, rodding, or tamping.
2. Do not vibrate forms or reinforcement.
3. Do not use vibrators to transport concrete inside the forms.

### 3.07 JOINTS

A Construction Joints:

1. Do not use horizontal construction joints except as may be shown on the Drawings.
2. If additional construction joints are found to be required, secure the Architect's approval of joint design and location prior to start of concrete placement.

B Expansion Joints:

1. Do not permit reinforcement or other embedded metal items that are being bonded with concrete (except dowels in floors bonded on only one side of the joints) to extend continuously through any expansion joint.
2. Fill expansion joints full depth with expansion joint material approved by the Architect.

### 3.08 CONCRETE FINISHING

A Except as may be shown otherwise on the Drawings, provide the following finishes at the indicated locations.

1. Scratch Finish:
  - a. Apply to monolithic slab surfaces that are to receive concrete floor topping or mortar setting bed.

2. Float Finish:
  - a. Apply to monolithic slab surfaces that are to receive trowel finish and other finishes specified hereinafter, and to slab surfaces which are to be covered with insulation.
3. Trowel Finish:
  - a. Apply to monolithic slab surfaces that are to be exposed to view, unless otherwise sown, and to slab surfaces that are to be covered with resilient flooring, carpeting, paint, or other thin- film finish coating system.
4. Non-slip Broom Finish:
  - a. Apply to walks, stairs, drives, ramps, and similar pedestrian and vehicular areas.
5. Vertical Finish:
  - 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. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

### 3.09 REMEDIAL WORK

- A Repair or replace deficient work as directed by the Architect and at no additional cost to the Owner.
- B Defective Work:
  1. Any concrete not formed as shown or not true to the intended lines, grades or tolerances, or that has rock pockets, voids, or debris embedded in it shall be deemed defective. Defective work shall be removed and replaced with conforming work or, at the option of the Architect, repaired to the Architect's satisfaction.
  2. Slab shrinkage cracks, edge curls or surface out-of-tolerance are defects which must be repaired to the satisfaction of the Architect, or the slabs shall be replaced with non-defective work. Repair shall be as follows:
    - a. Slabs Covered with Carpet or Vinyl Tile: Fill all cracks with cement mortar, grind all edge curl and grind or fill with floor stone any surface irregularities.
    - b. Slabs Exposed to View as Finish Floors:
      - (1) Hairline Cracks less than 1/16" Wide: No repair.
      - (2) Cracks more than 1/4" Wide: Replace slab section.
      - (3) Cracks less than 1/4" Wide: Fill with cement mortar flush with the surface.
      - (4) Slab curl or High Spots: Grind flush and restore surface color and texture with epoxy mortar.
      - (5) Slab Depressions: Fill with epoxy mortar to match adjacent areas.
- C Epoxy Bonding, Patching and Anchors:
  1. Use the following materials and procedures where epoxy materials are called for:
    - a. Prepare surfaces by cleaning, chipping, bushhammer or sandblast as necessary to roughen surface; remove laitance, and expose aggregate. Clean steel surfaces.

- b. Prime surfaces with "EUCO" #352 or equal. Thin per manufacturer's recommendations and apply a 10-mil layer using a stiff brush. Allow 30 minutes for volatiles to dry, then place concrete within 1-1/2 hours. Reprime if time limit is exceeded.
- c. Patch surfaces by preparing as above and then trowel applying "EUCO" #456 epoxy mortar. Follow manufacturer's recommendations for applications and aggregate fillers.
- d. Grout rebar by drilling a hole 3/8" to 1/2" larger than the anchor. Air blast and wire brush to remove all dust. Place "EUCO" #456 epoxy mortar with a caulking gun and extended tip in the bottom of the hole in an amount to fill the hole when the anchor is inserted. For overhead or horizontal application, use "EUCO" #M-235.

END OF SECTION

SECTION 03 3511  
CONCRETE FLOOR FINISHES

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A Liquid densifiers and hardeners.
- B Clear penetrating sealers.
- C Polished concrete.

## 1.02 RELATED REQUIREMENTS

- A Section 03 3000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

## 1.03 REFERENCE STANDARDS

- A ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine 2017.
- B CSDA-ST-115 - Measuring Concrete Micro Surface Texture Oct 4, 2013.

## 1.04 ADMINISTRATIVE REQUIREMENTS

- A Coordinate the work with concrete floor placement and concrete floor curing.

## 1.05 SUBMITTALS

- A See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.
- C Product Data: Manufacturer's published data and installation instructions for concrete polishing system and finishing products, including manufacturer's installation instructions, information on compatibility of different products, and limitations.
- D Maintenance Data: Provide data on maintenance and renewal of applied finishes.

## 1.06 MOCK-UP

- A Comply with the Size and location requirements of Section 01 4000, Mock-up.
- B For coatings, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.
- C Mock-Up Size: 10 feet square.
- D Locate where directed.
- E Mock-up may remain as part of the work.
  - 1. Mock-up will show:
    - a. Level of specified concrete sheen; Include additional mock-ups of sheen one surface texture grade higher, and lower based on CSDA levels for final selection by the Architect.
    - b. After final level of sheen selection, provide mock-up of stain color and gloss level. If required, provide additional mock-ups of stain at lighter and darker hues.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A Deliver materials in manufacturer's sealed packaging, including application instructions.

## 1.08 FIELD CONDITIONS

- A Maintain light level equivalent to a minimum 200 W light source at 8 feet above the floor surface over each 20 foot square area of floor being finished.
- B Maintain ambient temperature of 50 degrees F minimum.

## PART 2 PRODUCTS

## 2.01 SYSTEM

- A Provide densifiers, hardliners and coatings as part of a single supplied and warranted manufacturers system.
- B Performance:
  - 1. Material Compatibility: Provide materials that are compatible with one another under conditions of service and application required, as demonstrated by manufacturer based on testing and field experience.

2. Smooth and trowel finishes shall be finished to comply with a minimum Coefficient of Friction: 0.86 dry, 0.69 wet, when tested in accordance with ASTM D2047.

## 2.02 DENSIFIERS AND HARDENERS

- A Liquid Densifier and Hardener: Penetrating chemical compound that reacts with concrete, filling the pores and dustproofing; for application to concrete after set.

1. Products:
  - a. Ameripolish, Inc; 3D HS Hybrid Silicate Densifier: [www.ameripolish.com](http://www.ameripolish.com)
  - b. Husqvarna Floor Treatment Products; HiperLith Densifier: [www.husqvarna.com](http://www.husqvarna.com)
  - c. Substitutions: See Section 01 6000 - Product Requirements.

## 2.03 COATINGS

- A Penetrating Sealer: Transparent, nonyellowing, water- or solvent-based coating.

1. Products:
  - a. Ameripolish, Inc; SR2 Concrete Sealer: [www.ameripolish.com](http://www.ameripolish.com)
  - b. Husqvarna; HiperGuard: [www.husqvarna.com](http://www.husqvarna.com).
  - c. Substitutions: See Section 01 6000 - Product Requirements.

## 2.04 POLISHED CONCRETE SYSTEM

- A Polished Concrete System: Materials, equipment, and procedures designed and furnished by a single manufacturer to produce dense polished concrete of the specified sheen.

1. Acceptable Systems:
  - a. Ameripolish, Inc; Ameripolish Polished Concrete System: [www.ameripolish.com/#sle](http://www.ameripolish.com/#sle).
  - b. Husqvarna; HiperGuard: [www.husqvarna.com](http://www.husqvarna.com).
  - c. Substitutions: See Section 01 6000 - Product Requirements.

- B Sheen and System:

1. Design Criteria:
  - a. Hard-Steel Troweled: See Structural Drawing specification.
  - b. High Traction Rating: NFSI 101-A, ANSI B-101.1 2009 non-slip properties.
  - c. Abrasion Resistance: ASTM C779, Method A, high resistance, no more than 0.008 inch (0.20 mm) wear in 30 minutes.
2. Level of cut exposure:
  - a. Level 1 - Cream finish - polishing only the Portland Cement paste at the surface without exposing small, medium or large aggregate.
3. Level of Sheen:
  - a. Level: B2 (32  $\mu$ in) Low Polish (approx. 800 grit)

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A Verify that floor surfaces are acceptable to receive the work of this section.
- B Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

### 3.02 GENERAL

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

### 3.03 COATING APPLICATION

- A Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.
- B Verify that water vapor emission from concrete and relative humidity in concrete are within limits established by coating manufacturer.
- C Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.
- D Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.



**3.04 CONCRETE POLISHING**

- A Execute using materials, equipment, and procedures specified by manufacturer, using manufacturer approved installer.
  - 1. Final Polished Sheen: Final sheen is before addition of any sealer or coating, regardless of whether that is also specified or not.
    - a. Provide Surface Texture Grade described in Part 2 in accordance with CSDA-ST-115.
- B Protect finished surface as required and as recommended by manufacturer of polishing system.

**3.05 CLEANING**

- A Dried material may require mechanical abrasion for removal. Clean application and spray equipment with detergent and water immediately following use.
- B Clean up spills immediately and spot-treat stains with degreaser or oil emulsifier.
- C Clean floor regularly in accordance with manufacturer's recommendations.

**3.06 PROTECTION**

- A Keep traffic off floor 4-8 hrs after application.
- B Protect from freezing.

END OF SECTION

SECTION 03 3533  
STAMPED CONCRETE FINISHING

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A Stamping of new full-depth concrete.
- B Surface coatings on stamped concrete.

## 1.02 RELATED REQUIREMENTS

- A Section 03 3000 - Cast-in-Place Concrete: Concrete mix design; bonding and chemical admixtures; mixing; placement; finishing of concrete surface to tolerance: floating, troweling, and similar operations; frequency and treatment of control joints.

## 1.03 REFERENCE STANDARDS

- A ASTM C33/C33M - Standard Specification for Concrete Aggregates 2018.

## 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, including:
  - 1. VOC data for each liquid product.
  - 2. Preparation instructions and recommendations.
  - 3. Storage and handling requirements and recommendations.
  - 4. Installation methods.
- C Shop Drawings: Indicate location of construction and control joints.
- D Maintenance Data: Provide data on maintenance and renewal of applied finishes.
- E Certificates: Certify that products of this section meet or exceed specified requirements and are suitable for intended application.

## 1.05 QUALITY ASSURANCE

- A Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by owner.
  - 1. Submit installer's list of completed stamped concrete projects, including project name and location, name of Architect, and type and quantity of materials applied.

## 1.06 MOCK-UPS

- A Construct mock-up(s) of stamped concrete to serve as basis for evaluation of workmanship.
  - 1. Number of Mock-Ups to be Prepared: One.
  - 2. Use same materials and methods for use in the work.
  - 3. Record technique, timed procedures and material used.
  - 4. Locate where directed.
  - 5. Minimum Size: 4 by 4 feet.
- B Obtain approval of mock-up by Architect before proceeding with work.
- C Retain mock-up(s) until completion of work for use as quality standard.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B Store and handle materials in accordance with manufacturer's instructions.
- C Keep materials in manufacturer's original, unopened containers and packaging until application.
- D Store materials in clean, dry area indoors and out of direct sunlight.
- E Keep materials from freezing.
- F Protect materials during storage, handling, and application to prevent contamination or damage.

## 1.08 FIELD CONDITIONS

- A Do not install materials when air and surface temperatures are below 55 degrees F or above 80 degrees F.
- B Do not install materials when rain, snow, or excessive moisture is expected during application or within 24 hours after application.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A Stamping Materials:
  - 1. BRICKFORM: [www.brickform.com/#sle](http://www.brickform.com/#sle).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 STAMPED CONCRETE APPLICATIONS**

- A CONC-2 Full Depth Stamped Concrete Slab: Patterned new concrete.
  - 1. Application(s): As indicated on drawings.
  - 2. Pattern: Rough Cut Ashlar, FM-100 s/o.
  - 3. Coloring: None, natural cement gray.
  - 4. As last step, apply clear sealer.

**2.03 FULL-DEPTH CONCRETE SLAB MATERIALS**

- A See other section(s) for concrete design mix, mixing, forming, and reinforcement.
- B Slump: 4.0 inches maximum.
- C Do not use calcium chloride or admixtures containing calcium chloride.
- D Aggregates: Use non-reactive fine and coarse aggregates free from deleterious material and complying with ASTM C33/C33M.

**2.04 STAMPING MATERIALS**

- A Stamping Mats: Mat type imprinting tools for texturing freshly placed concrete, in pattern and texture to achieve required surface profile and design.
  - 1. Mat Composition: Polyurethane.
- B Release Agent: Bond breaker compound capable of releasing stamping forms from concrete without creating surface defects or leaving any residue; type as recommended by stamping mat manufacturer; compatible with concrete, form materials and specified coloring agents.

**2.05 SURFACE TREATMENTS**

- A Clear Sealer: Suitable for interior and exterior application.
  - 1. Composition: Acrylic, water-based.
  - 2. VOC: 100 g/L.
  - 3. Sheen: Low sheen, matte.
  - 4. Solids Content: Minimum of 18 percent.
  - 5. Color: Clear.
  - 6. Slip Resistant Additive: Included.
  - 7. Products:
    - a. BRICKFORM; BRICKFORM Safety-Seal 100 VOC: [www.brickform.com/#sle](http://www.brickform.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.

**2.06 ACCESSORY MATERIALS**

- A Curing Compound: As specified in section where concrete is specified and compatible with materials specified in this section.
- B Concrete Cleaner: Biodegradable cleaning and neutralizing agent for removal of curing compounds.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A Examine surfaces and areas to receive stamped concrete.
- B Verify that utility penetrations and peripheral work are complete.
- C Notify Architect of conditions that would adversely affect application or subsequent use.
- D Do not begin preparation or application until unacceptable conditions are corrected.

**3.02 PREPARATION**

- A Protect adjacent surfaces, areas, adjoining walls, and landscaping from overspray, blown dry materials, and damage due to work of this section.

B Immediately remove dry pigmented materials from surfaces on which they are not intended to be applied.

3.03 FULL-DEPTH CONCRETE SLABS INSTALLATION

A See other section(s) for concrete forming and placement.

3.04 STAMPING

A Match approved mock-ups for pattern, color, texture, and workmanship.

B Use stamping mats to create patterns in concrete as indicated on drawings; comply with manufacturer's recommendations and instructions.

C Use release agent to prevent damage to concrete surface or creation of bugholes during mat removal.

D After removal of stamping mats, make minor surface repairs as required.

3.05 CURING

A Protect recently placed materials from premature drying, excessive hot or cold temperatures and mechanical injury until fully cured.

B Do not use curing compounds on overlay topping coats; air cure in accordance with topping material manufacturer's instructions.

3.06 SURFACE TREATMENTS

A Match approved mock-ups for pattern, color, texture, and workmanship.

B Wait at least 28 days before applying any surface treatment materials or mechanical finishing.

C Clean curing agent residue off surface prior to application of surface treatment materials.

1. Apply concrete cleaner in accordance with manufacturer's instructions to remove excess form release agent, efflorescence, cement scale and curing agents.

D Sealer/Coating Application: Apply uniformly over entire surface in accordance with manufacturer's instructions.

3.07 PROTECTION

A Do not allow traffic on finished surfaces for the following periods after application:

1. Foot Traffic: Minimum 24 hours.
2. Heavy Traffic: Minimum 72 hours.

B Protect finished work from damage during construction and ensure that, except for normal weathering, work will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

**SECTION 05 05 23  
METAL FASTENING**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Includes But Not Limited To:  
Quality of structural metal-to-metal, wood-to-metal, and wood-to-wood bolts used on Project.

**1.02 REFERENCES**

- B. Reference Standards:
1. ASTM International:
    - a. ASTM A 36-05, 'Standard Specification for Carbon Structural Steel.'
    - b. ASTM A 307-04, 'Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.'
    - c. ASTM A 325-02, 'Standard Specification for High-Strength Bolts for Structural Steel Joints.'

**PART 2 - PRODUCTS**

**2.01 MANUFACTURED UNITS**

- A. Materials:
1. Bolts And Threaded Fasteners:
    - a. Steel-to-Steel Connections:
      - 1) Provide ASTM A325-N High Strength Bolts
      - 2) Bolt holes to be 1/32" to 1/16" larger than specified bolt. Washers shall be used at each bolt head and nut next to wood. All washers to be not less than standard cut washers.
    - b. Wood-to Steel Connections:
      - 1) Conform to requirements of ASTM A 307, Grade A.
      - 2) Bolt holes to be 1/32" to 1/16" larger than specified bolt. Washers shall be used at each bolt head and nut next to wood. All washers to be not less than standard cut washers.
    - c. Anchor Bolts:
      - 1) Conform to requirements of ASTM A 307, Grade A.
      - 2) Wood plates or sills shall be bolted to the foundation or foundation wall. Steel bolts with a minimum nominal diameter of 1/2" inch shall be used. Bolts shall be embedded at least 7 inches into the concrete or masonry. In a two pour system embedment shall be into the first pour. There shall be a minimum of two bolts per piece with one bolt located not more than 12 inches or less than 7 bolt diameters from each end of the piece.
      - 3) Plate washers a minimum of 3"x3"x1/4" thick shall be used on each bolt. See CBC section 2305.3.11 for alternate.
    - d. ALL BOLTS shall have a minimum of 3 threads projecting beyond the nut.
  2. All hardware called for shall be Simpson Strong-Tie Co., Inc., [www.strongtie.com](http://www.strongtie.com) and installed per the manufacturer's specifications, u.n.o.

**END OF SECTION**

**SECTION 05 12 00  
STRUCTURAL STEEL**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A Work Included: This Section of the work shall include, but not be limited to, the following specific items.
1. Fabrication and erection of all rolled structural steel shapes shown on the Drawings and not specifically included under "Miscellaneous Metal".
  2. Furnishing all anchor bolts, plates, angles and other items required to be built into the work of the other trades for connection of the work included under this Section of the Specifications.
  3. Shop painting and field touch-up of all steel work as hereinafter specified.
  4. Shop detailing of all structural steel work included under this Section of Specifications.
- B Related Work:
1. Documents affecting work of this Section including, but are not necessarily limited to General Conditions, Supplementary Conditions, and Sections in Division 01 of these Specifications.
  2. Setting and grouting anchor bolts and leveling plates where applicable for securing structural steel members.
  3. Installation of anchorage items embedded in concrete or masonry.

**1.02 REFERENCE STANDARDS**

- A American Institute of Steel Construction "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings", latest edition.
- B American Welding Society's "Structural Welding Codes" D1.1, latest edition.

**1.03 SUBMITTALS**

- A Mill certificate of compliance with appropriate standard of all structural material.
- B Shop Drawings showing all pertinent information necessary for the fabrication and erection of all structural steel and the location of all anchorage items for structural steel installed in the work of others.
- C Certificate of proficiency for all welders performing work covered by this Section of the Specifications.

**PART 2 - PRODUCTS****2.01 MATERIALS**

Structural steel shall conform to ASTM A992, grade 50 U.N.O. Miscellaneous steel such as plates, channels and angles may be ASTM A36. Steel pipe columns shall conform to ASTM A53, Type E or S. Steel tube (HSS) sections shall conform to ASTM A500, Grade B, Fy = 46 ksi.

- A Bolts: ASTM A325-N and ASTM A307
- B Welding Electrodes: All welding electrodes shall be E70XX or shielded wires with Fy = 70 ksi.
- C Paint: A rust inhibitive primer compatible with any subsequent coating specified.
- D All steel exposed to weather shall be hot-dip galvanized after fabrication or other approved weather proofing methods may be used.
- E All hardware called for shall be Simpson Strong-Tie Co, Inc. and installed per the Manufacturer's Specifications, U.N.O. McNichols Heavy Duty Welded Rectangular Bar Grating or approved equal:
  - a. Hot-dipped Galvanized Steel if exposed to weather.
  - b. Installed per Manufacturer's Specifications

**2.02 FABRICATION**

- A Structural Steel shall be fabricated in a shop suitably manned and equipped for the type of work involved.
- B All structural welding shall be performed by Certified Welders only. All welding will be subject to final inspection at the expense of the Owner. Re-inspection of repairs to defective welds will be performed at the expense of the Contractor.
- C Straightening by methods that will not injure the metal, will be required of all rolled material which is not within the tolerances allowed by ASTM Specifications A-6. All straightening shall be accomplished prior to shipment to the job site.
- D Gas cutting shall be done by machine and all gouge remaining from the cutting shall be removed by grinding. All reentrant corners shall be shaped notch free to a minimum radius of 1/2".
- E All welding shall conform to the American Welding Society specifications. All welding shall be performed by Certified welders approved by the local building authority. All shop welding shall be in an approved fabricators Shop authorized by the local building authority or special inspection per the CBC shall be provided. All field welding shall require special inspection per CBC Section 1704. The technique of welding employed, the appearance and quality of welds made, and the methods used in correcting defective work shall conform to Section 4 - Workmanship, of the Structural Welding Code D1.1, latest edition.
- F Holes for bolts shall be 1/16" larger than the nominal diameter of the bolt. Holes shall be punched, drilled or sub-punched and reamed, depending upon the plate thickness. Gas cut holes will not be permitted.
- G All structural steel except members to be encased in concrete, galvanized or fireproofed shall receive one shop coat of rust-inhibitive paint. Paint used as a primer shall be compatible with the intended finish coatings. Paint shall be applied after inspection and approval and before leaving the shop.
- H Architecturally Exposed Structural Steel:
  - c. Comply with fabrication requirements, of AISC's "Code of Standard Practice for Steel Buildings and Bridges", Chapter 10, as referenced in this section.
  - d. Fabricate and assemble AESS in the shop to the greatest extent possible. Locate field joints in AESS assemblies at concealed locations or as approved by the Architect. Detail AESS assemblies to minimize field handling and expedite erection.
  - e. Fabricate AESS with exposed surfaces smooth, and square. Use special care in handling and shipping of AESS both before and after shop painting.
  - f. In addition to special care used to handle and fabricate AESS, employ the following fabrication techniques.
    - i. Fabrication Tolerance: Fabricate steel to one half the normal tolerance, as specified in the Code of Standard Practice Section 10.
    - ii. Welds ground smooth: Fabricator shall grind welds of AESS smooth. For groove welds, the weld

- shall be made flush to the surfaces each side and be within  $+1/16", -0"$  of plate thickness. Grind butt welds flush.
- iii. Contouring and blending of welds: Where fillet welds are indicated to be ground-contoured, or blended, oversize welds as required and grind to provide a smooth transition.
  - iv. Minimize Weld Show Through: At locations where welding on the far side of an exposed connection occurs, grind distortion and marking of the steel to a smooth profile with adjacent material.
  - v. Coping and Blocking Tolerance: Maintain a uniform gap of  $1/8" \pm 1/32"$  at all copes and blocks.
  - vi. Joint Gap Tolerance: Maintain a uniform gap of  $1/8" \pm 1/32"$ .
  - vii. Piece Marks Hidden: Fabricate such that piece marks are fully hidden in the final structure or made with such media to permit full removal after erection.

### **PART 3 - EXECUTION**

#### **3.01 ERECTION**

- A. Temporary bracing adequate to insure the complete safety of the structure shall be maintained as required. Proper provisions shall be made to take care of loads resulting from erection operation, wind, etc. Bolt-up or welding shall progress as required to provide for all erection stresses.
- B. If embedded items placed by others to receive structural steel are not properly aligned or sufficiently straight to permit steel erection without cutting or fitting, the matter shall be brought to the attention of the Structural Engineer for corrective action prior to erecting steel.
- C. No permanent bolting or welding shall be done until as much of the structure as will be stiffened thereby has been properly aligned. In general, columns shall be plumbed and beams shall be level and at the elevation shown on the Drawings within a tolerance of 1:500.
- D. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.
- E. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
  - a. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
  - b. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
  - c. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
    - i. Comply with manufacturer's instructions for proprietary grout materials.
- F. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- G. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - a. Level and plumb individual members of structure.
  - b. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
- H. Splice members only where indicated.
- I. Do not use thermal cutting during erection.
- J. Finish sections thermally cut during erection equal to a sheared appearance.
- K. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.
- L. Set AESS accurately in locations and to elevations indicated, and according to AISC specifications referenced in this Section. In addition to the special care used to handle and erect AESS, employ the following erection techniques:
  - a. AESS erection tolerances: Erection tolerances shall meet the requirements of Chapter 10 of the AISC Code of Standard Practice.



- b. Welds ground smooth: Erector shall grind welds smooth in the connections of AESS members. For groove welds, the weld shall be made flush to the surfaces of each side and be within + 1/16", -0" of plate thickness. Grind butt welds flush.
- c. Contouring and blending of welds: Where fillet welds are indicated to be ground contoured, or blended, oversize welds as required; grind to provide a smooth transition and to match profile on approved mock-up.
- d. Minimize weld show-through: At locations where welding on the far side of an exposed connection occurs, grind distortion and marking of the steel to a smooth profile with adjacent material.
- e. Bolt head orientation: All bolt heads shall be oriented as indicated on the contract documents. Where bolt-head alignment is specified, the orientation shall be noted for each connection on the erection drawings. Where not noted, the bolt heads in a given connection shall be oriented to one side.
- f. Erection bolt removal: Remove erection bolts on welded AESS; fill holes with plug welds; and grind smooth at exposed surfaces.

### 3.02 FIELD CONNECTIONS

- A. Install and tighten non high-strength bolts, except where high-strength bolts are indicated.
- B. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Install and tighten high-strength bolts according to RCSC's "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
  - a. Bolts: ASTM A 325 (ASTM A 325M) high-strength bolts, unless otherwise indicated.
  - b. Bolts: ASTM A 490 (ASTM A 490M) high-strength bolts, unless otherwise indicated.
  - c. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.
  - d. Connection Type: Slip-critical, direct-tension, or tensioned shear/bearing connections as indicated.
- D. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
  - a. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
  - b. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
  - c. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch (13 mm) and larger. Grind flush butt welds. Dress exposed welds.

### 3.03 FIELD QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.
  - a. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- D. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- E. Field-bolted connections will be tested and inspected according to RCSC's "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
  - a. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.
- F. In addition to visual inspection, field-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.
  - a. Liquid Penetrant Inspection: ASTM E 165.

- b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
  - c. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
  - d. Ultrasonic Inspection: ASTM E 164.
- G. In addition to visual inspection, field-welded shear connectors will be inspected and tested according to requirements of AWS D1.1 for stud welding and as follows:
- a. Bend tests will be performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any shear connector.
  - b. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.

### **3.04 CLEANING AND TOUCH UP PAINTING**

- A. Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
  - a. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils (0.038 mm).
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A 780.

**END OF SECTION**

SECTION 05 5213  
PIPE AND TUBE RAILINGS

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A Free-standing railings at ramp.

**1.02 RELATED REQUIREMENTS**

- A Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B Section 09 9113 - Exterior Painting: Paint finish.

**1.03 REFERENCE STANDARDS**

- A ADA Standards - 2010 ADA Standards for Accessible Design 2010.
- B ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings 2020.
- C ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings 2021.
- D AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2020.
- E AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification 2021.
- F AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2022).

**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.
  - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.
- D Fabricator's Qualification Statement.

**1.05 QUALITY ASSURANCE**

- A Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in Oregon, or personnel under direct supervision of such an engineer.
- B Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.
- C Fabricator Qualifications:
  - 1. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A Handrails and Railings:
  - 1. The Wagner Companies: [www.wagnercompanies.com/#sle](http://www.wagnercompanies.com/#sle).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 RAILINGS - GENERAL REQUIREMENTS**

- A Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of 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 E935
- 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 E935
- D Allow for expansion and contraction of members and building movement without damage to connections or members.

## 2.03 RAILING ASSEMBLIES

- A Surface mounted Grab Railing (at ramp)
  - 1. Dimensions: See drawings for configurations and heights.
    - a. Top Rails: 1-1/2 inches diameter, round.
    - b. Posts: 1-1/2 inches diameter, round.
- B 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.
  - 1. For anchorage to concrete, provide bolting anchors.
  - 2. Posts: Provide adjustable flanged brackets.
- C Provide welding 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.

## 2.04 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.
- 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. 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 Weld connections that cannot be shop welded due to size limitations.
  - 1. Weld in accordance with AWS D1.1/D1.1M.
  - 2. Match shop welding and bolting.
  - 3. Clean welds, bolted connections, and abraded areas.
  - 4. Touch up shop primer and factory-applied finishes.
  - 5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.

## 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.

### 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 Install railings in compliance with ADA Standards for accessible design at applicable locations.
- D Anchor railings securely to structure.
- E Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

### 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

SECTION 05 7000  
DECORATIVE METAL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Railing and guardrail assemblies.
- B Wall-mounted handrails.

1.02 RELATED REQUIREMENTS

- A Section 09 9113-Exterior Painting: Paint finish.

1.03 REFERENCE STANDARDS

- A AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2020.
- B ADA Standards - 2010 ADA Standards for Accessible Design 2010.
- C ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2022.
- D ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- E ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2021.
- F ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing 2021.
- G ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- H ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings 2020.
- I ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
- J ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.
- K ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings 2021.
- L ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2022.
- M AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification 2021.
- N AWS C3.4M/C3.4 - Specification for Torch Brazing 2016.
- O AWS C3.5M/C3.5 - Specification for Induction Brazing 2016, with Amendment (2017).
- P AWS C3.9M/C3.9 - Specification for Resistance Brazing 2020.
- Q AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2022).
- R AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel 2017, with Amendment (2021).

1.04 SUBMITTALS

- A See Section 01 3000 - Administrative Requirements for submittal procedures.
- B Product Data: Submit manufacturer's product data, including description of materials, components, finishes, fabrication details, glass, anchors, and accessories.
- C Shop Drawings: Indicate railing system elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor and joint locations, brazed connections, transitions, and terminations.
- D Test Reports: Submit test reports from an independent testing agency showing compliance with specified design and performance requirements.
- E Manufacturer's Installation Instructions.
- F Manufacturer's qualification statement.
- G Installer's qualification statement.

- H Welders' qualification statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

#### 1.05 QUALITY ASSURANCE

- A Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of documented experience.
- B Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
- C Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.6/D1.6M no more than 12 months before start of scheduled welding work.
- D Templates: Supply installation templates, reinforcing, and required anchorage devices.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A Deliver materials in factory-provided protective coverings and packaging.
- B Protect materials against damage during transit, delivery, storage, and installation at site.
- C Inspect materials upon delivery for damage. Repair damage to be indistinguishable from undamaged areas; if damage cannot be repaired to be indistinguishable from undamaged parts and finishes, replace damaged items.
- D Prior to installation, store materials and components under cover in a dry location.

#### 1.07 FIELD CONDITIONS

- A Do not install railings until project is enclosed and ambient temperature of space is minimum 65 degrees F and maximum 95 degrees F.
- B Maintain ambient temperature of space at minimum 65 degrees F and maximum 95 degrees F for 24 hours before, during, and after railing installation.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A Railing Components:
  - 1. The Wagner Companies; Product Wall bracket: [www.wagnercompanies.com](http://www.wagnercompanies.com).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B Metal Cable Infill:
  - 1. C. R. Laurence Company, Inc; Cable Rail: [www.crl-arch.com](http://www.crl-arch.com).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

#### 2.02 RAILING SYSTEMS

- A Railing Systems - General: Factory- or shop-fabricated in design indicated, to suit specific project conditions, and for proper connection to building structure, and in largest practical sizes for delivery to site.
  - 1. Performance Requirements: Design and fabricate railings and anchorages to resist the following loads without failure, damage, or permanent set; loads do not need to be applied simultaneously.
    - a. Lateral Force: 75 lb minimum, at any point, when tested in accordance with ASTM E935.
    - b. Distributed Load: 50 lb/ft minimum, applied in any direction at the top of the handrail, when tested in accordance with ASTM E935.
    - c. Concentrated Loads on Intermediate Rails: 50 psf, minimum.
    - d. Concentrated Load: 200 lbs minimum, applied in any direction at any point along the handrail system, when tested in accordance with ASTM E935.
    - e. Handrails: Comply with applicable accessibility requirements of ADA Standards.
  - 2. Assembly: Join lengths, seal open ends, and conceal exposed mounting bolts and nuts using slip-on non-weld mechanical fittings, flanges, escutcheons, and wall brackets.
  - 3. Joints: Tightly fitted and secured, machined smooth with hairline seams.
  - 4. Field Connections: Provide sleeves to accommodate site assembly and installation.
  - 5. Welded and Brazed Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
    - a. Ease exposed edges to a small uniform radius.
    - b. Welded Joints:

- 1) Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.
  - 2) Stainless Steel: Perform welding in accordance with AWS D1.6/D1.6M.
- c. Brass/Bronze Brazed Joints:
- 1) Perform torch brazing in accordance with AWS C3.4M/C3.4.
  - 2) Perform induction brazing in accordance with AWS C3.5M/C 3.5.
  - 3) Perform resistance brazing in accordance with AWS C3.9M/C3.9.

## 2.03 RAILING ASSEMBLIES

- A Metal Railing: Engineered, post-supported railing system with metal infill. (at ramp and balcony)
1. Configuration: Guardrail with separate handrail.
  2. Top Rail: 2 inch square tube steel.
  3. Bottom Rail: 2 inch square tube steel. (only at balcony)
  4. Grip Rail: Round, steel, 1-1/2 inch diameter. (only at ramp)
  5. Decorative Flanges for Embedded Posts: Circular, collared cover plate without screw holes.
  6. Handrail Brackets: Same metal as railing. (only at ramp)
  7. Fasteners: Concealed.
  8. Infill at Cable Railings: Stainless steel cable.
    - a. Material: ASTM A666, Type 316. Provide 1x19 construction, threaded terminal factory attached to one end.
    - b. Size: 3/16 inch diameter.
    - c. Coating: Clear PVC.
    - d. Mounting: Mechanically attached to frame.
      - 1) Maximum cable design tension: 400 lbs.
      - 2) Provide stainless steel flat washers, stainless steel washer-nut, stainless steel end caps, and stainless steel Quick-Connect® SS fitting with each assembly.
    - e. Accessories: Stainless steel protector sleeves, rubber grommets, beveled washers and additional accessories as recommended by manufacturer for installation conditions.
  9. End and Intermediate Posts: Same material and size as top rails.
    - a. Horizontal Spacing: As indicated on drawings.
    - b. Mounting: Welded.
- B Wall-Mounted Handrail: (at interior stair)
1. 1-1/2 inch IPS / 1.90 inch OD aluminum, clear anodized finish.
  2. Internal Connection Sleeves: Sleeve, material compatible with handrail and top cap material.
  3. Handrail Brackets: Manufacturer's standard aluminum brackets.
    - a. Mounting: Wall.
    - b. Finish: Clear anodized.
  4. Comply with ADA Standards.

## 2.04 MATERIALS

- A Aluminum Components: ASTM B221 or ASTM B221M.
1. Clear Anodized Finish: Class I, AAMA 611 AA-M12C22A41 Clear anodic coating with electrolytically deposited organic seal; not less than 0.7 mils thick.
- B Steel Components:
1. Tubing: ASTM A501/A501M structural tubing, round and shapes as indicated.
  2. Pipe: ASTM A53/A53M Grade B Schedule 40, black finish.
  3. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

## 2.05 ACCESSORIES

- A Welding Fittings: Factory- or shop-welded from matching pipe or tube; joints and seams ground smooth.
- B Anchors and Fasteners: Provide anchors and other materials 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.

1. For anchorage to concrete, provide inserts to be cast into concrete for bolt anchors.
2. For anchorage to stud walls, provide backing plates for bolt anchors.
3. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

C Carbon Steel Bolts and Nuts: ASTM A307.

D Bituminous Coating: Cold-applied asphalt mastic, noncorrosive compound free of asbestos, sulfur, and other deleterious impurities; 0.015 inch dry film thickness per coat.

E Finish Touch-Up Materials: As recommended by manufacturer for field application.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A Verify that substrate and site conditions are acceptable and ready to receive work.
- B Verify field dimensions of locations and areas to receive work.
- C Notify Architect immediately of conditions that would prevent satisfactory installation.
- D Do not proceed with work until detrimental conditions have been corrected.
- E Furnish components to be installed in other work to installer of that other work, including but not limited to blocking, sleeves, inserts, anchor bolts, embedded plates, and supports for attachment of anchors.

#### 3.02 PREPARATION

- A Review installation drawings before beginning installation. Coordinate diagrams, templates, instructions, and directions for installation of anchorages and fasteners.
- B Clean surfaces to receive units. Remove materials and substances detrimental to the installation.

#### 3.03 INSTALLATION

- A Comply with manufacturer's drawings and written instructions.
- B Install components plumb and level, accurately fitted, free from distortion or defects, and with tight joints, except where necessary for expansion.
- C Anchor securely to structure.
- D Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- E Weld connections that cannot be shop welded due to size limitations.
  1. Weld in accordance with AWS D1.1/D1.1M.
  2. Match shop welding and bolting.
  3. Clean welds, bolted connections, and abraded areas.
  4. Touch up shop primer and factory-applied finishes.
  5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.
- F Isolate dissimilar materials with bituminous coating, bushings, grommets, or washers to prevent electrolytic corrosion.

#### 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.

#### 3.05 PROTECTION

- A Protect installed components and finishes from damage after installation.
- B Repair damage to exposed finishes to be indistinguishable from undamaged areas.
  1. If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.

END OF SECTION



SECTION 06 0120  
MAINTENANCE OF FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Clean, refinish, and restore existing woodwork. The Work includes:
  - 1. Remove existing finishes as indicated.
  - 2. Repair damage; fill holes and losses; replace missing elements.
  - 3. Refinish woodwork where indicated.
- B Present Condition: Locations of existing woodwork are noted on Drawings. The Drawings do not, however, fully describe the condition or extent of damage of each individual wood artifact. Contractor is responsible for field verifying, repairing and refinishing all woodwork to remain or be reinstalled.
- C Contractor to inspect site conditions as well as woodwork held in storage prior to bidding.

1.02 RELATED REQUIREMENTS

- A Section OJ 1000 — Summary: Contractor Use Of Site And Premise, Time restrictions for malodorous work.
- B Section 099123 - Interior Painting.

1.03 REFERENCE STANDARDS

- A ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- B NIOSH 42 C.F.R. pt. 84 - National Institute for occupational Safety and Health; Approval of Respiratory Protective Devices; October 1, 2012.
- C MSHA - Mine Safety and Health Administration, TC23c respirators.

1.04 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.
  - 1. Review requirements and procedures. Include requirements for review of mock-ups and samples. The conference shall include a walk-through of the job site as required.
  - 2. Inspection of Existing Wood Work: During Preinstallation Meeting, or at an alternate Owner agreed time, review and provide recommendations to the Owner on the extent, and level of re-finishing required for all wood work in the project. Incorporate final direction into Refinishing Plan submittal for Owners approve 1.
- B Codes and Standards:
  - 1. Adhere to applicable local, State and Federal laws and requirements.
  - 2. Observe applicable federal and state agency, industry, and manufacturer recommended safety regulations and precautions.

1.05 SUBMITTALS

- A See Section 013000 - Administrative Requirements, for submittal procedures.
- B Coordinate submittals with section 09 9300.
- C Product Data: Provide manufacturer's current product data sheets on all products to be used for the Work.
- D Samples: Samples of replacement wood described in this Section will be required for approval before proceeding with the remainder of the Work. Samples to have specified finish.
- E Refinishing Plan: Provide plans, elevations or other drawings which outline and detail the extent, and of level refinishing required to woodwork for all wood work included in project. Include products used for each area of level of finishing outlined.
- F Shop Drawings: Shop drawings for all newly fabricated wood and for existing elements to be removed and installed, indicating dimensions and details of attachment.
- G Protection Plan: Describe methods for protecting surrounding areas, building occupants, pedestrians, vehicles and surfaces during the work from contact with strippers, stains, coatings, or other potential sources of damage.
- H Statement of Qualifications:
  - 1. List of recently completed projects including project name, location, name of owner and architect and description of work and products used.
  - 2. Certification that contractor/applicator is experienced in the application of the specified products.

- I Documentary Photography: Submit documentary photography complying with requirements stipulated in Section 01 3000.
  - J Schedule of Work: Submit schedule of work, including all required mock-ups and submittals and execution steps.
  - K Mock-up Proposal: Submit detailed proposal for mock-ups indicating locations and physical extent of mock-ups, proposed restoration and cleaning techniques, and proposed products.
  - L Mock-up Documentation Submittals: Contractor shall document, in writing, the procedures used in the preparation of the mockups. This documentation will include the following information:
    - 1. Cleaning, staining and/or refinishing materials used including concentrations, number of applications, surface preparation method, order and duration of applications.
    - 2. Equipment used.
    - 3. Water and/or application pressures used.
    - 4. Accessory materials used.
    - 5. Waste disposal requirements.
    - 6. Photographs: Contractor to photographs documenting "before" and "after" conditions. Provide close-up detail photographs, as well as overall views.
  - M Maintenance Instructions: After the Work is complete, maintenance instructions shall be submitted for the Work covered in this Section. These instructions will include recommended routine cleaning materials, procedures, and schedule, to be carried out by the maintenance staff.
- 1.06 QUALITY ASSURANCE
- A Applicator Qualifications: Company specializing in performing work of the type specified and
    - 1. with minimum ten years of documented experience.
    - 2. Restoration Specialist: Applicator must provide documented experience in comparable woodworking and wood restoration. Employees assigned to the Work must be skilled in the processes and operations indicated.
- 1.07 MOCK-UP
- A Prepare mock-up of repair and refinishing for each type of woodwork indicated.
    - 1. Location and size of mock-ups to be determined by approved mock-up proposal.
    - 2. Mock-ups to demonstrate the full range of work required. Provide multiple mock-ups where necessary to demonstrate the range of work.
    - 3. Mock-ups to test multiple stain colors or finishes, as directed by Architect.
    - 4. Consult with manufacturer's field representative prior to coating mock-up.
    - 5. Photograph before and after conditions and document procedures and products used in accordance with Section 01 3000 - Progress photographs.
    - 6. Completed and approved mock-ups shall serve as the minimum standard by which all subsequent work in this Section will be judged.
      - a. Conformance with mock-ups, however, does not relieve the contractor of the refinishing intent.
    - 7. Ensure that field production matches and blends seamlessly and unobtrusively with existing.
    - 8. Retain and protect approved mock-ups for the duration of the work.
    - 9. Do not begin work until mock-ups are approved by Architect in writing.
- 1.08 DELIVERY, STORAGE, AND HANDLING
- A Deliver materials to site in manufacturer's original, unopened containers and packages with labels clearly identifying product name and manufacturer.
  - B Store containers upright in a cool, dry, well ventilated place, out of the sun. Store away from all other chemicals and potential sources of contamination. Keep lights, fire, sparks, and heat away from containers. Do not drop onto or slide across sharp object. Keep containers tightly closed when not in use. Store and handle materials in accordance with manufacturer's instructions.
- 1.09 JOB CONDITIONS
- A Risks: It should be noted that there are inherent risks and health hazards involved with the use of wood finishing chemicals. It will be the responsibility of the Contractor to ensure that safety precautions are taken, that respirators with chemical cartridge filters meeting NIOSH and MSHA regulations TC23C are worn when appropriate, as well as

solvent resistant gloves and aprons. It shall also be the responsibility of the Contractor to inform all personnel of the risks involved in the work and to make available to them the Material Safety Data Sheets for all products in use, per OSHA regulations.

B Historic Building-Required Care:

1. Building materials and components shall be considered very fragile and must be dismantled, removed, worked-on, and transported, and in general, handled with special care.
2. Damaged historic materials may not be replaceable, and repair and restoration may be required by Architect.
3. Costs of such repair and restoration may be significant and shall be borne by Contractor.
4. Protection of existing materials, surfaces and finishes is of great importance.

1.10 FIELD CONDITIONS

- A Surface and air temperatures must be a minimum of 40 degrees F.
- B Area to be properly ventilated.
- C Protect work area from pedestrians.

PART 2 PRODUCTS

2.01 MATERIALS

- A General: Materials shall conform to the following requirements and shall be new, of the highest grade, free from defects, and of recent manufacture. Alternate materials and procedures are to be used only with the approval of Project Manager and are to match performance sample.
- B Glue: Acceptable glues for the restoration of the woodwork include aliphatic emulsion, casein glue, polyvinyl acetate (PVA) emulsion and synthetic joinery grade glues.
- C Wood Filler: 2 -part polyester or epoxy-resin wood compound with a 10 to 15-minute cure at 70 deg F (21 deg C), in knife grade formulation and recommended by manufacturer for type of wood repair indicated. Compound shall be produced for filling damaged wood materials that have deteriorated due to weathering and exposure. Filler shall be capable of filling deep holes and capable of spreading to featheredge.
- D Stains and Finishes: Provide as specified in Section 09 9300 - Staining and Transparent Finishing.
- E New or Replacement Materials: Missing or reproduced parts and components must be fabricated of dried lumber of correct moisture content. Match wood genus and species with lumber cut in matching grain and pattern for each type of wood artifact.
- F Tools: Tools required include both soft and stiff bristle brushes, copper or steel bristle brushes, medium and fine steel wool, medium and fine sandpaper, syringes, spatulas, screwdrivers, pry bars, respiratory protection masks with chemical cartridges meeting NIOSH and MSHA regulations TC23C, cotton rags, alcohol heat lamp with small burn-in knife, chisels, and solvent proof gloves and other tools as deemed necessary by the Contractor.

PART 3 EXECUTION

3.01 GENERAL

- A Wood elements are old, valuable and inherently fragile. Great care must be exercised throughout all phases of this Work to protect the woodwork, as well as adjacent walls and floors.
- B On-Site Work: Where items of historic nature are to be renovated on-site, work shall be executed in a clean, well-ventilated work area, protected from other areas of the project.
- C Preparation:
  1. Remove all nails, screws, or other protruding objects.
  2. Remove all signs or other extraneous objects. Label and store as directed by Project Manager.
- D Restoration of Wood: All wood work in the room, including doors, need some level of sanding, stain, and varnish. Obtain Owner approval of Refinishing Plan, prior to start of Work.
  1. Restore Wood Trim, Base, Moldings, Shelving with or without glass, Paneling, Bookcases, Cabinets and Other Woodwork.

3.02 TREATMENT PROCESSES

- A Process B -Removal of Previous Finishes and Refinishing:
  1. Remove all finishes and stain from surface by applying chemical stripper, per manufacturer's printed instructions. Remove residue of strippers, varnish, and stain from surface using medium coarse steel wool

and flexible spatula.

2. Neutralize stripped surface with TSP/water mixture using nylon brush.
3. Allow the newly stripped surfaces to dry at least 24 hours before starting the sanding process.
4. Sand all surfaces using 100 grit garnet sandpaper and then 220 grit garnet sandpaper. All sanding shall be done with the grain of the wood. Cross grain sanding is not acceptable. Dust surfaces with a soft bristle brush and then lightly wipe surfaces with a tack cloth.
5. Repair any wood damage per PART 3 "Wood Repair" Article.
6. Brush-on stain with soft bristle brush, allow to dry 30 minutes or as recommended by manufacturer, and then wipe off excess. Follow manufacturer's printed directions.
7. Allow surface to dry thoroughly for 12 hours.
8. Apply the first coat of varnish to surfaces, and allow to dry for 24 hours.
9. Lightly sand varnished surfaces using 220 grit sandpaper, and wipe with a tack cloth.
10. Apply the finish coat of varnish.

### 3.03 REMOVAL OF EXISTING FINISH

- A All exposed surfaces shall be inspected for foreign material such as thick paint, chewing gum or other thick deposits. Any such material shall be removed mechanically.
- B Stripping shall be carried out in a controlled manner. In situ work shall be masked and protected to ensure that adjacent surfaces are not marred or damaged by the treatment of the woodwork.
- C Strippers shall be used in accordance with manufacturer's directions.

### 3.04 WOOD REPAIR

- A Missing areas of wood over 2-inch-square shall be reproduced in the same genus and species as the original, with the grain configuration and direction chosen to blend in discreetly with the surrounding original. These patches shall be glued and nailed, leveled and fine sanded flush. All joints shall be flush, level and smooth. No tool or sandpaper marks left apparent will be acceptable. All nails should be set and heads stopped with wood stopping.
- B Losses, gouges, dents or areas of deterioration under 2 inch in the veneer or solid wood shaft be consolidated and filled. Such fills should be colored and grained to blend into the surrounding wood.
  1. Patch wood using approved consolidant and filler materials in accordance with manufacturer's written instructions.
- C Any loose parts or lifting veneers shall be re-glued with clamps ensuring a flat fault free surface.
- D Reattach door stops or other moldings where loose. Replace where damaged or missing with salvaged wood or new wood to match. The molded profile should match the existing, and the grain should be even and reasonably straight. Machine mounding cutter marks should not be evident, as with good quality joinery work.
- E Fill junctions between base or other moldings and walls.
- F Re-repair prior repairs which do not conform to the standards of this Section.

### 3.05 STAINING AND FINISHING OF WOODWORK

- A General:
  1. Treat woodwork consistently with materials and procedures to ensure a uniform final appearance which matches Architect's performance sample. Any deviation from specified materials or procedures must be approved by Architect.
  2. All materials and procedures used must conform to all pertinent regulations. Identify all applicable regulations and to guarantee that all materials and procedures are in accordance with regulations.
  3. Test materials and procedures called for in specifications to ensure that all necessary steps are taken, that stripping compounds are adequately neutralized, that proper application and drying times are observed, that there are no inherent chemical incompatibilities with the materials called for, and that both the conditions and the procedures are appropriate for completion of Work.
  4. Protect and keep clean all work during the finishing process to guarantee a finish of the highest quality. Only a finish and stain of uniform color and opacity matching the performance sample and a smooth finish free of dust, pinholes, drips or sag marks will be accepted.

5. Wrap with padded brown paper and carefully store all work following the finishing operations. Cover with plastic or brown paper in situ work during other procedures in those spaces to prevent drips, spills or other accidents.

B Procedure:

1. Comply with requirements of Section 09 9300, unless modified with this Section.
2. Surface appearance should be smooth and even. Sanding of surfaces with at least 220 grit garnet paper should be carried out. Any black iron marks should be removed with oxalic acid, followed by neutralizing with Borax, alternatively surfaces may be washed with non- malt vinegar.
3. Grain shall be filled as follows only where larger than 1/16 inch. Thin the paste wood filler as necessary with paint thinner. Apply with a brush, working it into the grain, brushing with the grain.
  - a. Let the filler set up for a few minutes, per manufacturer's instructions, then wipe off the excess, rubbing across the grain. Allow to dry for a least 48 hours. Lightly fine sand before proceeding.
4. Staining:
  - a. Match predominant color of stain in each area. Re-stain adjacent woodwork as necessary to result in a uniform appearance. Submit stain samples for each color condition.
  - b. Either brush, sponge or spray application is acceptable, provided the performance sample is matched. If sprayed, the color must be thinned to achieve the correct concentration of color and the application must be uniform. If brushed, the stain must be thinned appropriately and the excess wiped off at the proper time to guarantee a uniform penetration which matches the performance sample.
  - c. Stain shall be allowed to dry per manufacturer's directions, excess rubbed off and then allowed to dry thoroughly before executing the following procedure.
  - d. For in situ work, all adjacent surfaces must be masked and protected from drips and spills.
5. Prior to finishing, all woodwork shall be protected from grease, oil, or finger marks. A final inspection shall be carried out to verify that all fills are level and smooth surfaces shall be lightly fine sanded and wiped with a solvent to clean them, if necessary.
6. Application of the Finish:
  - a. For in situ work, all adjacent surfaces must be masked and protected from brush marks, spills and runs.
  - b. Personnel to wear solvent resistant gloves and respiratory masks with chemical cartridge filters.
  - c. All work is to be delivered with a smooth finish free of dust marks and scratches.

3.06 REPLACEMENT AND REPRODUCTION OF WOOD ARTIFACTS

- A Replacement or reproduction woodwork to match existing in profile, dimension, wood genus or species, graining, coloring, and finish.
1. Stain or paint new wood as required to match existing.
  2. Fill nail holes and nicks with filler to match wood color.

END OF SECTION

**SECTION 06 10 11  
WOOD FASTENINGS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Includes But Not Limited To:
  1. Quality of wood fastening methods and materials used for Rough Carpentry unless specified otherwise.

**1.02 REFERENCES**

- B. Reference Standards:
  1. ASTM International:
    - a. ASTM F 1667-03, 'Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.'

**1.02 SUBMITTALS**

- C. Action Submittals:
  1. Product Data:
    - a. Manufacturer's literature on framing anchors and powder actuated fasteners.
  2. Shop Drawings:
    - a. Submit diameter and lengths of fasteners proposed for use on Project. If length or diameter of proposed fasteners differ from specified fasteners, also include technical and engineering data for proposed fasteners including, but not limited to:
      - 1) Adjusted fastener spacing where using proposed fasteners and,
      - 2) Adjusted number of fasteners necessary to provide connection capacity equivalent to specified fasteners.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURED UNITS**

- A. Description:
  1. Nail Terminology:
    - a. When following nail terms are used in relation to this Project, following lengths and diameters will be understood. Refer to nails of other dimensions by actual length and diameter, not by one of listed terms:

| Nail Term  | Length       | Diameter   | Length  | Diameter |
|------------|--------------|------------|---------|----------|
| 8d Box     | 2-1/2 inches | 0.113 inch | 63.5 mm | 2.827 mm |
| 8d Common  | 2-1/2 inches | 0.131 inch | 63.5 mm | 3.389 mm |
| 10d Box    | 3 inches     | 0.128 inch | 76.2 mm | 3.251 mm |
| 10d Common | 3 inches     | 0.148 inch | 76.2 mm | 3.759 mm |
| 16d Box    | 3-1/2 inches | 0.135 inch | 88.9 mm | 3.411 mm |
| 16d Sinker | 3-1/4 inches | 0.148 inch | 82.6 mm | 3.759 mm |
| 16d Common | 3-1/2 inches | 0.162 inch | 88.9 mm | 4.115 mm |

- B. Materials:
  1. Fasteners:
    - a. Fasteners in contact with preservative treated and fire treated wood shall be of hot dipped, zinc coated, galvanized steel, silicon, bronze or copper. The coating weights for zinc coated fasteners shall be in accordance with ASTMA 153.
    - b. Nails:
      - 1) Meet requirements of ASTM F 1667.

- 2) Unless noted otherwise, nails listed on Drawings or in Specifications shall be common nail diameter, except 16d nails, which shall be box diameter.
- c. Wood Screws:
  - 1) SDS Screws: SDS Screws by Simpson Strong-Tie Co., Inc., [www.strongtie.com](http://www.strongtie.com).
  - 2) All Other: Standard type and make for job requirements.
2. All Metal Connectors, included but not limited to, Hangers, Post Caps, Post Bases, Straps, Holdowns, etc. shall be Simpson Strong-Tie Co., Inc., [www.strongtie.com](http://www.strongtie.com) or approved equal.
3. Adhesives:
  - a. Construction Mastics: Meet requirements of American Plywood Association Specification AFG-01 September 1974. Use phenol-resorcinol type for use on pressure treated wood products.

### **PART 3 - EXECUTION**

#### **3.01 ERECTION**

- A. Secure one Manufacturer approved fastener in each hole of framing anchor that bears on framing member unless approved otherwise in writing by Architect.
- B. Provide washers with bolt heads and with nuts bearing on wood.

**END OF SECTION**

SECTION 06 1053  
MISCELLANEOUS ROUGH CARPENTRY

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A Non-load bearing interior walls.
- B Non-load bearing wall furring and exterior wall infill framing.
- C Floor underlayment.
- D Preservative treated wood materials.
- E Concealed wood blocking, nailers, and supports.

**1.02 RELATED REQUIREMENTS**

- A Section 06 1011 - Wood Fastening.
- B Section 06 1101 - Wood Framing.
- C Section 06 1636 - Wood Panel Products Sheathing.

**1.03 REFERENCE STANDARDS**

- A ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- B ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- C AWPA U1 - Use Category System: User Specification for Treated Wood 2022.
- D PS 20 - American Softwood Lumber Standard 2021.
- E WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17 2018.
- F WWPAA G-5 - Western Lumber Grading Rules 2021.

**1.04 SUBMITTALS**

- A See Section 01 3000 - Administrative Requirements for submittal procedures.
- B Product Data: Provide technical data on wood preservative materials and application instructions.

**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.

**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 species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
  - 3. Grading Agency: 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.

**2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS**

- A Grading Agency: West Coast Lumber Inspection Bureau; WCLIB (GR).
- B Grading Agency: Western Wood Products Association; WWPAA G-5.
- C Sizes: Nominal sizes as indicated on drawings, S4S.
- D Moisture Content: S-dry or MC19.
- E Stud Framing for sizes 2 by 2 through 2 by 6:
  - 1. Grade: No.1 or better.
- F Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
  - 1. Lumber: S4S, No.2 or Standard Grade.
  - 2. Boards: Standard or No.3.

**2.03 CONSTRUCTION PANELS**

- A Underlayment, For offices: APA Underlayment A-C; plywood, Exposure 2, thickness as indicated on drawings. Fully sanded faces at resilient flooring and carpet.



## 2.04 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. Comply with the requirements of Section 06 1011.

### 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.

## 2.05 FACTORY WOOD TREATMENT

### A Treated Lumber and Plywood: Comply with requirements of AWPA 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 AWPA standards.

### B Preservative Treatment:

1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft retention.
  - 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.
  - e. Treat lumber less than 18 inches above grade.
  - f. Treat lumber in other locations as indicated.

## PART 3 EXECUTION

### 3.01 PREPARATION

#### A 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.

#### D Coordinate the requirements of Section 06 1100.

### 3.03 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 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.

#### C Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

#### D Provide the following specific nonstructural framing and blocking:

1. Cabinets and shelf supports.
2. Grab bars.
3. Wall-mounted door stops.

### 3.04 INSTALLATION OF CONSTRUCTION PANELS

#### A Underlayment: Install without gaps between boards; Secure with screws and glue over existing flooring; Flush out new underlayment with adjacent surfaces; fasteners at maximum 12 inches on center, on edges and into joists in field of board. Refer to finish flooring manufacturers installation requirements prior to installing flooring.

3.05 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.

3.06 CLEANING

- A Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
- B Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

**SECTION 06 11 00  
WOOD FRAMING**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install wood framing and blocking as described in Contract Documents.
- B. Products Installed But Not Furnished Under This Section:
  - 1. Miscellaneous structural steel elements.
  - 2. Structural composite lumber.
- C. Related Requirements:
  - 1. Section 05 12 00: Furnishing of miscellaneous structural steel.

**1.02 REFERENCES**

- D. Reference Standards:

**1.03 ADMINISTRATIVE REQUIREMENTS**

- E. Pre-Installation Conference:
  - 1. Schedule pre-installation conference immediately before beginning framing work.
  - 2. Review items such as:
    - a. Nails & Nailing Requirements
    - b. Connections

**1.04 SUBMITTALS**

- F. Informational Submittals:
  - 1. Test And Evaluation Reports: Technical and engineering data on nails to be set by nailing guns for Architect's approval of types proposed to be used as equivalents to specified hand set nails and adjusted number and spacing of pneumatically-driven nails to provide equivalent connection capacity.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- G. Delivery And Acceptance Requirements:
  - 1. Protect lumber and plywood and keep under cover in transit and at job site.
  - 2. Do not deliver material unduly long before it is required.
- H. Storage And Handling Requirements:
  - 1. Store lumber and plywood on level racks and keep free of ground to avoid warping. Stack to insure proper ventilation and drainage.

**PART 2 - PRODUCTS**

**2.01 SUPPLIERS**

- I. Not Applicable

**1.2 MATERIALS**

- A. Dimension Lumber:
  - 1. Meet requirements of DOC PS 20 and National Grading Rules for softwood dimension lumber.

2. Bear grade stamp of WWPA, SPIB, or other association recognized by American Lumber Standards Committee identifying species of lumber by grade mark or by Certificate of Inspection.
  3. All lumber shall not exceed 19 percent in moisture content at time of fabrication and installation and be stamped 'S-DRY', 'K-D', or 'MC15.'
- B. Posts, Beams, and Timbers 5 inches 125 mm and Larger: Douglas Fir, Larch No. 1 or Better
- C. All Other Framing Members: Douglas Fir, Larch No. 2 Grade or Better
- D. Refer to Sheet S0.1 Division 6 of the Construction Documents for Additional Requirements.

### 1.3 ACCESSORY PRODUCTS

- A. Blocking: Sound lumber without splits, warps, wane, loose knots, or knots larger than 1/2 inch 13 mm.
- B. Furring Strips: Utility or better.

## PART 3 - EXECUTION

### 3.01 INSTALLERS

- A. Installers shall be pre-approved and included in Contract Documents by Addendum.

### 3.02 INSTALLATION

- B. General: Use preservative treated wood for wood members in contact with concrete or masonry, including wall, sill, and ledger plates, door and window subframes and bucks, etc.
- C. Interface With Other Work:
1. Coordinate with other Sections for location of blocking required for installation of equipment and building specialties. Do not allow installation of gypsum board until required blocking is in place.
  2. Where manufactured items are to be installed in framing, provide rough openings of dimensions within tolerances required by manufacturers of such items. Confirm dimensions where not shown on Drawings.

**END OF SECTION**

**SECTION 06 16 36  
WOOD PANEL PRODUCT SHEATHING**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install wood panel product sheathing required for walls, roofs, and floors as described in Contract Documents.

**1.02 ADMINISTRATIVE REQUIREMENTS**

- B. Pre-Installation Conference: Participate in pre-installation conference specified in Section 06 11 00.

**1.03 DELIVERY, STORAGE, AND HANDLING**

- C. Protect sheathing and keep under cover in transit and at job site.
- D. Do not deliver material unduly long before it is required.
- E. Store sheathing on level racks and keep free of ground. Stack to insure proper ventilation and drainage.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURED UNITS**

- A. Performance:
  - 1. Design Criteria:
    - a. All plywood sheathing shall conform to APA DOC PS1 or DOC PS2. All shear plywood shall be C-D, C-C, or approved equal.
- B. Materials:
  - 1. Sheathing:
    - a. Every sheet of sheathing shall be stamped with appropriate APA, TECO, or PFS grade stamp identifying thickness and span rating.
    - b. Sheathing shall not exceed 18 percent moisture content when fabricated or more than 19 percent when installed in Project.
    - c. Sheathing 3/4 inch 19 mm thick and thicker used for single-layer subflooring shall be tongue and groove.
    - d. Sheathing used for same purpose shall be of same thickness. In all cases, thickness specified is minimum required regardless of span rating.
    - e. Minimum sheet size shall be 2'-0" x 4'-0".
    - f. Minimum span ratings for given thicknesses shall be as follows:

| Thickness         |                 | Span Rating |
|-------------------|-----------------|-------------|
| 3/8 inch          | 9.5 mm          | 24 / 0      |
| 15/32 inch actual | 11.9 mm actual  | 32 / 16     |
| 1/2 inch nominal  | 12.5 mm nominal | 32 / 16     |
| 19/32 inch actual | 15.1 mm actual  | 40 / 20     |
| 5/8 inch nominal  | 15.9 mm nominal | 40 / 20     |
| 23/32 inch actual | 18.3 mm actual  | 48 / 24     |
| 3/4 inch nominal  | 19 mm nominal   | 48 24       |

## 2.02 ACCESSORY PRODUCTS

- C. Nails:
1. **3/8 inch 9.5mm** and thicker panels: 10d common or galvanized box.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. General:
1. Top of nail heads shall be flush with sheathing surface.
  2. Use of edge clips to provide spacing between sheathing panels is acceptable.
- B. Wall Sheathing:
1. Spacing: Provide **1/8 inch 3 mm** space between sheets at end and edge joints.
  2. Edge Bearing And Blocking:
    - a. Panel edges shall bear on framing members and butt along their center lines.
    - b. Back block panel edges, which do not bear on framing members, with **2 inch nominal 45 mm** framing.
  3. Size:
    - a. **1/2 inch actual 12.5 mm** minimum thickness.
    - b. Do not install any piece of wall sheathing with shortest dimension of less than **12 inches 300 mm**.
- C. Roof Sheathing:
1. Placing:
    - a. Lay face grain at right angles to supports. Provide blocking for support if framing turns at roof overhang.
    - b. Provide **1/8 inch 3 mm** space between sheets at end and side joints.
    - c. Stagger panel end joints.
    - d. Sheathing shall be continuous of two spans minimum.
  2. Nailing:
    - a. Place nails at least **3/8 inch 9.5 mm** in from edge.
    - b. Nail **12 inches 300 mm** on centers on intermediate supports.
  3. Size:
    - a. **1/2 inch 12.5 mm** actual minimum thickness.
    - b. Do not install any piece of roof sheathing with shortest dimension of less than **24 inches 600 mm** unless support is provided under all edges.

### 3.02 PROTECTION

- D. Protect roof sheathing from moisture until roofing is installed.

**END OF SECTION**

SECTION 06 2000  
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Finish carpentry items.
- B Wood door frames.
- C Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

- A Section 08 8000 - Glazing: Glass shelves..
- B Section 09 9300 - Staining and Transparent Finishing: Staining and transparent finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

- A AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).
- B AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards 2021, with Errata.

1.04 ADMINISTRATIVE REQUIREMENTS

- A Coordinate the work with installation of associated and adjacent components.

1.05 SUBMITTALS

- A See Section 01 3000 - Administrative Requirements for submittal procedures.
- B Product Data:
  - 1. Provide manufacturer's product data, storage and handling instructions for factory-fabricated units.
  - 2. Provide instructions for attachment hardware and finish hardware.
- C Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
  - 1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
  - 2. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
- D Samples: Submit two samples of wood trim 6 inch long.

1.06 QUALITY ASSURANCE

- A Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
  - 1. Company with at least one project within the past 5 years with value of woodwork within 20 percent of cost of woodwork for this project.
  - 2. Single Source Responsibility: Provide and install this work from single fabricator.

1.07 MOCK-UPS

- A Provide mock-up in window bay, full size, illustrating finish and construction, glass and hardware.
- B See Section 01 4000 - Quality Requirements for additional requirements.
- C Locate where directed.
- D Mock-up may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.
- B Protect from moisture damage.
- C Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

- A Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B Interior Woodwork Items:
  - 1. Door frame: Hardwood lumber; prepare for stained finish.
  - 2. Replacment Ceiling Molding Trim: Hardwood; Profile matching existing profile; prepare for transparent finish to match adjacent color.

3. Replacement for damaged existing trim: Hardwood; Sized to match damaged replacement; prepare for transparent finish to match adjacent color.

## 2.02 LUMBER MATERIALS

- A Contractor shall use their experience and best industry practice to determine the substance of existing materials and provide matching materials where indicated on drawings. Where the contractor has provided evidence that they are unable to determine existing materials, the following materials in this section shall be used.
- B Hardwood Lumber: White Oak or Birch species, Plain sawn, maximum moisture content of 6 to 12 percent ; with flat grain , of quality suitable for transparent finish.

## 2.03 FASTENINGS

- A Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.
- B Fasteners: Of size and type to suit application; Finish nails or self-tapping bugle head steel screws finish in concealed locations and hot-dipped galvanized finish in exposed locations.

## 2.04 ACCESSORIES

- A Adhesive: Type recommended by fabricator to suit application.
- B Glass shelf: Type G-15, see Section 08 8000.
- C Wood Filler: Solvent base, tinted to match surface finish color.

## 2.05 HARDWARE

- A Adjustable Display Standards and Brackets: adjustable storage system consisting of compatible steel parts including wall mounted standards, shelf support brackets, plus accessories required for a complete, functional storage system
  1. Adjustable Wall Standard: 7/8 inch wide by 11/16 inch deep channel and designed for surface mounting; Modular.
    - a. Model CRL KB Adjustable Heavy-Duty steel Standards; Lengths as detailed on drawings
  2. Steel shelf Bracket: Designed to fit standards; Non-lipped at end for supporting shelves at sides; Length: 8 inches.

## 2.06 SITE FINISHING MATERIALS

- A Stain, Shellac, Varnish, and Finishing Materials: Comply with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B Field Finishing: See Section 09 9123.

## 2.07 FABRICATION

- A Shop assemble work for delivery to site, permitting passage through building openings.
- B When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

## 2.08 SHOP FINISHING

- A Sand work smooth and set exposed nails and screws.
- B Apply wood filler in exposed nail and screw indentations.
- C On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.
- D Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
  1. Transparent:
    - a. Stain: Refer to Section 09 9123.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A Verify adequacy of backing and support framing.

### 3.02 INSTALLATION

- A Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B Set and secure materials and components in place, plumb and level.



- C Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

- A Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

3.04 TOLERANCES

- A Maximum Variation from True Position: 1/16 inch.
- B Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 4100  
ARCHITECTURAL WOOD CASEWORK

## PART 1 GENERAL

## 1.01 RELATED REQUIREMENTS

- A Section 12 3600 - Countertops.

## 1.02 REFERENCE STANDARDS

- A ANSI A208.1 - American National Standard for Particleboard 2022.
- B AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).
- C AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards 2021, with Errata.
- D BHMA A156.9 - Cabinet Hardware 2020.
- E NEMA LD 3 - High-Pressure Decorative Laminates 2005.

## 1.03 ADMINISTRATIVE REQUIREMENTS

- A Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

## 1.04 SUBMITTALS

- A See Section 01 3000 - Administrative Requirements for submittal procedures.
- B Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
  - 1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
  - 2. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
- C Product Data: Provide data for hardware accessories.
- D Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.
- E Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

## 1.05 QUALITY ASSURANCE

- A Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
  - 1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
  - 2. Single Source Responsibility: Provide and install this work from single fabricator.

## 1.06 MOCK-UPS

- A Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.
- B See Section 01 4000 - Quality Requirements for additional requirements.
- C Locate where directed.
- D Mock-up may remain as part of the work.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A Protect units from moisture damage.

## 1.08 FIELD CONDITIONS

- A During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

## PART 2 PRODUCTS

## 2.01 CABINETS

- A Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B Plastic Laminate Faced Cabinets: Custom grade.
- C Cabinets at all locations:
  - 1. Finish - Exposed Exterior Surfaces: Decorative laminate.
    - a. HPDL; Specific types as listed.

2. Finish - Exposed Interior Surfaces: Decorative laminate.
    - a. HPDL; Specific types as listed.
  3. Finish - Semi-Exposed Surfaces: Decorative laminate
    - a. Back of doors & back of drawer faces: HPDL, CLS.
    - b. All other locations: LPDL.
  4. Finish - Concealed Surfaces: Manufacturer's option.
  5. Casework Construction Type: Type A - Frameless.
  6. Interface Style for Cabinet and Door: Style 1 - Overlay; flush overlay.
  7. Cabinet Design Series: As indicated on drawings.
  8. Adjustable Shelf Loading: 40 psf.
    - a. Deflection: L/144.
  9. Cabinet Style: Flush overlay.
  10. Cabinet Doors and Drawer Fronts: Flush style.
  11. Drawer Side Construction: Manufacturer's option.
  12. Drawer Construction Technique: As recommended by fabricator.
  13. Baseboards/Toe Kicks: Same as cabinets, except:
    - a. Wet areas/laboratory use: Wood materials within 2 inch of the finish floor to be constructed of solid lumber, exterior plywood, or exterior particleboard.
- 2.02 WOOD-BASED COMPONENTS
- A Wood fabricated from old growth timber is not permitted.
  - B All wood materials shall be manufactured with low, no urea-formaldehyde content.
- 2.03 PANEL CORE MATERIALS
- A Particleboard: Composite panel composed of cellulosic particles, additives, and bonding system; comply with ANSI A208.1.
    1. Grade: M-2; moisture resistance: MR10.
    2. Panel Thickness: 3/4 inch.
- 2.04 THERMALLY FUSED LAMINATE PANELS
- A Thermally Fused Laminate (TFL): Melamine- or polyester-resin-saturated decorative papers; for fusion to composite wood substrates under heat and pressure.
    1. Test in accordance with NEMA LD 3 Section 3.
    2. Panel Core Substrate: Particleboard.
    3. Color: White.
    4. Products:
      - a. Roseburg Forest Products; Thermally Fused Laminate: [www.roseburg.com/#sle](http://www.roseburg.com/#sle).
      - b. Wilsonart LLC; Thermally Fused Laminate Panels: [www.wilsonart.com/#sle](http://www.wilsonart.com/#sle).
      - c. Substitutions: See Section 01 6000 - Product Requirements.
- 2.05 LAMINATE MATERIALS
- A Manufacturers:
    1. Abet Laminati: [www.abetlaminati.com](http://www.abetlaminati.com).
    2. Formica Corporation: [www.formica.com/#sle](http://www.formica.com/#sle).
    3. Lamin-Art, Inc: [www.laminart.com](http://www.laminart.com).
    4. Panolam Industries International, Inc: [www.panolam.com/#sle](http://www.panolam.com/#sle).
    5. Wilsonart LLC: [www.wilsonart.com/#sle](http://www.wilsonart.com/#sle).
    6. Substitutions: See Section 01 6000 - Product Requirements.
  - B Provide specific types as indicated.
    1. PLAM-1 Vertical Surfaces: VGS, 0.028 inch nominal thickness, colors as indicated, finish as indicated.
    2. Cabinet Liner: CLS, 0.020 inch nominal thickness, through color, White color, finish as indicated.

3. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.
- 2.06 COUNTERTOPS
- A Countertops: See Section 12 3600.
- 2.07 ACCESSORIES
- A Adhesive: Type recommended by fabricator to suit application.
  - B Plastic Edge Banding: Extruded PVC, flat 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 all exposed plywood edges.
    3. Use at all exposed shelf edges.
    4. Use at Door and drawer edges, bottoms.
  - C Fasteners: Size and type to suit application.
  - D 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.
  - E Concealed Joint Fasteners: Threaded steel.
- 2.08 HARDWARE
- A Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
  - B Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch spacing adjustments.
    1. Product: Vogt 345 NP manufactured by Knape and Vogt.  
or
    2. Product: #72511 manufactured by US Futaba.
  - C Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers.
    1. Product: #4676.150 manufactured by Baldwin.  
or
    2. Product: #613x-2sc-p manufactured by Berenson
  - D Drawer Slides:
    1. Type: Full extension.
    2. Static Load Capacity: As scheduled.
    3. Mounting: Side mounted.
    4. Manufacturers:
      - a. Basis of Design: Accuride International, Inc; [\_\_\_\_\_]: [www accuride.com/#sle](http://www accuride.com/#sle).
      - b. Blum, Inc: [www.blum.com/#sle](http://www.blum.com/#sle).
      - c. Hettich America, LP: [www.hettich.com/#sle](http://www.hettich.com/#sle).
      - d. Knape & Vogt Manufacturing Company: [www.knapeandvogt.com/#sle](http://www.knapeandvogt.com/#sle).
      - e. Substitutions: See Section 01 6000 - Product Requirements.
  - E Hinges: European style concealed self-closing type, steel with nickel-plated finish.
    1. Manufacturers:
      - a. Blum, Inc; Clip top Item # 70T5550, TL: [www.blum.com/#sle](http://www.blum.com/#sle).
- 2.09 FABRICATION
- A Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
  - B Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
  - C Sub-top: Provide on all casework base cabinets
    1. Exception: At base cabinets with sinks or plumbing fixtures requiring removal of the majority of the countertop, the sub-top may be replaced with full length 3-1/2 inch (minimum) wide stretchers, made from sub-top

material, at front and back of the cabinet. Stretchers may run front to back at sinks.

- D Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- E Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A Verify adequacy of backing and support framing.
- B Verify location and sizes of utility rough-in associated with work of this section.

#### 3.02 INSTALLATION

- A Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C Use fixture attachments in concealed locations for wall mounted components.
- D Use concealed joint fasteners to align and secure adjoining cabinet units.
- E Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- F Secure cabinets to floor using appropriate angles and anchorages.
- G Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

#### 3.03 ADJUSTING

- A Adjust installed work.
- B Adjust moving or operating parts to function smoothly and correctly.

#### 3.04 CLEANING

- A Clean casework, counters, shelves, hardware, fittings, and fixtures.

#### 3.05 SCHEDULES

- A Adjustable Shelf Supports: four per shelf .
- B Pulls: Two required for drawers over 36 inches wide; one per door leaf.
- C Drawer Slides:
  - 1. Drawers 10 inches high and less - Medium Duty Slide 3832, full extension, up to 100 lb. rated
  - 2. Drawers over 10 inches high - Heavy Duty Slide 4034, 3/4 extension, 150 lb. rated.

END OF SECTION

SECTION 06 8316  
FIBERGLASS REINFORCED PANELING

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A Fiberglass reinforced plastic panels.

## 1.02 REFERENCE STANDARDS

- A ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels 2022.
- B ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.

## 1.03 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 Samples: Submit two samples 3 by 3 inch in size illustrating material and surface design of panels.

## 1.04 DELIVERY, STORAGE, AND HANDLING

- A Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

## 1.05 FIELD CONDITIONS

- A Environmental Limitations: Building are to be fully enclosed prior to installation with sufficient heat (70°) and ventilation consistent with good working conditions for finish work.
- B During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.
  - 1. Provide ventilation to disperse fumes during application of adhesive as recommended by the adhesive manufacturer.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A Fiberglass Reinforced Plastic Panels:
  - 1. Marlite, Inc; Standard: [www.marlite.com/#sle](http://www.marlite.com/#sle).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

## 2.02 PANEL SYSTEMS

- A Wall Panels:
  - 1. Panel Size: 4 feet by 8, 9 or 10 feet long, as required to conceal seams..
  - 2. Panel Thickness: 0.09 inch.
  - 3. Surface Design: Embossed.
  - 4. Color: White.
  - 5. Attachment Method: Adhesive only, sealant joints, no trim.

## 2.03 MATERIALS

- A Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
  - 1. Surface Burning Characteristics: Maximum flame spread index of 200 and smoke developed index of 450; when system tested in accordance with ASTM E84.
  - 2. Scratch Resistance: Barcol hardness score greater than 35, when tested in accordance with ASTM D2583.
  - 3. Impact Strength: Greater than 72 ft lb force per inch, when tested in accordance with ASTM D256.
  - 4. Surface Characteristics and Cleanability: Provide products that are smooth, durable, and easily cleanable, in compliance with FDA Food Code, Chapter 6 - Physical Facilities.
- B Adhesive: Type recommended by panel manufacturer.
- C Sealant: Type recommended by panel manufacturer; white.

## PART 3 EXECUTION

## 3.01 EXAMINATION

- A Verify existing conditions and substrate flatness before starting work.

B Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

A Install panels in accordance with manufacturer's instructions.

B Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

D Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

E Install panels with manufacturer's recommended gap for panel field and corner joints.

F Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

G Remove excess sealant after paneling is installed and prior to curing.

3.03 CLEANING

A Remove excess sealant from panels and moldings. Wipe panel down using a damp cloth and mild soap solution or cleaner.

B Refer to manufacturer's specific cleaning recommendations Do not use abrasive cleaners

END OF SECTION

SECTION 07 0500  
COMMON WORK RESULTS FOR THERMAL AND MOISTURE PROTECTION

## PART 1 GENERAL

## 1.01 GENERAL REQUIREMENTS

- A All building envelope design shall be as per Oregon OSSC Building Code requirements.
  - 1. Vapor barriers are required in all buildings and they shall be located on the warm side of insulation
  - 2. Sealing of the building envelope.
    - a. Openings and penetrations in the building envelope are sealed with caulking materials or closed with gasketing systems compatible with the construction materials and location.
    - b. Joints and seams are sealed in the same manner or taped or covered with a moisture vapor-permeable wrapping material.
    - c. Sealing materials spanning joints between construction materials allow for expansion and contraction of the construction materials.
- B Coordinate with Common Work Results for Openings.

## PART 2 PRODUCTS

## 2.01 INSULATION PRODUCTS

- A Product Rating.
  - 1. Determine thermal resistance (R-value) of insulation in accordance with the U.S. FTC R-value rule.

## PART 3 EXECUTION

## 3.01 SPECIAL EXECUTION REQUIREMENTS

- A Building thermal envelope insulation
  - 1. Manufacturer shall apply R-value identification marks to each piece of insulation 12 inches or greater in width.
    - a. Alternately: Insulation installers shall provide a signed, dated and posted certification listing the type, manufacturer and R-value of insulation installed.
  - 2. Refer to code section for blown or sprayed insulation installation/settling depths and marker requirements.
  - 3. Installation
    - a. Install insulating materials to expose manufacturer's R-value mark for inspection.
    - b. Install all material, systems and equipment in accordance with the manufacturer's installation instructions and the International Building Code.

END OF SECTION



SECTION 07 1400  
FLUID-APPLIED WATERPROOFING

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A Modified-polymer elastomeric waterproofing.

## 1.02 REFERENCE STANDARDS

- A ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer 2015 (Reapproved 2022).
- B ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension 2016 (Reapproved 2021).
- C ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a.
- D NRCA (WM) - The NRCA Waterproofing Manual 2021.

## 1.03 SUBMITTALS

- A See Section 01 3000 - Administrative Requirements for submittal procedures.
- B Product Data: Provide data for membrane, surface conditioner, flexible flashings, joint cover sheet, and joint and crack sealants.
- C Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and acceptable installation temperatures.
- E Installer's qualification statement.
- F Warranty Documentation:
  - 1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

## 1.04 QUALITY ASSURANCE

- A Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

## 1.05 FIELD CONDITIONS

- A Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until cured.

## 1.06 WARRANTY

- A See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B Installer Warranty: Provide 2-year warranty for waterproofing failing to resist penetration of water commencing on Date of Substantial Completion. Complete forms in Owner's name and register with installer.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A Modified-Polymer Elastomeric Waterproofing:
  - 1. Henry Company; Henry CM100: [www.henry.com/#sle](http://www.henry.com/#sle).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

## 2.02 FLUID-APPLIED WATERPROOFING MATERIALS

- A Modified-Polymer Elastomeric Waterproofing:
  - 1. Cured Thickness: 60 mil, 0.060 inch, minimum.
  - 2. Suitable for installation over concrete substrates. Provide High-build reinforced systems, two coats and products required for vertical application.
  - 3. Ultimate Elongation: 575 percent, minimum, measured in accordance with ASTM D412.
  - 4. Hardness: 60, minimum, measured in accordance with ASTM C661, using Type 00 durometer.

5. Water Vapor Permeance: 0.05 perm, maximum, measured in accordance with ASTM E96/E96M, Procedure A.
6. Products:
  - a. Henry Company; Henry CM100: [www.henry.com/#sle](http://www.henry.com/#sle).
  - b. Substitutions: See Section 01 6000 - Product Requirements.

### 2.03 ACCESSORIES

- A Sealant for Joints and Cracks in Substrate: Type compatible with waterproofing material and as recommended by waterproofing manufacturer.
- B Reinforcing Fabric for Between Liquid Applied Membranes (LAM): Polyester fabric, unsaturated spun bond and nonwoven, used as reinforcement between LAM waterproofing systems.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A Verify existing conditions before starting work.
- B Verify substrate surfaces are free of frozen matter, dampness, loose particles, cracks, pits, projections, penetrations, or foreign matter detrimental to adhesion or application of waterproofing system.
- C Verify that substrate surfaces are smooth, free of honeycomb or pitting, and not detrimental to full contact bond of waterproofing materials.
- D Verify that items penetrating surfaces to receive waterproofing are securely installed.
- E Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions.
- F Do not proceed with this work until unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A Protect adjacent surfaces from damage not designated to receive waterproofing.
- B Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.
- C Do not apply waterproofing to surfaces unacceptable to waterproofing manufacturer.
- D Fill non-moving joints and cracks with a filler compatible with waterproofing materials.
- E Seal moving cracks with sealant and non-rigid filler, using procedures recommended by sealant and waterproofing manufacturers.

### 3.03 INSTALLATION

- A Install waterproofing to specified minimum thickness in accordance with manufacturers instructions and NRCA (WM) applicable requirements.
- B Seal membrane and flashings to adjoining surfaces.

### 3.04 PROTECTION

- A Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

SECTION 07 2100  
THERMAL INSULATION

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A Batt insulation and vapor retarder in exterior wall construction.
- B Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

## 1.02 REFERENCE STANDARDS

- A ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
- B ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C 2022.

## 1.03 SUBMITTALS

- A See Section 01 3000 - Administrative Requirements for submittal procedures.
- B Product Data: Provide data on product characteristics, performance criteria, and product limitations.

## 1.04 FIELD CONDITIONS

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

## PART 2 PRODUCTS

## 2.01 APPLICATIONS

- A Insulation in Wood Framed Walls: Batt insulation with integral vapor retarder.

## 2.02 MINERAL FIBER BLANKET INSULATION MATERIALS

- A Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
  - 1. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
  - 2. Formaldehyde Content: Zero.
  - 3. Thermal Resistance: R-value of 19.
  - 4. Thickness: 6.5 inch.
  - 5. Facing: Asphalt treated Kraft paper, one side.
  - 6. Products:
    - 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: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
    - d. Substitutions: See Section 01 6000 - Product Requirements.

## 2.03 ACCESSORIES

- A 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.

## PART 3 EXECUTION

## 3.01 BATT INSTALLATION

- A Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B Install in exterior wall 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 Staple or nail facing flanges in place at maximum 6 inches on center.
- F 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 face of member.
- G Tape seal tears or cuts in vapor retarder.

- H 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.

END OF SECTION

SECTION 08 0500  
COMMON WORK RESULTS FOR OPENINGS

## PART 1 GENERAL

## 1.01 GENERAL REQUIREMENTS

- A All building envelope design shall be as per Oregon OSSC Building Code requirements, and ASHRAE Standard 90.1-2016.
- B Weather and Vapor barriers are shall be coordinated with openings,

## PART 2 PRODUCTS

## 2.01 WINDOW AND DOOR ASSEMBLIES.

- A Air leakage for fenestration and doors shall be determined in accordance with AAMA/WDMA/CSA 101/I.S.2/A440, NFRC 400, or ASTM E283 as specified below. Air leakage shall be determined by a laboratory accredited by a nationally recognized accreditation organization, such as the National Fenestration Rating Council, and shall be labeled and certified by the manufacturer.
- B U-Factors, Solar Heat Gain Coefficient (SHGC)
  - 1. U-factors shall be determined in accordance with NFRC 100.
  - 2. All fenestration with U-factors, SHGC, or visible transmittance determined, certified, and labeled in accordance with NFRC 100, 200, and 300, respectively, shall be assigned those values.

## PART 3 EXECUTION

## 3.01 SPECIAL EXECUTION REQUIREMENTS

- A Labeling
  - 1. All manufactured and site-built fenestration and door products shall be labeled, or a signed and dated certificate shall be provided, by the manufacturer, listing the U-factor, SHGC, VT, and air leakage rate.
  - 2. Do not remove the temporary label affixed to the fenestration products prior to inspection.

END OF SECTION

SECTION 08 1213  
HOLLOW METAL SLIP-ON FRAMES

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A Non-fire-rated hollow metal frames for non-hollow metal doors.

## 1.02 RELATED REQUIREMENTS

- A Section 08 1433 - Stile and Rail Wood Doors: Non-hollow metal door for hollow metal frames.
- B Section 08 7100 - Door Hardware: Hardware.

## 1.03 REFERENCE STANDARDS

- A ADA Standards - 2010 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 2019.
- C ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames 2020.
- D ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.
- E ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2020.
- F ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- G ASTM A879/A879M - Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface 2022.
- H ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable 2021a.
- I 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 2018a.
- J BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames 2016.
- K ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
- L NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames 2002.
- M NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames 2011.
- N NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames 2017.
- O NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames 2014.
- P SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames 2019.

## 1.04 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 grade standard.
- C Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
- D Samples: Submit one sample of frame metal, 2 by 2 inches, showing factory finishes, colors, and surface textures.
- E Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- F Manufacturer's qualification statement.
- G Installer's qualification statement.

## 1.05 QUALITY ASSURANCE

- A Manufacturer Qualifications: Provide hollow metal frames from SDI Certified manufacturer: <https://steeldoor.org/sdi-certified/#sle>.
- B Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

### 1.06 DELIVERY, STORAGE, AND HANDLING

- A Store in accordance with applicable requirements and in compliance with standards and/or custom guidelines as indicated.
- B Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A Hollow Metal Frames with Applied Casings, Prefinished:
  - 1. Rediframe Door Frames; PF Series; (18 ga) Kerfed Fixed Throat: [www.dunbarton.com](http://www.dunbarton.com)..
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

### 2.02 PERFORMANCE REQUIREMENTS

- A Refer to Door and Frame Schedule on drawings for frame sizes, fire ratings, sound ratings, finishing, door hardware to be installed, and other variations, if any.
- B Door Frame Type: Provide hollow metal door frames with applied casings.
- C 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.
- D Accessibility: Comply with ICC A117.1 and ADA Standards.
- E 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 frame that is also indicated as being sound-rated must comply with the requirements specified for exterior frames and for sound-rated frames; where two requirements conflict, comply with the most stringent.
- F Hardware Preparations, Selections and Locations: Comply with BHMA A156.115, NAAMM HMMA 830, NAAMM HMMA 831 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

### 2.03 HOLLOW METAL DOOR FRAMES WITH APPLIED CASINGS

- A Frame Type: Knockdown, slip-on drywall frames; separate jambs and head with separate snap-on casings both sides; factory-applied finish on exposed surfaces.
  - 1. Frame Material: Cold-rolled steel complying with ASTM A1008/A1008M.
  - 2. Casing Material: Extruded aluminum.
  - 3. Casing Profile: Square corner.
    - a. RediFrame "Aluminum" commercial style
  - 4. Finish: Factory-applied baked enamel finish, or electrostatically applied water-based paint.
- B Interior Door Frames, Non-Fire-Rated:
  - 1. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.
  - 2. Frames in Wet Areas: Electro-galvanize components prior to finishing in accordance with ASTM A879/A879M, with manufacturer's standard coating thickness.

### 2.04 FINISHES

- A Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B Factory Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.
  - 1. Color: To be selected by Architect from manufacturer's custom range.

### 2.05 ACCESSORIES

- A 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.
- B Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

## 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 frames in accordance with manufacturer's instructions and related requirements of specified frame standards or custom guidelines indicated.
- B Install prefinished frames after painting and wall finishes are complete.
- C Coordinate frame anchor placement with wall construction.
- D Install door hardware as specified in Section 08 7100.
  - 1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.
- E 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 edges, crossed corner to corner.

END OF SECTION



SECTION 08 1416  
FLUSH WOOD DOORS

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A Type DR-1: Flush wood doors; flush configuration; non-rated.

**1.02 RELATED REQUIREMENTS**

- A Section 08 7100 - Door Hardware.
- B Section 08 7129 - Sliding and Folding Door Hardware.

**1.03 REFERENCE STANDARDS**

- A AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).
- B AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards 2021, with Errata.

**1.04 SUBMITTALS**

- A See Section 01 3000 - Administrative Requirements for submittal procedures.
- B Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
- D Samples: Submit two samples of door veneer, 2 by 2 inches in size illustrating wood grain, stain color, and sheen.
- E Manufacturer's qualification statement.
- F Installer's qualification statement.
- G Warranty, executed in Owner's name.

**1.05 QUALITY ASSURANCE**

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

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A Package, deliver and store doors in accordance with specified quality standard.
- B Accept doors on site in manufacturer's packaging, and inspect for damage.
- C Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

**1.07 WARRANTY**

- A See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.
  - 1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A Wood Veneer Faced Doors:
  - 1. Masonite Architectural; Aspiro Select Wood Veneer Doors: [www.architectural.masonite.com/#sle](http://www.architectural.masonite.com/#sle).
  - 2. VT Industries, Inc: [www.vtindustries.com/#sle](http://www.vtindustries.com/#sle).
  - 3. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 DOORS**

- A Doors: See drawings for locations and additional requirements.
  - 1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
  - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.

1. Provide solid core doors at each location.
  2. Wood veneer facing with factory transparent finish as indicated on drawings.
- 2.03 DOOR AND PANEL CORES
- A Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.
- 2.04 DOOR FACINGS
- A Veneer Facing for Transparent Finish: Natural birch, veneer grade in accordance with quality standard indicated, Cut of veneer to match existing door panels, with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
- 2.05 DOOR CONSTRUCTION
- A Fabricate doors in accordance with door quality standard specified.
- B Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- C Provide edge clearances in accordance with the quality standard specified.
- 2.06 FINISHES - WOOD VENEER DOORS
- A Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
1. Transparent:
    - a. System - 9, UV Curable, Acrylated Epoxy, Polyester or Urethane.
    - b. Stain: As indicated on drawings, or match existing stain color
    - c. Sheen: Satin.
- 2.07 ACCESSORIES
- A Sliding Wood Door systems: See Section 08 7129.
- PART 3 EXECUTION
- 3.01 EXAMINATION
- A Verify existing conditions before starting work.
- B Verify that opening sizes and tolerances are acceptable.
- C Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.
- 3.02 INSTALLATION
- A Install doors in accordance with manufacturer's instructions and specified quality standard.
- B Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C Use machine tools to cut or drill for hardware.
- D Coordinate installation of doors with installation of frames and hardware.
- 3.03 TOLERANCES
- A Comply with specified quality standard for fit and clearance tolerances.
- B Comply with specified quality standard for telegraphing, warp, and squareness.
- 3.04 ADJUSTING
- A Adjust doors for smooth and balanced door movement.
- B Adjust closers for full closure.
- 3.05 SCHEDULE - SEE DRAWINGS

END OF SECTION

SECTION 08 1423  
CLAD WOOD DOORS

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A DR-2, DR-4 Clad wood doors with integral frames.

**1.02 RELATED REQUIREMENTS**

- A Section 08 7100 - Door Hardware.
- B Section 08 8000 - Glazing: Glazing product and performance requirements.
- C Section 09 9300 - Staining and Transparent Finishing: Field finishing of doors.

**1.03 REFERENCE STANDARDS**

- A AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights 2017.
- B AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2020.
- C ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.
- D WDMA I.S. 4 - Industry Specification for Preservative Treatment for Millwork 2019.

**1.04 SUBMITTALS**

- A See Section 01 3000 - Administrative Requirements for submittal procedures.
- B Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
- D Performance Validation: Submit certified label or test report on products as indicated under performance requirements to validate product compliance.
- E Manufacturer's Installation Instructions: Indicate special installation instructions.
- F Manufacturer's qualification statement.
- G Installer's qualification statement.
- H Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- I Specimen warranty.

**1.05 QUALITY ASSURANCE**

- A Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A Package, deliver and store doors in accordance with specified quality standard.
- B Accept doors on site in manufacturer's packaging. Inspect for damage.
- C Protect doors with resilient packaging. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

**1.07 WARRANTY**

- A See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A Wood Doors with Exterior Aluminum Cladding and Interior Wood Facing:
  - 1. Andersen Windows, Inc; E Series: [www.andersenwindows.com/#sle](http://www.andersenwindows.com/#sle).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

## 2.02 COMPONENTS

- A Clad Wood Doors: See drawings for locations and additional requirements.
- B Stile and Rail Clad Wood Doors: Stile and rail wood doors, laminated veneer lumber (LVL) construction with wood veneer, kiln dried and suitable for interior finish as indicated.
  - 1. Provide mortise and tenon joints at each corner with lag screw reinforcement.
- C Exterior Clad Wood Doors: Water-repellent and preservative-treated lumber in accordance with WDMA I.S. 4.
  - 1. Thickness: 1-3/4 inches, unless otherwise indicated.
  - 2. Exterior Door Cladding: Aluminum sheet as indicated.
  - 3. Exterior Frame Cladding: Extruded aluminum as indicated.
  - 4. DR-2 Interior Wood Facing, Transparent: Wood veneer for field finish as indicated on drawings.
  - 5. DR-4 Interior Wood Facing, Opaque: Wood veneer with factory finish as indicated.
- D Configuration: Single rectangular doors.
- E Glazing: Double glazed, clear, high performance Low-E coated, manufacturer's standard gas filled, fully tempered, with glass thicknesses as recommended by manufacturer for specified wind conditions.
  - 1. Fully Tempered Glass: ASTM C1048, Kind FT - Fully Tempered.
  - 2. Outboard Lite: Clear glass.
  - 3. Inboard Lite: Clear glass.
  - 4. High Performance Low-E Coating: Magnetron sputtering vapor deposition (MSVD) titanium dioxide (TiO<sub>2</sub>) coating, applied to No. 2 surface.
- F Glass and Glazing Materials: Type IG-1; See Section 08 8000 for additional requirements.
- G Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.
  - 1. Apply silicone glazing sealant to exterior glazing stops as recommended by manufacturer.
  - 2. Apply water repellent treatment to wood glazing stops.
- H Door Stops: Clear preservative treated wood, finished to match frame.
- I Door Hardware: Manufacturer's standard.
  - 1. Hardware color:
    - a. DR-2 Bright Brass.
    - b. DR-4 Satin Nickel.
  - 2. See Section 08 7100 for balance of hardware not provided by door manufacturer.

## 2.03 DOOR INTERIOR WOOD FACINGS

- A Veneer Facing for Transparent Finish: White Oak, veneer grade in accordance with requirements indicated, and plain sliced (flat cut), with book match between leaves of veneer, and running match of spliced veneer leaves assembled on door or panel face.
- B Door Edging: Any option allowed by quality standard for grade.
- C Wood Finish: Factory UN-finished for field finish transparent finish.
  - 1. Field finish doors, see Section 09 9123.
- D Facing Adhesive: Type I - waterproof.

## 2.04 DOOR EXTERIOR CLADDING

- A Aluminum Cladding: 6063-T5 aluminum cladding on exterior side, 0.045 inch minimum thickness, factory fabricated, factory glazed; complete with integral sloped sill/threshold, flashings, and anchorage devices.
- B Exterior Aluminum Finish: Class I color anodized.
  - 1. DR-2 and DR-4 Color: Dark Bronze
- C Aluminum Members: Factory finished; solid corner construction; thermally broken.
- D Drainage: Provide drainage to exterior for moisture entering joints and glazing spaces and for condensation occurring within frame construction.
- E Glass Stops: Same material and color as frame, sloped for wash.

## 2.05 PERFORMANCE REQUIREMENTS

- A Clad Wood Doors: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific door type:
- B Clad Wood Doors: Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of side hinged doors.
- C Performance Validation: Side hinged doors (SHD) in compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance requirements as indicated, or an independent test report for indicated products itemizing compliance and acceptable by authorities having jurisdiction.

## 2.06 FABRICATION

- A Fabricate doors in accordance with door quality standard specified.
- B Cores constructed with stiles and rails:
  - 1. Provide solid blocks at lock edge for hardware reinforcement.
  - 2. Provide solid blocking for other thru-bolted hardware.
- C At exterior doors, provide aluminum flashing at the top and bottom rail and the sill of glazed openings for full thickness and width of door.
  - 1. Provide manufacturers standard nailing fin at jambs and head of integral door frame.
- D Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- E Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- F Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- G Cut and configure exterior door edge to receive recessed weatherstripping devices.
- H Provide edge clearances in accordance with the quality standard specified.

## 2.07 FACTORY FINISHING - WOOD VENEER INTERIOR FACE

- A Factory finish doors in accordance with approved sample.

## 2.08 ALUMINUM FINISHES

- A Class I Color Anodized Finish: AAMA 611 AA-M12C22A42, integrally colored anodic coating not less than 0.7 mil thick.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A Verify existing conditions before starting work.
- B Verify that opening sizes and tolerances are acceptable.
- C Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

### 3.02 INSTALLATION

- A Install doors in accordance with manufacturer's instructions and specified quality standard.
- B Assemble multiple units before installation in accordance with manufacturer's installation guidelines.
- C Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- D Field-Finished Doors: Trimming to fit is acceptable.
  - 1. Adjust width of doors by cutting equally on both jamb edges.
  - 2. Trim maximum of 3/4 inch off bottom edges.
- E Use machine tools to cut or drill for hardware.
- F Coordinate installation of doors with installation of integral frames and hardware.
- G Coordinate installation of glazing.

### 3.03 TOLERANCES

- A Comply with specified quality standard for fit and clearance tolerances.
- B Comply with specified quality standard for telegraphing, warp, and squareness.

### 3.04 ADJUSTING

- A Adjust doors for smooth and balanced door movement.
- B Adjust closers for full closure.

3.05 CLEANING

- A Remove protective material from factory finished surfaces.
- B Clean units using cleaning material and methods in accordance with door manufacturer's written recommendations.
- C Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

3.06 PROTECTION

- A Protect installed work from damage due to subsequent construction activity on the site.
- B Protect unit surfaces from masonry cleaning solution that could damage insulating glass panels, aluminum or wood finishing, and hardware.

END OF SECTION

SECTION 08 1433  
STILE AND RAIL WOOD DOORS

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A Type DR-2 and DR-3: Wood doors, stile and rail design; non-fire rated.
- B Panels of wood.

**1.02 RELATED REQUIREMENTS**

- A Section 08 1213 - Hollow Metal Slip-On Frames.
- B Section 08 7100 - Door Hardware.
- C Section 09 9123 - Interior Painting: Field finishing.
- D Section 09 9300 - Staining and Transparent Finishing: Field finishing.

**1.03 REFERENCE STANDARDS**

- A AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).
- B AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards 2021, with Errata.

**1.04 SUBMITTALS**

- A See Section 01 3000 - Administrative Requirements for submittal procedures.
- B Product Data: Indicate stile and rail core materials and construction; veneer species, type and characteristics.
- C Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, and factory finishing criteria.
- D Samples: Submit two samples of door veneer, 2 by 2 inches in size illustrating wood grain, stain color, and sheen.
- E Manufacturer's qualification statement.
- F Installer's qualification statement.
- G Warranty, executed in Owner's name.

**1.05 QUALITY ASSURANCE**

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

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A Package, deliver, and store doors in accordance with quality standard specified.
- B Accept doors on site in manufacturer's packaging, and inspect for damage.
- C Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

**1.07 WARRANTY**

- A See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B Interior Doors: Provide manufacturer's warranty for the life of the installation.
- C Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A Stile and Rail Wood Doors:
  - 1. Masonite Architectural; Aspiro Authentic Stile & Rail Doors: [www.architectural.masonite.com/#sle](http://www.architectural.masonite.com/#sle).
  - 2. VT Industries, Inc; Eggers Stile and Rail Collection: [www.vtindustries.com/#sle](http://www.vtindustries.com/#sle).
  - 3. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 DOORS**

- A Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless otherwise indicated.

- B Interior Doors: 1-3/4 inches thick unless otherwise indicated; veneer and lumber stile and rail construction; mortise and tenon joints. Transparent finish.
  - C DR-2 Wood veneer facing for field transparent finish as indicated on drawings.
- 2.03 DOOR AND PANEL FACINGS
- A Veneer Facing for Transparent Finish: Natural Birch, veneer grade in accordance with quality standard indicated, Cut of veneer to match existing door panels, with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
    - 1. Pairs: Pair match each pair; set match pairs within 10 feet of each other when doors are closed.
  - B Adhesive: Type I - Waterproof.
- 2.04 DOOR CONSTRUCTION
- A Panels: Flat.
  - B Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.
- 2.05 FINISHES
- A Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
    - 1. Transparent:
      - a. Stain: Custom. As indicated on drawings, or match existing stain color
      - b. Sheen: Satin.
- 2.06 ACCESSORIES
- A Hollow Metal Slip-on Frames: See Section 08 1213.
  - B Panel or Glass Retention Molding: Wood of same species as door facing, flat bead stop, with butted corners; prepared for countersink style screws.
  - C Door Hardware: See Section 08 7100.
- PART 3 EXECUTION
- 3.01 EXAMINATION
- A Verify existing conditions before starting work.
  - B Verify that opening sizes and tolerances are acceptable.
  - C Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.
- 3.02 INSTALLATION
- A Install doors in accordance with manufacturer's instructions and specified quality standards.
  - B Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
  - C Field-Finished Doors: Trimming to fit is acceptable.
    - 1. Adjust width of non-rated doors by cutting equally on both jamb edges.
  - D Machine cut for hardware.
  - E Coordinate installation of doors with installation of frames and hardware.
- 3.03 TOLERANCES
- A Comply with specified quality standard for fit, clearance, and joinery tolerances.
- 3.04 ADJUSTING
- A Adjust doors for smooth and balanced door movement.
- 3.05 SCHEDULE - SEE DRAWINGS

END OF SECTION



SECTION 08 4313  
ALUMINUM-FRAMED STOREFRONTS

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A Aluminum-framed storefront, with vision glass.

## 1.02 RELATED REQUIREMENTS

- A Section 08 7100 - Door Hardware: Hardware items other than specified in this section.
- B Section 08 8000 - Glazing: Glass and glazing accessories.

## 1.03 REFERENCE STANDARDS

- A AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site 2015.
- B AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2020.
- C ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
- D ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.
- E ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2019.
- F ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference 2014 (Reapproved 2021).
- G ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference 2000 (Reapproved 2016).

## 1.04 SUBMITTALS

- A See Section 01 3000 - Administrative Requirements for submittal procedures.
- B Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.
- C Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

## 1.05 QUALITY ASSURANCE

- A Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A Handle products of this section in accordance with AAMA CW-10.
- B Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

## 1.07 FIELD CONDITIONS

- A Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

## 1.08 WARRANTY

- A See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B Correct defective Work within a (2) two year period after Date of Substantial Completion.

## PART 2 PRODUCTS

## 2.01 BASIS OF DESIGN -- FRAMING FOR MONOLITHIC GLAZING

- A Center-Set Style:
  - 1. Basis of Design: Kawneer TriFab 400 Framing System.
  - 2. Vertical Mullion Dimensions: 1-3/4 inches wide by 4 inches deep.
- B Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
  - 1. Arcadia, Inc: [www.arcadiainc.com/#sle](http://www.arcadiainc.com/#sle).
  - 2. Trulite Glass and Aluminum Solutions, LLC; [\_\_\_\_]: [www.trulite.com/#sle](http://www.trulite.com/#sle).

C Substitutions: See Section 01 6000 - Product Requirements.

1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

## 2.02 ALUMINUM-FRAMED STOREFRONT

A Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.

1. Finish: Class II natural anodized.
  - a. Factory finish all surfaces that will be exposed in completed assemblies.
  - b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
3. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
4. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
5. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
6. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
7. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B Performance Requirements

1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
  - a. Positive Design Wind Load: 20 lbf/sq ft.
  - b. Negative Design Wind Load: 20 lbf/sq ft.
  - c. Member Deflection: Limit member deflection to 1/175 in any direction, with full recovery of glazing materials.
2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf.
3. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 6.27 psf pressure difference.

## 2.03 COMPONENTS

A Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.

1. Glazing Stops: Flush.

B Glazing: See Section 08 8000.

## 2.04 MATERIALS

A Extruded Aluminum: ASTM B221 (ASTM B221M).

B Fasteners: Stainless steel.

C Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

## 2.05 FINISHES

A Class II Natural Anodized Finish: AAMA 611 AA-M10C21A41 Clear anodic coating not less than 0.4 mils thick.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A Verify dimensions, tolerances, and method of attachment with other work.

- B Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

### 3.02 INSTALLATION

- A Install wall system in accordance with manufacturer's instructions.
- B Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C Provide alignment attachments and shims to permanently fasten system to building structure.
- D Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

### 3.03 TOLERANCES

- A Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

### 3.04 CLEANING

- A Remove protective material from pre-finished aluminum surfaces.

### 3.05 PROTECTION

- A Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 5413  
FIBERGLASS WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Factory fabricated fiberglass windows with fixed and operating sash.
- B Glazed by factory.
- C Operating hardware.
- D Insect screens.

1.02 RELATED REQUIREMENTS

- A Section 08 8000 - Glazing: Insulated glazing product and performance requirements.

1.03 REFERENCE STANDARDS

- A AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights 2017.
- B ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference 2000 (Reapproved 2016).
- C FS L-S-125 - Screening, Insect, Nonmetallic 1972b, with Notice (1987).

1.04 SUBMITTALS

- A See Section 01 3000 - Administrative Requirements for submittal procedures.
- B Product Data: Provide component dimensions, anchors, fasteners, glass, and internal drainage details.
- C Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, installation requirements.
- D Submit two samples of operating hardware.
- E Manufacturer's Certificate: Certify that products of this section meet or exceed specified requirements.
- F Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
  - 1. Evidence of AAMA Certification.
  - 2. Evidence of WDMA Certification.
  - 3. Evidence of CSA Certification.
  - 4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.
- G Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.
- H Specimen warranty.
- I Warranty Documentation: 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 three 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.

1.06 DELIVERY, STORAGE, AND HANDLING

- A Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.
- B Jig, brace, and box the window frame assemblies for transport to minimize flexing of members or joints.

1.07 FIELD CONDITIONS

- A Do not install sealants when ambient temperature is less than 40 degrees F.
- B Maintain this minimum temperature during and after installation of sealants.

1.08 WARRANTY

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

- B Provide ten year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same. Include coverage for degradation of color finish.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

#### A Fiberglass Windows:

1. Basis of Design: Anderson Windows & Doors; A Series Windows: [www.andersenwindows.com](http://www.andersenwindows.com).
2. Substitutions: See Section 01 6000 - Product Requirements.

### 2.02 WINDOW UNITS

#### A Fiberglass Windows: Hollow, tubular, multi-layer fiber reinforced material; factory fabricated; with vision glass, related flashings, anchorage and attachment devices.

1. Product Type: C - Casement window and FW - Fixed window (Transom) in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
2. Color: As indicated on drawings.
3. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
4. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
5. Thermal Movement: Design to accommodate thermal movement caused by 100 degrees F temperature change without buckling stress on glass, joint seal failure, damaging loads on structural elements, damaging loads on fasteners, reduction in performance or other detrimental effects.

### 2.03 PERFORMANCE REQUIREMENTS

#### A Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:

1. Performance Class (PC): LC.
2. Performance Grade (PG): 50, with minimum design pressure (DP) of 50.13 psf.

#### B Deflection: Limit member deflection to 1/200 of the longer dimension with full recovery of glazing materials.

#### C Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 9.19 pounds per square foot.

### 2.04 COMPONENTS

#### A Frames: Manufacturers standard profile; flush glass stops of screw fastened type.

1. Type: Nailing flange (for new windows).
2. Frame Corners: Mitered and joined with nylon corner locks.

#### B Sills: Manufacturers standard thickness, composite fiberglass; sloped for positive wash; fit under sash to 1/2 inch beyond wall face; one piece full width of opening.

#### C Insect Screen Frame: Rolled aluminum frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.

#### D Insect Screens: FS L-S-125 woven plastic mesh; 14/18 mesh size.

1. Color: Black.

#### E Fasteners: Stainless steel.

#### F Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

### 2.05 GLASS AND GLAZING MATERIALS

#### A Glass and Glazing Materials: See Section 08 8000 for Types described below:

1. Glass in Exterior Lights: Type IG-1 and IG-5.

### 2.06 HARDWARE

#### A Casement and Awning Sash: Zinc die-cast steel worm-gear operator with Painted finish.

#### B Finish For Exposed Hardware: Satin nickel.

### 2.07 FABRICATION

#### A Fabricate framing, mullions and sash members with fusion welded corners and joints, in a rigid jig. Supplement frame sections with internal reinforcement where required for structural rigidity.

- B Form sills and stools in one piece. Slope sills for wash.
- C Form weather stop flange to perimeter of unit.
- D Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- E Arrange fasteners to be concealed from view.
- F Permit internal drainage weep holes and channels to migrate moisture to exterior. Provide internal drainage of glazing spaces to exterior through weep holes.
- G Assemble insect screen frame, miter and reinforced frame corners. Fit mesh taut into frame and secure. Fit frame with four spring loaded steel pin retainers.
- H Factory glaze window units.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A Verify wall openings and adjoining water-resistive barrier seal materials are ready to receive work of this section.

#### 3.02 INSTALLATION

- A Install windows in accordance with manufacturer's instructions.
- B Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- C Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- D Install sill.
- E Set sill members and sill flashing in continuous bead of sealant.
- F Install operating hardware.

#### 3.03 TOLERANCES

- A Maximum Variation from Level or Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

#### 3.04 ADJUSTING

- A Adjust hardware for smooth operation and secure weathertight closure.

#### 3.05 CLEANING

- A Remove protective material from pre-finished surfaces.
- B Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

END OF SECTION

SECTION 08 7100  
DOOR HARDWARE

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A Hardware for wood and figerglass doors.
- B Pulls for sliding doors.
- C Thresholds.
- D Weatherstripping and gasketing.

## 1.02 RELATED REQUIREMENTS

- A Section 06 2000 - Finish Carpentry: Wood door frames.
- B Section 08 1416 - Flush Wood Doors.
- C Section 08 7129 - Sliding and Folding Door Hardware: Hardware for sliding doors.

## 1.03 REFERENCE STANDARDS

- A ADA Standards - 2010 ADA Standards for Accessible Design 2010.
- B BHMA A156.1 - Standard for Butts and Hinges 2021.
- C BHMA A156.2 - Bored and Preassembled Locks and Latches 2017.
- D BHMA A156.4 - Door Controls - Closers 2019.
- E BHMA A156.5 - Cylinders and Input Devices for Locks 2020.
- F BHMA A156.6 - Standard for Architectural Door Trim 2021.
- G BHMA A156.7 - Template Hinge Dimensions 2016.
- H BHMA A156.13 - Mortise Locks & Latches Series 1000 2017.
- I BHMA A156.16 - Auxiliary Hardware 2018.
- J BHMA A156.18 - Materials and Finishes 2020.
- K BHMA A156.21 - Thresholds 2019.
- L BHMA A156.22 - Standard for Gasketing 2021.
- M BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems 2018.
- N DHI (H&S) - Sequence and Format for the Hardware Schedule 2019.
- O DHI (KSN) - Keying Systems and Nomenclature 2019.
- P DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors 1993; also in WDHS-1/WDHS-5 Series, 1996.
- Q ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

## 1.04 ADMINISTRATIVE REQUIREMENTS

- A Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
- B Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- C Preinstallation Meeting: Convene a preinstallation meeting at least one week prior to commencing work of this section; attendance is required by affected installers and the following:
  - 1. Architect.
  - 2. Installer's Architectural Hardware Consultant (AHC).
  - 3. Hardware Installer.
  - 4. Owner's Security Consultant.
- D Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- E Keying Requirements Meeting:
  - 1. Attendance Required:
    - a. Contractor.
    - b. Owner.
    - c. Architect.
    - d. Installer's Architectural Hardware Consultant (AHC).
    - e. Hardware Installer.

- f. Owner's Security Consultant.
  2. Agenda:
    - a. Establish keying requirements.
    - b. Verify locksets and locking hardware are functionally correct for project requirements.
    - c. Verify that keying and programming complies with project requirements.
    - d. Establish keying submittal schedule and update requirements.
  3. Contractor to record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
  4. Deliver established keying requirements to manufacturers.
- 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, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
  - C Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
    1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
    2. Comply with DHI (H&S) using door numbers and hardware set numbers as indicated in construction documents.
    3. List groups and suffixes in proper sequence.
    4. Provide complete description for each door listed.
    5. Provide manufacturer name, product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
    6. Include account of abbreviations and symbols used in schedule.
  - D Samples Prior to Preparation of Hardware Schedule:
    1. Submit minimum size of 2 by 4 inch for sheet samples, and minimum length of 4 inch for other products.
    2. Submit one (1) sample of hinge, latchset, lockset, and closer illustrating style, color, and finish.
    3. Return full-size samples to Contractor.
    4. Submit product description with samples.
  - E Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
  - F Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
    1. Submit manufacturer's parts lists and templates.
  - G Keying Schedule:
    1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.
  - H Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
  - I Project Record Documents: Record actual locations of concealed equipment, services, and conduit.
  - J Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
    1. See Section 01 6000 - Product Requirements, for additional provisions.
    2. Lock Cylinders: Ten for each master keyed group.
    3. Tools: One set of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.
- 1.06 QUALITY ASSURANCE
- A Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five (5) years of documented experience.



- B Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.
- C Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with 5 years of experience, minimum.
- D Hardware Supplier Personnel: Employ a qualified person to assist in the work of this section.
  - 1. Consultant shall be available on a 24-hour notice at the jobsite by request of the Architect to consult, advise and assist in the installation of the Finish Hardware. He shall attend a Keying Conference with the Owner and Architect and provide a Keying Schedule resulting from this Conference.
  - 2. At the completion of the project and prior to final job closeout, the Hardware Supplier Consultant shall visit the Project and inspect all Hardware as installed. He shall advise the Architect by letter that all Hardware is per specification, properly installed and correctly adjusted, or note matters that require correction.
  - 3. Hardware Supplier shall be a locally stocking, Factory Direct Distributor for all products and services required for this Project and shall so certify in his Hardware schedule submittal.
- E It is the intent of this specification to provide general guidelines for the quality, function and design of the architectural finish hardware. It is the specific responsibility of the hardware supplier to furnish products which are fully functional, in full compliance with federal, state and local building codes, fire codes and accessible codes. Any supplier bidding on this section of work will notify the Architect, prior to bidding, of discrepancies, or will be assumed to have included correct material to make this compliance.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

#### 1.08 WARRANTY

- A See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B Warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion.
  - 1. Closers: Five years, minimum.

### PART 2 PRODUCTS

#### 2.01 DESIGN AND PERFORMANCE CRITERIA

- A Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
- B Provide individual items of single type, of same model, and by same manufacturer.
- C Provide door hardware products that comply with the following requirements:
  - 1. Applicable provisions of federal, state, and local codes.
  - 2. Accessibility: ADA Standards and ICC A117.1.
    - a. The opening force of doors along an accessible route shall be as follows:
    - b. Exterior doors: 8 - 1/2 pounds-force (lbf) (37.8 N).
    - c. Interior doors: 5 pounds-force (lbf) (22.2 N).
    - d. Stairway doors at pressurized stair enclosures: 15 pounds (6.8 kg) at exterior doors.
    - e. Where environmental conditions require greater closing pressure, power-operated doors shall be used within the accessible route.
- D Latches: Provide a latch for every door that is not required to lock, unless specifically indicated "push/pull" or "not required to latch".
- E Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. Refer to Door Hardware Schedule.
- F Fasteners:
  - 1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
    - a. Aluminum fasteners are not permitted.
    - b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.

2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
    - a. Self-drilling (Tek) type screws are not permitted.
- G Where not specifically indicated, comply with applicable ANSI A156 standard for type of hardware required. Furnish each type of hardware with accessories as required for applications indicated and for complete, finished, operational doors.
1. Templates: Furnish templates or physical hardware items to door and frame manufacturers sufficiently in advance to avoid delay in Work.
  2. Reinforcing Units: Furnished by door and frame manufacturers; coordinated by hardware supplier or hardware manufacturer.
  3. Fasteners: Furnish as recommended by hardware manufacturer and as required to secure hardware.
- 2.02 HINGES
- A Manufacturers:
1. Ives, an Allegion brand: [www.allegion.com/us](http://www.allegion.com/us).
- B Hinges: Complying with BHMA A156.1, Grade 1.
1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
    - a. Provide hinge width required to clear surrounding trim.
  2. Provide hinges on every swinging door.
  3. Provide ball-bearing hinges at each door with closer.
  4. Provide non-removable pins on exterior outswinging doors.
  5. Provide following quantity of butt hinges for each door:
    - a. Doors up to 60 inches High: Two hinges.
    - b. Doors From 60 inches High up to 90 inches High: Three hinges.
    - c. Doors 90 inches High up to 120 inches High: Four hinges.
- 2.03 FLUSH BOLTS
- A Manufacturers:
1. Ives, an Allegion brand: [www.allegion.com/us/#sle](http://www.allegion.com/us/#sle).
- B Flush Bolts: Comply with BHMA A156.16, Grade 1.
1. Flush Bolt Throw: 3/4 inch, minimum.
  2. Provides extension bolts in leading edge of door, one bolt into floor, one bolt into top of frame.
    - a. Pairs of Swing Doors: At inactive leaves, provide flush bolts of type as required to comply with code.
  3. Provide dustproof floor strike for bolt into floor, except at metal thresholds.
  4. Manual Flush Bolts: Provide lever extensions for top bolt at over-sized doors.
  5. Self-Latching Flush Bolts: Automatically latch upon closing of door; manually retracted; located on inactive leaf of pair of doors.
  6. Automatic Flush Bolts: Automatically latch upon closing of door; automatic retraction of bolts when active leaf is opened; located on inactive leaf of pair of doors.
- 2.04 LOCK CYLINDERS
- A Manufacturers:
1. Schlage, an Allegion brand: [www.allegion.com/us](http://www.allegion.com/us).
  2. Substitutions: See Section 01 6000 - Product Requirements.
- B Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
1. Provide standard type cylinders, Grade 1, with six-pin core in compliance with BHMA A156.5 at locations indicated.
  2. Provide cylinders from same manufacturer as locking device.
  3. Provide cams and/or tailpieces as required for locking devices.
  4. Within specific Door Sections, when provisions for lock cylinder are being referenced to this Section, provide specified lock cylinder and keyed to building keying system, unless otherwise indicated.
  5. For ease of maintenance, it is mandatory that all cylindrical lock cylinders be furnished so cylinders can be removed without removing lock from door.

## 2.05 CYLINDRICAL LOCKS

### A Manufacturers:

1. Schlage, an Allegion brand: [www.allegion.com/us/#sle](http://www.allegion.com/us/#sle).
2. Substitutions: See Section 01 6000 - Product Requirements.

### B Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.

1. Bored Hole: 2-1/8 inch diameter.
2. Latchbolt Throw: 1/2 inch, minimum.
3. Backset: 2-3/4 inch unless otherwise indicated.
4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
  - a. Finish: To match lock or latch.
5. Provide a lock for each door, unless otherwise indicated that lock is not required.
6. Provide an office lockset for swinging door where hardware set is not indicated.
7. Trim: Provide lever handle or pull trim on outside of each lock, unless otherwise indicated.
8. Vandal Resistance: Provide manufactures hardware upgrade product for vandal resistant locks at indicated locations. 'Vandlegard' by Schlage. Provide Latch Protector.

## 2.06 MORTISE LOCKS

### A Verify with Owner all locations to include hardware latchsets cylinders which can be removed without removing lock from door. The following locations shall be specifically addressed:

1. Panic and egress locksets.
2. Exterior locksets.
3. Locksets where lock cylinder is expected to be changed frequently.

### B Manufacturers:

1. Schlage, an Allegion brand; Product # L9496, privacy lock with occupied indicator: [www.allegion.com/us/#sle](http://www.allegion.com/us/#sle).
2. Substitutions: See Section 01 6000 - Product Requirements.

### C Mortise Locks: Comply with BHMA A156.13, Grade 1, Security, 1000 Series.

1. Latchbolt Throw: 3/4 inch, minimum.
2. Deadbolt Throw: 1 inch, minimum.
3. Backset: 2-3/4 inch unless otherwise indicated.
4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
  - a. Finish: To match lock or latch.

## 2.07 DOOR TRIM (LEVER HANDLE) FOR FOR CYLINDER AND MORTISE LOCKS

### A Accessibility: ADA Standards and ICC A117.1.

### B Manufacturers: Same as for Cylinder and Mortise Locks.

1. Lever Style: 'OMEGA'.

## 2.08 DOOR PULLS

### A Manufacturers:

1. Ives, an Allegion brand: [www.allegion.com/us](http://www.allegion.com/us).
2. Substitutions: See Section 01 6000 - Product Requirements.

### B Door Pulls: Comply with BHMA A156.6.

1. Pull Type: Flush, unless otherwise indicated.
2. Material: Aluminum, unless otherwise indicated.
3. Provide door pulls at sliding track doors.

## 2.09 CLOSERS

### A Manufacturers; Surface Mounted:

1. LCN, an Allegion brand: [www.allegion.com/us/#sle](http://www.allegion.com/us/#sle).
2. Substitutions: See Section 01 6000 - Product Requirements.

- B Closers: Comply with BHMA A156.4, Grade 1.
  - 1. Type: Surface mounted to door.
    - a. All surface door closers shall be size as recommended by the manufacturer.
    - b. Check degree of opening for all closers.
    - c. Brackets or drop plates of proper type and size to be provided where necessary.
    - d. No exposed fasteners.
  - 2. Provide door closer on each exterior door.
  - 3. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.
  - 4. At corridor entry doors, mount closer on room side of door.
  - 5. At outswinging exterior doors, mount closer on interior side of door.
- 2.10 PROTECTION PLATES
  - A Manufacturers:
    - 1. Ives, an Allegion brand: [www.allegion.com/us/#sle](http://www.allegion.com/us/#sle).
    - 2. Substitutions: See Section 01 6000 - Product Requirements.
  - B Protection Plates: Comply with BHMA A156.6.
  - C Metal Properties: Aluminum.
  - D Edges: Beveled, on four sides unless otherwise indicated.
  - E Fasteners: Countersunk screw fasteners.
  - F Drip Guard: Provide at head of exterior doors unless covered by roof or canopy.
  - G Provide protection plate for doors indicated on hardware schedule, or hardware matrix.
- 2.11 KICK PLATES
  - A Manufacturers:
    - 1. Ives, an Allegion brand: [www.allegion.com/us/#sle](http://www.allegion.com/us/#sle).
  - B Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
    - 1. Size: 12 inch high by 2 inch less door width (LDW) on push side of door.
- 2.12 FLOOR STOPS
  - A Manufacturers:
    - 1. Ives, an Allegion brand: [www.allegion.com/us/](http://www.allegion.com/us/).
    - 2. Substitutions: See Section 01 6000 - Product Requirements.
  - B Floor Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
    - 1. Provide floor stops when wall surface is not available; be cautious not to create a tripping hazard.
    - 2. Type: Manual hold-open, with dome floor stop.
    - 3. Material: Aluminum housing with rubber insert.
- 2.13 WALL STOPS
  - A Manufacturers:
    - 1. Ives, an Allegion brand: [www.allegion.com/us/](http://www.allegion.com/us/).
    - 2. Substitutions: See Section 01 6000 - Product Requirements.
  - B Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
    - 1. Provide wall stops, unless otherwise indicated, to prevent damage to wall surface upon opening door.
    - 2. If wall stops are not practical, due to configuration of room or furnishings, provide overhead stop.
    - 3. Type: Bumper, concave, wall stop.
    - 4. Material: Aluminum housing with rubber insert.
- 2.14 THRESHOLDS
  - A Manufacturers:
    - 1. Pemko; an Assa Abloy Group company; [\_\_\_\_]: [www.assaabloydss.com/#sle](http://www.assaabloydss.com/#sle).

2. Zero International, Inc; [\_\_\_\_]: [www.zerointernational.com/#sle](http://www.zerointernational.com/#sle).
  3. Substitutions: See Section 01 6000 - Product Requirements.
- B Thresholds: Comply with BHMA A156.21.
1. Provide threshold at each exterior door, unless otherwise indicated.
  2. Type: Flat surface.
  3. Material: Aluminum.
  4. Threshold Surface: Fluted horizontal grooves across full width.
  5. Field cut threshold to profile of frame and width of door sill for tight fit.
  6. Provide non-corroding fasteners at exterior locations.
- 2.15 WEATHERSTRIPPING AND GASKETING
- A Manufacturers:
1. National Guard Products, Inc: [www.ngpinc.com/#sle](http://www.ngpinc.com/#sle).
  2. Zero International, Inc: [www.zerointernational.com/#sle](http://www.zerointernational.com/#sle).
- B Weatherstripping and Gasketing: Comply with BHMA A156.22.
1. Head and Jamb Type: Adjustable.
  2. Door Sweep Type: Encased in retainer.
  3. Material: Aluminum, with brush weatherstripping.
  4. Provide gasketing for smoke and draft control doors indicated that complies with local codes, requirements of assemblies tested in accordance with UL 1784.
  5. Provide frame-applied intumescent gasketing on wood doors that are labeled as smoke and draft control doors indicated, unless otherwise indicated.
  6. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
  7. Provide door bottom sweep on each exterior door, unless otherwise indicated.
- 2.16 SILENCERS
- A Manufacturers:
1. Ives, an Allegion brand: [www.allegion.com/us/#sle](http://www.allegion.com/us/#sle).
  2. Substitutions: See Section 01 6000 - Product Requirements.
- B Omit at doors with weatherstripping or draftseal.
- C Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
1. Single Door: Provide three on strike jamb of frame.
  2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
  3. Material: Rubber, gray color.
- 2.17 KEY CONTROL SYSTEMS
- A Key Control Systems: Comply with guidelines of BHMA A156.28.
1. Provide keying information in compliance with DHI (KSN) standards.
  2. Keying: Master keyed.
  3. Include construction keying and control keying with removable core cylinders.
  4. Key to existing keying system.
  5. Supply keys in following quantities:
    - a. Two (2) Construction Master keys.
    - b. Six (6) Construction keys.
    - c. 2 each Construction Control keys.
    - d. Two (2) Control keys if new system.
    - e. One (1) Extra Cylinder cores.
    - f. Two (2) Change keys for each keyed core.
  6. Deliver keys with identifying tags to Owner by security shipment direct from hardware supplier.
- 2.18 FINISHES
- A Finishes: Provide door hardware of same finish, unless otherwise indicated.

1. Primary Finish: 605; bright brass, clear coated, with brass base material (former US equivalent US3); BHMA A156.18.
  - a. Use Primary finish in historic, front portion of building, rooms 200-206; provide primary finish on one side of door and secondary finish on other side if necessary.
2. Secondary Finish: 626; satin chromium plated over nickel, with brass or bronze base material (former US equivalent US26D); BHMA A156.18.
  - a. Use secondary finish in rear upper and lower addition portion of building, or other locations not in the historic portion of the building.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A Verify that doors and frames are ready to receive this work; labeled doors and frames are properly installed, and dimensions are as indicated on shop drawings.
- B Verify that electric power is available to power operated devices and of correct characteristics.

#### 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 application of finishes to substrate are fully completed.
- D Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
  1. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
  2. Mounting heights in compliance with ADA Standards:
- E Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

#### 3.03 FIELD QUALITY CONTROL

- A Perform field inspection and testing under provisions of Section 01 4000 - Quality Requirements.
- B Provide an Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

#### 3.04 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.

#### 3.05 CLEANING

- A Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
- B Clean adjacent surfaces soiled by hardware installation.
- C Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

#### 3.06 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.

#### 3.07 SCHEDULE - HARDWARE GROUPS INDICATED ON DRAWINGS.

END OF SECTION

SECTION 08 7129  
SLIDING AND FOLDING DOOR HARDWARE

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A Product requirements of hardware for sliding and folding doors, supplementing specifications in Section 08 7100.

**1.02 RELATED REQUIREMENTS**

- A Section 08 7100 - Door Hardware: General administrative and installation requirements applicable to this Section.

**1.03 SUBMITTALS**

- A See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B Product Data: Submit manufacturer's product data, details, and installation instructions for all material provided in this section.
- C Shop Drawings: Show layout, components, track mounting and support, anchorage details, and adjoining interface construction.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A Deliver materials in manufacturer's sealed and labeled packaging.
- B Protect hardware and track product from damage, and store in a dry, well ventilated area within manufacturer's packaging until ready for installation.
  - 1. Report any damaged product or materials to carrier on carrier's freight bill.
- C Provide necessary precautions to protect product during construction.
  - 1. Do not install damaged products, replace damaged products.

**1.05 WARRANTY**

- A See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B Provide manufacturer's 10 year commercial warranty covering defects in materials and workmanship.

**PART 2 PRODUCTS****2.01 SLIDING AND FOLDING DOOR HARDWARE - GENERAL**

- A No hardware sets are specified; Hardware sets are indicated on drawings.
- B Where type or size is not indicated, select from manufacturer's full line based on manufacturer's recommendations, actual door/panel sizes and weights, and configurations indicated on drawings.
- C Tracks: Provide tracks of appropriate type, size, and length for openings, regardless of manufacturer's standard unit sizes; splice tracks without gaps or offsets.
- D Accessories: Provide all accessory parts necessary to make door/panel assemblies operate smoothly, close openings completely, and remain in position when closed.

**2.02 OVERHEAD SUPPORTED SINGLE TRACK SLIDING DOOR HARDWARE, WITH WHEELED CARRIERS**

- A Track and Carriers: Designed as a set, to suit operational configuration, weight of doors, and manufacturer's limitations, if any, and as follows:
  - 1. Track: Steel track, mounted on to face of opening header, unless otherwise indicated.
    - a. Finish: Manufacturers standard.
    - b. Color: Black Steel
    - c. Length: As indicated on drawings.
  - 2. Number of Carriers: Two per panel.
    - a. Carriers: Continuous ball bearing rollers; no wheeled rollers; mounted to top of panel.
    - b. Heavy-Duty, Up to 200 pounds per panel.
    - c. Basis of Design - KrownLab; Axel : [www.krownlab.com](http://www.krownlab.com)
    - d. Substitutions: Not permitted.
- B Floor Guides: Manufacturer's standard; diecast zinc; routed into bottom of door panel; one for each door panel.
- C Pull: See Section 078100.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A Do not begin installation until support and floor substrates have been properly completed.

- B Verify structural supports are level and of adequate strength in compliance with applicable loads.
- C Verify opening dimensions prior to fabrication and assembly.
- D Notify Architect of unsatisfactory conditions.

3.02 PREPARATION

- A Prepare work areas to be level, plumb, secure, straight and true, as well as dry, clean and free of debris.
- B Installer shall ensure hardware and track surfaces are clean and free of debris.

3.03 INSTALLATION

- A Install in accordance with Hardware Schedule and manufacturer's written instructions.
- B Install hardware level, plumb, secure, straight and true.
- C Adjust hardware as necessary to ensure safe, smooth, quiet and effortless operation.
- D Clean track and hardware surfaces before hanging sliding doors.
- E See Section 08 7100 for additional requirements.

END OF SECTION



SECTION 08 8000  
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Insulating glass units: Requirements for units specified and provided in related sections.
- B Glazing units.
- C Glazing accessories.

1.02 RELATED REQUIREMENTS

- A Section 081613 - Fiberglass Doors: Insulated glazing provided by door manufacturer.
- B Section 08 4313 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.
- C Section 08 5413 - Fiberglass Windows: Insulated glazing provided by window manufacturer.

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 2015 (Reaffirmed 2020).
- C ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers 2005 (Reapproved 2019).
- D ASTM C1036 - Standard Specification for Flat Glass 2021.
- E ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.
- F ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
- G ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass 2021a.
- H ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings 2016.
- I ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation 2019.
- J GANA (GM) - GANA Glazing Manual 2008.
- K GANA (SM) - GANA Sealant Manual 2008.
- L GANA (LGRM) - Laminated Glazing Reference Manual 2019.
- M IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use 1990 (2016).
- N NFRC 100 - Procedure for Determining Fenestration Product U-factors 2020.
- O NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence 2020.
- P NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems 2020.

1.04 SUBMITTALS

- A See Section 01 3000 - Administrative Requirements for submittal procedures.
- B Product Data on Insulating Glass Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
  - 1. For each glazing product, indicate whether the glazing will be factory, or field installed, for each product requiring glazing in the project.
- D Certificate: Certify that products of this section meet or exceed specified requirements.
  - 1. Submit NFRC Site-Built or Product ID (E.G.- Certification ID, Pending ID, Product Label).
- E Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.
- B Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

- C Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

#### 1.06 FIELD CONDITIONS

- A Do not install glazing when ambient temperature is less than 40 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 Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A Float Glass Manufacturers:
  1. AGC Glass Company North America, Inc: [www.us.agc.com](http://www.us.agc.com).
  2. Cardinal Glass Industries: [www.cardinalcorp.com](http://www.cardinalcorp.com).
  3. Guardian Industries Corp: [www.sunguardglass.com](http://www.sunguardglass.com).
  4. Pilkington North America Inc: [www.pilkington.com/na](http://www.pilkington.com/na).
  5. PPG Industries, Inc: [www.ppgideascales.com](http://www.ppgideascales.com).

#### 2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
  1. Design Pressure: Calculated in accordance with applicable codes.
  2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
  3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
  4. Glass thicknesses listed are minimum.
- B Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
- C Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
  1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
  2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
  3. Solar Optical Properties: Comply with NFRC 300 test method.

#### 2.03 GLASS MATERIALS

- A Float Glass: Provide float glass based glazing unless otherwise indicated.
  1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
  2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
  3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
  4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
  5. Impact Resistant Safety Glass: Complies with ANSI Z97.1 - Class B, or 16 CFR 1201 - Category I criteria.
  6. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

#### 2.04 INSULATING GLASS UNITS

- A Manufacturers:

1. As supplied by the windows and door manufacturers meeting the requirements of this section, and specified in sections with those materials.
- B Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
  2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
  3. Spacer Color: Black.
  4. Edge Seal:
    - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
    - b. Color: Black.
  5. Purge interpane space with dry air, hermetically sealed.
- C Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
1. Applications: 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. Thermal Transmittance (U-Value), Solar Heat Gain Coefficient (SHGC): As indicated on drawings.
    - a. Coordinate with glazing provided by fiberglass window and door manufacturer.
- D Type IG-2 - IG-4: Not Used.
- E Type IG-5 - Insulating Glass Units: Safety glazing.
1. Applications:
    - a. Glazed lites in exterior doors.
    - b. Glazed sidelights and panels next to doors.
    - c. Other locations required by applicable federal, state, and local codes and regulations.
  2. Space between lites filled with argon.
  3. Glass Type: Same as Type IG-01 except use fully tempered float glass for both outboard and inboard lites.
  4. Total Thickness: 1 inch.
- 2.05 GLAZING UNITS
- A Type G-2 - Monolithic Interior Vision Glazing:
1. Applications: Interior glazing unless otherwise indicated.
  2. Glass Type: Annealed float glass.
  3. Tint: Clear.
  4. Thickness: 1/4 inch, nominal.
- B Type G-3 - Monolithic Safety Glazing: Non-fire-rated.
1. Applications:
    - a. Glazed lites in doors, except fire doors.
    - b. Glazed sidelights to doors, except in fire-rated walls and partitions.
    - c. Other locations required by applicable federal, state, and local codes and regulations.
    - d. Other locations indicated on drawings.
  2. Glass Type: Fully tempered safety glass as specified.
  3. Tint: Clear.
  4. Thickness: 1/4 inch, nominal.
- C Type G-15 - Glass Shelves:
1. Applications: Display Windows at Reception.
  2. Tint: Clear.

3. Glass Type: Fully tempered float glass with ground edges and corners; ASTM C1048.
4. Thickness: 1/4 inch, nominal.

## 2.06 GLAZING COMPOUNDS

- A Manufacturers warranted products, compatible with adjacent materials including glass, laminated glass core, insulated glass seals and glazing channels.
1. Field installed glazing: Glass Manufacturers warranted compounds.
  2. Factory installed glazing: Door or window manufacturers warranted compounds.

## 2.07 ACCESSORIES

- A Setting Blocks: Silicone, with 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 by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option I. Continuous by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C Glazing Gaskets: Resilient polyvinyl chloride extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
- D Glazing Clips: Manufacturer's standard type.

## PART 3 EXECUTION

### 3.01 VERIFICATION OF CONDITIONS

- A Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- C Verify that sealing between joints of glass framing members has been completed effectively.
- D Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

### 3.03 INSTALLATION, GENERAL

- A Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
1. Notify Architect in any instance where glazing installation instructions or methods conflict with those included in this specification.
- B Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- E Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

### 3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B At exterior doors, set glazing, and install in accordance with manufactures requirements.
- 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 fixed stop with sufficient pressure on gasket to attain full contact.
- E Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

### 3.05 FIELD QUALITY CONTROL

- A See Section 01 4000 - Quality Requirements for additional requirements.
- B Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

C Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING

- A Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B Remove nonpermanent labels immediately after glazing installation is complete.
- C Clean glass and adjacent surfaces after sealants are fully cured.
- D Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.07 PROTECTION

- A After installation, mark pane with an 'X' by using removable plastic tape or paste.
- B Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

3.08 SCHEDULES

- A Aluminum-Framed Storefront Glazing: Glass Type G-2 and G-3, install glass using gasket method, and with glass thickness as required to comply with performance requirements indicated in Section 08 4313.
- B Flush Wood Door Glazing:
  - 1. Interior: Glass Type G-3, 1/4 inch thick, install glass using manufacturers method and glazing compound required to comply with performance requirements.
- C Fiberglass Door Glazing: Factory glazed.
  - 1. Exterior: Glass Type IG-5, one (1) inch thick, install glass using manufacturers method and glazing compound required to comply with performance requirements.
- D Fiberglass Windows: Factory glazed.
  - 1. Exterior: Glass Type IG-5, one (1) inch thick, install glass using manufacturers method and glazing compound required to comply with performance requirements.

END OF SECTION

SECTION 09 2116  
GYPSUM BOARD ASSEMBLIES

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A Gypsum wallboard.
- B Joint treatment and accessories.
- C Textured finish system.

**1.02 RELATED REQUIREMENTS**

- A Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

**1.03 REFERENCE STANDARDS**

- A ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board 2017 (Reapproved 2022).
- B ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board 2004 (Reapproved 2020).
- C ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2020.
- D ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base 2019.
- E ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.
- F ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2021.
- G GA-216 - Application and Finishing of Gypsum Panel Products 2021.

**1.04 SUBMITTALS**

- A See Section 01 3000 - Administrative Requirements for submittal procedures.
- B Product Data: Provide data on gypsum board, accessories, and joint finishing system.
- C 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 3 years of experience.

**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.

**2.02 BOARD MATERIALS**

- A Manufacturers - Gypsum-Based Board:
  - 1. Basis of Design: USG Corporation: [www.usg.com/#sle](http://www.usg.com/#sle).  
Substitution products from the following manufacturers meeting the requirements are acceptable:
  - 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. Lafarge North America Inc: [www.lafargenorthamerica.com](http://www.lafargenorthamerica.com).
  - 5. National Gypsum Company: [www.nationalgypsum.com](http://www.nationalgypsum.com).
  - 6. Substitutions: See Section 01 6000 - Product Requirements.
- 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: Meets requirements when tested in accordance with ASTM D3273.
    - a. Mold resistant board is required at locations indicated on drawings. Refer to WALL & HORIZONTAL ASSEMBLY NOTES.
  - 3. Paper-Faced Products:
    - a. USG Corporation; Sheetrock Brand Firecode X Panels 5/8 in. (15.9 mm): [www.usg.com/#sle](http://www.usg.com/#sle).

- b. Substitutions: See Section 01 6000 - Product Requirements.
    - 4. Mold Resistant Paper Faced Products:
      - a. USG Corporation; Sheetrock Brand EcoSmart Panels Mold Tough Firecode X 5/8 in. (15.9 mm): [www.usg.com/#sle](http://www.usg.com/#sle).
      - b. Substitutions: See Section 01 6000 - Product Requirements.
- 2.03 GYPSUM BOARD ACCESSORIES
  - A Finishing Accessories: ASTM C1047, extruded aluminum alloy (6063 T5) or galvanized steel sheet ASTM A924/A924M G90, unless noted otherwise.
    - 1. Types: As detailed or required for finished appearance.
    - 2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
    - 3. Products:
      - a. Same manufacturer as gypsum board materials.
      - or
      - b. Fry Reglet: Aluminum Special Sections
      - c. Phillips Manufacturing Co: [www.phillipsmfg.com/#sle](http://www.phillipsmfg.com/#sle).
      - d. Trim-tex, Inc: [www.trim-tex.com/#sle](http://www.trim-tex.com/#sle).
      - e. Substitutions: See Section 01 6000 - Product Requirements.
  - B Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
  - C Textured Finish Materials: Latex-based compound; plain.
    - 1. Products:
      - a. Sherwin-Williams; Tuff Surface Premium Texture Finish: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
      - b. Substitutions: See Section 01 6000 - Product Requirements.
  - D Nails for Attachment to Wood Members: ASTM C514.
  - E Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

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

#### 3.02 FRAMING INSTALLATION

- A Studs: Space studs at 16 inches on center.
  - 1. Extend partition framing to structure in all locations.
- B Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- C Blocking: Install wood blocking for support of:
  - 1. Framed openings.
  - 2. Wall-mounted cabinets.
  - 3. Toilet accessories.

#### 3.03 BOARD INSTALLATION

- A Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:
  - 1. Single-Layer Applications: Screw attachment.

#### 3.04 INSTALLATION OF TRIM AND ACCESSORIES

- A Control Joints: Place control joints consistent with lines of building spaces and as indicated.
- B Corner Beads: Install at external corners, using longest practical lengths.
- C Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

## 3.05 JOINT TREATMENT

- A Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- B Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
  - 1. Level 5: Walls and ceilings to receive paint finish and other areas specifically indicated
  - 2. Level 4: Walls and ceilings to receive light texture or wall coverings, unless otherwise indicated.
  - 3. Level 3: Walls to receive heavy or medium textured wall finish or covering
  - 4. Level 2: Behind cabinetry, and on backing board to receive tile finish
  - 5. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.
  - 6. Level 0: Temporary partitions.
- C 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 are not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
  - 3. Taping, filling, and sanding are not required at base layer of double-layer applications.

## 3.06 TEXTURE FINISH

- A Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.
- B Texture Required: Match existing wall texture. Existing wall texture appears consistent with 'knock-down' style..

## 3.07 TOLERANCES

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

END OF SECTION



SECTION 09 6500  
RESILIENT FLOORING

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A Resilient sheet flooring.
- B Resilient base.
- C Resilient stair accessories.
- D Installation accessories.

## 1.02 RELATED REQUIREMENTS

- A Section 06 1053 - Miscellaneous Rough Carpentry: Underlayment required prior to laying carpet.

## 1.03 REFERENCE STANDARDS

- A ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source 2019a, with Editorial Revision (2020).
- B ASTM F1861 - Standard Specification for Resilient Wall Base 2021.
- C ASTM F2034 - Standard Specification for Sheet Linoleum Floor Covering 2018.
- D ASTM F2169 - Standard Specification for Resilient Stair Treads 2015 (Reapproved 2020).
- E NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source 2023.
- F RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings 2011.

## 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 Verification Samples: Submit two samples, 3 by 3 inch in size illustrating color and pattern for each resilient flooring product specified.
- D Installer's Qualification Statement.
- E Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- F Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Extra Flooring Material: 100 square feet of each type and color.
  - 3. Extra Wall Base: 50 linear feet of each type and color.
  - 4. Extra Stair Materials: Quantity equivalent to 5 percent 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.

## 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 RF-1 Linoleum Sheet Flooring: Homogeneous wear layer bonded to backing, with color and pattern through wear layer thickness.
1. Minimum Requirements: Comply with ASTM F2034, Type corresponding to type specified.
  2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
  3. Backing: Jute fabric.
  4. Wear Layer Thickness: 0.098 inch, minimum, excluding backing.
  5. Thickness: 0.100 inch, minimum, excluding backing.
  6. Sheet Width: 79 inch, minimum.
  7. Seams: Heat welded.
  8. Pattern: Marbleized.
  9. Color: As indicated on drawings.
- B Welding Rod: Solid bead in material compatible with flooring, produced by flooring manufacturer for heat welding seams, and in color matching field color.

**2.02 STAIR COVERING**

- A RSC-1 Stair Treads: Rubber; full width and depth of stair tread in one piece; tapered thickness.
1. Minimum Requirements: Comply with ASTM F2169, Type TS, rubber, vulcanized thermoset.
  2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
  3. Nominal Thickness: 0.1875 inch.
  4. Nosing: Square.
  5. Texture: Raised.
  6. Pattern: SQUARE.
  7. Color: As indicated on drawings.

**2.03 RESILIENT BASE**

- A RB-1 Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; Style A, Straight.
1. Manufacturers:
    - a. Roppe Corporation: Pinnacle Rubber Base: [www.roppe.com/#sle](http://www.roppe.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.
  2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
  3. Height: 4 inch.
  4. Thickness: 0.125 inch.
  5. Finish: Satin.
  6. Color: As indicated on drawings.
  7. Accessories: Premolded external corners.
- B RB-2 Resilient Base: Same as RB-1, except:
1. Style B Coved at polished concrete.
- C RB-3 Resilient Base: Same as RB-1, except:
1. Height: 6 inch.

**2.04 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: Wood.

**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 Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

**3.02 PREPARATION**

- A Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).
- B Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- C Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.
- D Prohibit traffic until filler is fully cured.
- E Clean substrate.

**3.03 INSTALLATION - GENERAL**

- A Starting installation constitutes acceptance of subfloor conditions.
- B Install in accordance with manufacturer's written instructions.
- C Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
- D Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- E Install flooring in recessed floor access covers, maintaining floor pattern.

**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 Seams are prohibited in bathrooms, kitchens, toilet rooms, and custodial closets.
- C Seal seams by heat welding where indicated.

**3.05 INSTALLATION - RESILIENT BASE**

- A Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
- C Install base on solid backing. Bond tightly to wall and floor surfaces.
- D Scribe and fit to door frames and other interruptions.

**3.06 INSTALLATION - STAIR COVERINGS**

- A Install stair coverings in one piece for full width and depth of tread.
- B Adhere over entire surface. Fit accurately and securely.

**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

SECTION 09 6813  
TILE CARPETING

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A Carpet tile, fully adhered.

## 1.02 RELATED REQUIREMENTS

- A Section 06 1053 - Miscellaneous Rough Carpentry: Underlayment required prior to laying carpet.

## 1.03 REFERENCE STANDARDS

- A ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials 2016 (Reapproved 2021).
- B ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source 2019a, with Editorial Revision (2020).
- C NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source 2023.

## 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; sizes, patterns, colors available, and method of installation.
- C Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- D Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

## 1.05 QUALITY ASSURANCE

- A Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

## 1.06 FIELD CONDITIONS

- A Store materials in area of installation for minimum period of 24 hours prior to installation.

## PART 2 PRODUCTS

## 2.01 MATERIALS

- A CPT-1 Tile Carpeting: Fusion bonded, manufactured in one color dye lot.
  - 1. Product: Landform Tile manufactured by ShawContract.
  - 2. Tile Size: 24 by 24 inch, nominal.
  - 3. Thickness: 0.230 inch.
  - 4. Color: As indicated on drawings.
  - 5. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
  - 6. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
  - 7. Maximum Electrostatic Charge: 3.5 Kv. at 20 percent relative humidity.
  - 8. Primary Backing Material: Polypropylene.

## 2.02 ACCESSORIES

- A Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.
- B Edge Strips: Rubber, color as selected by Architect.
- C Adhesives:
  - 1. Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI (GLP) certified; in lieu of labeled product, independent test report showing compliance is acceptable.
- D Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

**3.02 PREPARATION**

- A Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
- C Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- D Vacuum clean substrate.

**3.03 INSTALLATION**

- A Starting installation constitutes acceptance of subfloor conditions.
- B Install carpet tile in accordance with manufacturer's instructions.
- C Blend carpet from different cartons to ensure minimal variation in color match.
- D Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E Lay carpet tile in ASHLAR pattern, with pile direction parallel to next unit, set parallel to building lines.
- F Fully adhere carpet tile to substrate.
- G Trim carpet tile neatly at walls and around interruptions.
- H Complete installation of edge strips, concealing exposed edges.

**3.04 CLEANING**

- A Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 9113  
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Surface preparation.
- B Field application of paints.
- C Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
- D Do Not Paint or Finish the Following Items:
  - 1. Items factory-finished unless otherwise 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. Floors, unless specifically indicated.
  - 6. Glass.
  - 7. Concealed pipes, ducts, and conduits.

1.02 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 MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.
- C SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).
- D SSPC-SP 2 - Hand Tool Cleaning 2018.
- E SSPC-SP 13 - Surface Preparation of Concrete 2018.

1.03 SUBMITTALS

- A See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide complete list of 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 installation instructions.
  - 5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.
- C Samples: Submit three paper "draw down" 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. Allow 30 days for approval process, after receipt of complete samples by Architect.
- D Manufacturer's Instructions: Indicate special surface preparation procedures.
- E Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- F Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
  - 3. Label each container with color in addition to the manufacturer's label.

1.04 QUALITY ASSURANCE

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

- B Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience and approved by manufacturer.

#### 1.05 MOCK-UPS

- A See Section 01 4000 - Quality Requirements, for general requirements for mock-up.
- B Provide panel, 3 feet long by 3 feet wide, illustrating paint color, texture, and finish.
- C Provide door and frame assembly illustrating paint color, texture, and finish.
- D Locate where directed by Architect.
- E Mock-up may remain as part of the work.

#### 1.06 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 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.

#### 1.07 FIELD CONDITIONS

- A Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.
- 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 paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E Provide lighting level of 80 ft candles measured mid-height at substrate surface.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A Provide paints and finishes from the same manufacturer to the greatest extent possible.
- B Paints:
  1. Base Manufacturer: Sherwin-Williams Company: [www.sherwin-williams.com](http://www.sherwin-williams.com)
  2. Products meeting or exceeding the requirements from the following are acceptable:
  3. Benjamin Moore & Co: [www.benjaminmoore.com](http://www.benjaminmoore.com) .
  4. PPG Paints: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
  5. Rodda Paint Company: [www.roddapaint.com/#sle](http://www.roddapaint.com/#sle).
- C Primer Sealers: Same manufacturer as top coats.
- D Substitutions: See Section 01 6000 - Product Requirements.

#### 2.02 PAINTS AND FINISHES - GENERAL

- A Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
  1. Provide paints and finishes 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 paint material in quantity required to complete entire project's work from a single production run.
  5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.
- B Volatile Organic Compound (VOC) Content:

1. Provide paints and finishes 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.
    - b. Architectural coatings VOC limits of Oregon.
  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.
  - C Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
  - D Colors: As indicated on drawings.
- 2.03 PAINT SYSTEMS - EXTERIOR
- A Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including unprimed and concrete, primed metal, and STUCCO.
    1. Two top coats and one coat primer on unprimed surfaces.
    2. EC-1 Top Coat(s): Exterior Light Industrial Coating, Water Based, at steel columns, balcony guardrails, ramp guardrails and handrails.
      - a. Products:
        - 1) Sherwin-Williams Pro Industrial DTM Acrylic, Eg-Shel. (MPI #161)
    3. EC-2 Top Coat(s): Exterior Pigmented Elastomeric, Water Based; MPI #113, exposed wall concrete at ramp, and stucco re-paint. (Do not paint concrete ramp)
      - a. Products:
        - 1) Sherwin-Williams Conflex XL Smooth. (MPI #113)
        - 2) Substitutions: Section 01 6000 - Product Requirements.
    4. Primer: As recommended by top coat manufacturer for specific substrate.
- 2.04 ACCESSORY MATERIALS
- A Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
  - B Patching Material: Latex filler.
  - C Fastener Head Cover Material: Latex filler.
- PART 3 EXECUTION
- 3.01 EXAMINATION
- A Do not begin application of paints and finishes 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. Report any condition that may potentially effect proper application.
  - D If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
  - E Test shop-applied primer for compatibility with subsequent cover materials.
  - F 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. Exterior Plaster and Stucco: 12 percent.
    2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
- 3.02 PREPARATION
- A Clean surfaces thoroughly and correct defects prior to 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 or repair existing paints or finishes that exhibit surface defects.
  - D Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.



- E Seal surfaces that might cause bleed through or staining of topcoat.
- F Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G Concrete:
  - 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
  - 2. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.
- H Galvanized Surfaces:
  - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
  - 2. Prepare surface according to SSPC-SP 2.
- I Ferrous Metal:
  - 1. Solvent clean according to SSPC-SP 1.
  - 2. Shop-Primed Surfaces: 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.
  - 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

### 3.03 APPLICATION

- A Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E Apply each coat to uniform appearance.
- F Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.
- G Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- H Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

### 3.04 CLEANING

- A Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

### 3.05 PROTECTION

- A Protect finishes until completion of project.
- B Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 9123  
INTERIOR PAINTING

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A Surface preparation.
- B Field application of paints.
- C Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
- D Do Not Paint or Finish the Following Items:
  - 1. Items factory-finished unless otherwise 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, bar code labels, and operating parts of equipment.
  - 5. Floors, unless specifically indicated.
  - 6. Glass.
  - 7. Concealed pipes, ducts, and conduits.

## 1.02 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 D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.
- C MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.
- D SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).
- E SSPC-SP 2 - Hand Tool Cleaning 2018.

## 1.03 SUBMITTALS

- A See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide complete list of 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 installation instructions.
  - 5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.
- C Samples: Submit three paper "draw down" 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. Allow 30 days for approval process, after receipt of complete samples by Architect.
- D Manufacturer's Instructions: Indicate special surface preparation procedures.
- E Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- F Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
  - 3. Label each container with color in addition to the manufacturer's label.

## 1.04 QUALITY ASSURANCE

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

- B Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience and approved by manufacturer.

#### 1.05 MOCK-UP

- A See Section 01 4000 - Quality Requirements, for general requirements for mock-up.
- B Provide panel, 3 feet long by 3 feet wide, illustrating paint color, texture, and finish.
- C Provide door and frame assembly illustrating paint color, texture, and finish.
- D Locate where directed by Architect.
- E Mock-up may remain as part of the work.

#### 1.06 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 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.

#### 1.07 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 Provide lighting level of 80 ft candles measured mid-height at substrate surface.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A Provide paints and finishes from the same manufacturer to the greatest extent possible.
- B Paints:
  - 1. Base Manufacturer: Sherwin-Williams Company: [www.sherwin-williams.com](http://www.sherwin-williams.com)
  - 2. Products meeting or exceeding the requirements from the following are acceptable:
  - 3. Benjamin Moore & Co: [www.benjaminmoore.com](http://www.benjaminmoore.com) .
  - 4. PPG Paints: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
  - 5. Rodda Paint Co: [www.rodmapaint.com/#sle](http://www.rodmapaint.com/#sle).
- C Primer Sealers: Same manufacturer as top coats.
- D Substitutions: See Section 01 6000 - Product Requirements.

#### 2.02 PAINTS AND FINISHES - GENERAL

- A Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
  - 1. Provide paints and finishes 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 paint material in quantity required to complete entire project's work from a single production run.
  - 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B Volatile Organic Compound (VOC) Content:
  - 1. Provide paints and finishes 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.
    - b. Architectural coatings VOC limits of Oregon.

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.
  - C Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
  - D Colors: As indicated on drawings.
- 2.03 PAINT SYSTEMS - INTERIOR
- A Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, wood, uncoated steel, shop primed steel, galvanized steel, aluminum, and acoustical ceilings.
    1. Two top coats and one coat primer.
    2. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, 141, or 142.
      - a. Products:
        - 1) IC-1 Sherwin-Williams Pre-Catalyzed Waterbased Epoxy, Semi-Gloss. (MPI #141) at bathrooms
    3. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.
      - a. Products:
        - 1) IC-2 Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Flat at ceilings
        - 2) IC-3 Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Low Sheen. (MPI #144) at all other locations.
    4. Primer: As recommended by top coat manufacturer for specific substrate.
- 2.04 ACCESSORY MATERIALS
- A Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
  - B Patching Material: Latex filler.
  - C Fastener Head Cover Material: Latex filler.
- PART 3 EXECUTION
- 3.01 EXAMINATION
- A Do not begin application of paints and finishes until substrates have been adequately 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. Report any condition that may potentially affect proper application.
  - D If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
  - E Test shop-applied primer for compatibility with subsequent cover materials.
  - F Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
    1. Gypsum Wallboard: 12 percent.
    2. Plaster and Stucco: 12 percent.
    3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
    4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
- 3.02 PREPARATION
- A Clean surfaces thoroughly and correct defects prior to 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 or repair existing paints or finishes that exhibit surface defects.
  - D Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
  - E Seal surfaces that might cause bleed through or staining of topcoat.

- F Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
  - G Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
  - H Plaster: 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 Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
  - J Galvanized Surfaces:
    - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
    - 2. Prepare surface according to SSPC-SP 2.
  - K Ferrous Metal:
    - 1. Solvent clean according to SSPC-SP 1.
    - 2. Shop-Primed Surfaces: 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. Re-prime entire shop-primed item.
  - L 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.
  - M Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.
- 3.03 APPLICATION
- A Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
  - B Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
  - C Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
  - D Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
  - E Apply each coat to uniform appearance in thicknesses specified by manufacturer.
  - F Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
  - G Sand wood and metal surfaces lightly between coats to achieve required finish.
  - H Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
  - I Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
- 3.04 CLEANING
- A Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- 3.05 PROTECTION
- A Protect finishes until completion of project.
  - B Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 9300  
STAINING AND TRANSPARENT FINISHING

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A Surface preparation.
- B Field application of stains and transparent finishes.

## 1.02 RELATED REQUIREMENTS

- A Section 06 0120 - Maintenance of Finish Carpentry

## 1.03 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 MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

## 1.04 SUBMITTALS

- A See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B Coordinate submittals with the requirements of Section 06 0120, and submission of Refinishing Plan.
- C Product Data: Provide complete list of products to be used, with the following information for each:
  - 1. Manufacturer's name, product name and/or catalog number, and general product category.
- D Samples: Submit two samples, illustrating selected colors and sheens for each system with specified coats cascaded. Submit on actual wood substrate to be finished, 2 x 2 inch in size.
- E Certification: By manufacturer that stains and transparent finishes comply with VOC limits specified.
- F Manufacturer's Instructions: Indicate special surface preparation procedures.
- G Manufacturer's Qualification Statement.
- H Applicator's Qualification Statement.

## 1.05 QUALITY ASSURANCE

- A Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience and approved by manufacturer.

## 1.06 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 stain or transparent finish, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C Stain and Transparent Finish 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.

## 1.07 FIELD CONDITIONS

- A Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by manufacturer of stains and transparent finishes.
- 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 materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.
- D Minimum Application Temperature: 50 degrees F unless required otherwise by manufacturer's instructions.
- E Provide lighting level of 80 ft candles measured mid-height at substrate surface.

## PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A Provide finishes from the same manufacturer to the greatest extent possible.

## 2.02 STAINS AND TRANSPARENT FINISHES - GENERAL

### A Finishes:

1. Provide finishes 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. Supply each finish material in quantity required to complete entire project's work from a single production run.
4. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

### B Volatile Organic Compound (VOC) Content:

1. Provide stains and transparent finishes 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.

### C Flammability: Comply with applicable code for surface burning characteristics.

### D Sheens: Match existing sheen adjacent to work requiring stains.

### E Colors: Match existing colors adjacent to work requiring stains and transparent coating.

1. Selection to be made by Architect after award of contract.

## 2.03 INTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS

### A Transparent Finishes and Stains:

1. Basis of Design: Sherwin-Williams Company: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
2. Other Approved manufacturers:
  - a. Behr Process Corporation: [www.behr.com/#sle](http://www.behr.com/#sle).
  - b. PPG Paints: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
3. Substitutions: See Section 01 6000 - Product Requirements.

### B Finish on Wood - Vertical Surfaces:

1. 2 coat(s) varnish over 1 coat(s) stain.
2. Stain: Semi-Transparent Stain for Wood, Oil Based
  - a. Minwax; Wood Finish Penetrating Staion 250 VOC: [www.minwax.com](http://www.minwax.com).
  - b. Substitutions: Section01 6000-Product Requirements.
3. Top Coat(s): Polyurethane Varnish, Oil Based.
  - a. Minwax; Polyurethane Wood Finish: [www.minwax.com](http://www.minwax.com).
  - b. Substitutions: Section01 6000-Product Requirements.

## 2.04 ACCESSORY MATERIALS

- ### A Accessory Materials: Cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of finished surfaces.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- #### A Do not begin application of stains and finishes 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. Report any condition that may potentially effect proper application.
- #### D Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

### 3.02 PREPARATION

- #### A Clean surfaces thoroughly and correct defects prior to 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 or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D Refer to Section 06 0120 for additional requirements to prepare surfaces with coatings.
- E 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.

### 3.03 APPLICATION

- A Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- D Sand wood surfaces lightly between coats to achieve required finish.
- E Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- F Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- G Reinstall items removed prior to finishing.

### 3.04 CLEANING

- A Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

### 3.05 PROTECTION

- A Protect finishes until completion of project.

END OF SECTION



SECTION 10 1423  
PANEL SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A Panel signage.

1.02 REFERENCE STANDARDS

- A ADA Standards - 2010 ADA Standards for Accessible Design 2010.
- B ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

1.03 SUBMITTALS

- A See Section 01 3000 - Administrative Requirements for submittal procedures.
- B Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.
- C Shop Drawings:
  - 1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
  - 2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
    - a. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
    - b. 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.
    - c. 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, indicating sign style, font, and method of attachment.
- E Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- F Manufacturer's qualification statement.

1.04 QUALITY ASSURANCE

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

1.05 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.

1.06 FIELD CONDITIONS

- A Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.02 PANEL SIGNAGE

- A Panel Signage for Mechanical Maintenance:
  - 1. Application: Room and door signs.
  - 2. Description: Flat signs with injection molded panel media, nontactile characters.
  - 3. Sign Size: As indicated on drawings.
  - 4. Total Thickness: 1/8 inch.
  - 5. Sign Edges: Bevelled.
  - 6. Corners: Radiused.

7. Color and Font, unless otherwise indicated:
    - a. Character Font: Helvetica, Arial, or other sans serif font.
    - b. Character Case: Upper case only.
    - c. Background Color: As scheduled.
    - d. Character Color: Contrasting color.
  8. Material: Plastic panel with letters and graphics silk screened onto reverse side of panel.
  9. Profile: Flat panel without frame.
  10. One-Sided Wall Mounting: Tape adhesive.
- B Panel Signage for Exits and Accessibility information:
1. Application: Exterior or Interior directional and information signs.
  2. Description: Flat signs with injection molded panel media, tactile characters.
  3. Sign Size: As indicated on drawings.
  4. Total Thickness: 1/8 inch.
  5. Sign Edges: Bevelled.
  6. Letter Edges: Squared.
  7. Corners: Radiused.
  8. Color and Font, unless otherwise indicated:
    - a. Character Font: Helvetica, Arial, or other sans serif font.
    - b. Character Case: Upper case only.
    - c. Background Color: As scheduled.
    - d. Character Color: Contrasting color.
  9. Material: One-piece injection molded acrylic plastic with raised letters and braille.
  10. Profile: Flat panel without frame.
  11. Tactile Letters: Raised 1/32 inch minimum.
  12. Braille: Grade II, ADA-compliant.
  13. One-Sided Wall Mounting: Tape adhesive.
- 2.03 SIGNAGE APPLICATIONS
- A Room and Door Signs:
1. Service Rooms: Identify with text indicated on drawings.
  2. Rest Rooms: Identify with pictograms as detailed on drawings; and braille.
- B Exit Signage:
1. Sign Type: Flat signs with applied character panel media as specified.
  2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
  3. Character Height: 1.25, unless otherwise indicated.
  4. Sign Height: 3 inches, unless otherwise indicated.
  5. Sign Width: 6 inches wide, unless otherwise indicated
  6. Text as scheduled:
    - a. At Exits: 'EXIT'.
  7. Allow for one sign as indicated on drawings, plus an additional five signs.
- 2.04 ACCESSORIES
- A Concealed Screws: Noncorroding metal; stainless steel, galvanized steel, chrome plated, or other.
- B Exposed Screws: Chrome plated.
- C Tape Adhesive: Double-sided tape, permanent adhesive.
- PART 3 EXECUTION
- 3.01 EXAMINATION
- A Verify that substrate surfaces are ready to receive work.
- B Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

- A Install in accordance with manufacturer's instructions.
- B Install with horizontal edges level.
- C Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 2800  
TOILET, BATH, AND LAUNDRY ACCESSORIES

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A Commercial toilet accessories.

**1.02 RELATED REQUIREMENTS**

- A Section 06 1053: Concealed supports for accessories.

**1.03 REFERENCE STANDARDS**

- A ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service 2015a (Reapproved 2019).
- B ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

**1.04 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 Samples: Submit two samples of each accessory, illustrating color and finish.
- D Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A Commercial Toilet, Shower, and Bath Accessories:
  - 1. Basis of Design: Bobrick: <https://www.bobrick.com>  
Substitution products from the following manufacturers meeting the requirements are acceptable:
  - 2. American Specialties, Inc: [www.americanspecialties.com/#sle](http://www.americanspecialties.com/#sle).
  - 3. Bradley Corporation: [www.bradleycorp.com/#sle](http://www.bradleycorp.com/#sle).
  - 4. Substitutions: Section 01 6000 - Product Requirements.

**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.
- B Keys: Provide 2 keys for each accessory to Owner.
- C Stainless Steel Sheet: ASTM A666, Type 304.
- D Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

**2.03 FINISHES**

- A Stainless Steel: Satin finish.
- B Back paint components where contact is made with building finishes to prevent electrolysis.

**2.04 COMMERCIAL TOILET ACCESSORIES**

- A Toilet Paper Dispenser: Roll-in-reserve type, designed to allow automatic activation of reserve roll when needed, or manual activation by pressing release bar, recessed, stainless steel unit with pivot hinge, tumbler lock.
  - 1. Products:
    - a. Contura Series, B-4288.
    - b. Substitutions: Section 01 6000 - Product Requirements.
- B Paper Towel Dispenser: Folded paper type, stainless steel, fully-recessed, with viewing slots on sides as refill indicator.
  - 1. Capacity: 300 C-fold or 400 multifold minimum.
  - 2. Products:
    - a. Trimline Series, B-35903.
    - b. Substitutions: Section 01 6000 - Product Requirements.

- C Soap Dispenser: Liquid soap dispenser, wall-mounted, recessed, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator and special key for opening.
  - 1. Minimum Capacity: 50 ounces.
  - 2. Products:
    - a. Contura Series, B-4063.
    - b. Substitutions: Section 01 6000 - Product Requirements.
- D Seat Cover Dispenser: Stainless steel, recessed, reloading by concealed opening at base.
  - 1. Minimum capacity: 250 seat covers.
  - 2. Products:
    - a. Contura Series, B-4221.
    - b. Substitutions: Section 01 6000 - Product Requirements.
- E Grab Bars: Stainless steel, smooth surface.
  - 1. Standard Duty Grab Bars:
    - a. Push/Pull Point Load: 250 pound-force, minimum.
    - b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
    - c. Finish: Satin.
    - d. Length and Configuration: As indicated on drawings.
- F Sanitary Napkin Disposal Unit: Stainless steel, recessed, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
  - 1. Products:
    - a. Contura, B-435.
    - b. Substitutions: Section 01 6000 - Product Requirements.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A Verify existing conditions before starting work.
- B Verify exact location of accessories for installation.
- C See Section 06 1053 for installation of blocking in walls.

#### 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.

#### 3.04 PROTECTION

- A Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 4400  
FIRE PROTECTION SPECIALTIES

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A Fire extinguishers.
- B Fire extinguisher cabinets.
- C Accessories.

**1.02 REFERENCE STANDARDS**

- A NFPA 10 - Standard for Portable Fire Extinguishers 2022.

**1.03 SUBMITTALS**

- A See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, color and finish, and installation instructions.
- C Shop Drawings: Indicate locations of cabinets, cabinet physical dimensions, and rough-in measurements for recessed cabinets.
- D Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- E Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

**1.04 FIELD CONDITIONS**

- A Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A Fire Extinguishers:
  - 1. Potter-Roemer; #3005: [www.potterroemer.com/#sle](http://www.potterroemer.com/#sle).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B Fire Extinguisher Cabinets and Accessories:
  - 1. Potter-Roemer; Loma Style #7308: [www.potterroemer.com/#sle](http://www.potterroemer.com/#sle).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 FIRE EXTINGUISHERS**

- A Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
- B Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
  - 1. Class: A:B:C type.
  - 2. Size: 5 pound.
  - 3. Finish: Baked polyester powder coat, Red color.
  - 4. Temperature range: Minus 40 degrees F to 120 degrees F.

**2.03 FIRE EXTINGUISHER CABINETS**

- A Cabinet Construction: Non-fire rated.
- B Cabinet Configuration: Semi-recessed type.
  - 1. Interior nominal dimensions of 9 inch wide by 18 inch high by 4 inch deep.
  - 2. Projected Trim: Returned to wall surface, with 2 inch projection, and 1.375 inch wide face.
- C Door Glazing: Acrylic plastic, clear, 1/8 inch thick, full view bubble shape and set in resilient channel glazing gasket.
- D Fabrication: Weld, fill, and grind components smooth.
- E Finish of Cabinet Exterior Trim and Door: Baked enamel, Red color.
- F Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

- A Lettering: FIRE EXTINGUISHER decal, or vinyl self-adhering, vertical, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.01 EXAMINATION

- A Verify existing conditions before starting work.
- B Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A Install in accordance with manufacturer's instructions.
- B Install cabinets plumb and level in wall openings, 42 inches from finished floor to opening handle.
- C Secure rigidly in place.
- D Place extinguishers in cabinets.

END OF SECTION

SECTION 12 3600  
COUNTERTOPS

## PART 1 GENERAL

## 1.01 SECTION INCLUDES

- A Countertops for architectural cabinet work.

## 1.02 RELATED REQUIREMENTS

- A Section 06 4100 - Architectural Wood Casework.

## 1.03 REFERENCE STANDARDS

- A ANSI A208.1 - American National Standard for Particleboard 2022.
- B ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2022.
- C AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).
- D AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards 2021, with Errata.
- E ISFA 2-01 - Classification and Standards for Solid Surfacing Material 2013.
- F NEMA LD 3 - High-Pressure Decorative Laminates 2005.

## 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, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Specimen warranty.
- C Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
- D Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.
- E Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- F Installation Instructions: Manufacturer's installation instructions and recommendations.
- G Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

## 1.05 QUALITY ASSURANCE

- A Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A Store products in manufacturer's unopened packaging until ready for installation.
- B Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

## 1.07 FIELD CONDITIONS

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

## PART 2 PRODUCTS

## 2.01 COUNTERTOPS

- A Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B SURF-1 Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
  - 1. Flat Sheet Thickness: 1/2 inch, minimum.
  - 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout



thickness.

- a. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
  - b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
  - c. Color and Pattern: As indicated on drawings.
3. Other Components Thickness: 1/2 inch, minimum.
  4. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
  5. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

## 2.02 MATERIALS

- A Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf minimum density; minimum 3/4 inch thick; join lengths using metal splines.
- B Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- C Joint Sealant: Mildew-resistant silicone sealant, white.

## 2.03 FABRICATION

- A Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
  1. Join lengths of tops using best method recommended by manufacturer.
  2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
  3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
  1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
  2. Height: 4 inches, unless otherwise indicated.
- C Solid Surfacing: Fabricate tops and wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

## 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.
- C Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

### 3.02 PREPARATION

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

### 3.03 INSTALLATION

- A Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B Attach epoxy resin countertops using compatible adhesive.
- C Seal joint between back/end splashes and vertical surfaces.

### 3.04 TOLERANCES

- A Variation From Horizontal: 1/8 inch in 10 feet, maximum.
- B Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C Field Joints: 1/8 inch wide, maximum.

### 3.05 CLEANING

### 3.06 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

SECTION 220000  
COMMON WORK RESULTS FOR PLUMBING

PART 1 – GENERAL

1.1 APPLICABLE REQUIREMENTS

- A. All work to be furnished and installed under this section shall comply with Division 01 – General Requirements when available. If not available, the Contractor shall meet the requirements of these specifications.
- B. Where the Owner-Contractor Agreement contradicts this division, the more stringent shall apply.

1.2 RELATED REQUIREMENTS

- A. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, including state/local building code, mechanical code, plumbing code, electrical code, fire code, and energy code.

1.3 GENERAL

- A. Work included in 22 00 00 applies to Division 22 work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of plumbing systems for proposed project.
- B. Contract Documents include, but are not limited to, Specifications, Drawings, Addenda, Owner/Engineer Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.
- C. In the event there is a discrepancy between the drawings, specifications, and current code, the more stringent shall apply.
- D. Examine the Drawings, specifications and other Contract Documents relating to the Work and the work of all trades and become fully informed as to the extent and character of work required. Coordinate all work with that of others to ensure proper and complete installation of all materials, equipment and supports.
- E. Intent:
  - 1. The intent of the Contract Documents is for the Contractor to include all work necessary for the complete Plumbing systems, tested **and ready for operation (hereinafter "Design Intent")**.
  - 2. Provide all items not specifically shown on the drawings, called for in the specifications or related Contract Documents, but required to conform to the labor, material and equipment to achieve the Design Intent.
  - 3. Provide all scaffolding, access provisions, tools, appliances, consumables, fees, permits and licenses, debris removal/disposal, supervision and labor, including required start-up, check-out and training to provide complete and fully operable systems in full compliance with the Contract Documents.
  - 4. Before submitting a bid and prior to the start of work, Contractor shall examine all conditions relating to the **Work, including that associated with the work of other trades upon which Contractor's work** may rely or otherwise depend, to achieve the Design Intent, in accordance with the best trade practices, workmanship and highest quality product installation, taking into account the sequence of the work, delivery, storage and hoisting requirements, requirements for access, testing and temporary services and all other site limitations and project complexities. Report to the Architect/Engineer any conditions which might prevent installation of materials and/or equipment in the manner intended by the Contract Documents or contrary to applicable codes, standards or regulations.
  - 5. By submitting a bid, the Contractor represents that it has made a thorough examination of the site, of the work, including that associated with the work of other trades, all existing conditions and limitations, and that it has examined the Contract Documents in complete detail and has determined beyond doubt that the drawings, specifications, and existing conditions are sufficient, adequate and satisfactory for the construction of the work under the Contract.

6. No consideration or allowance will be granted for any alleged misunderstanding of materials, equipment or components to be furnished or work to be done; it being agreed that tender of proposal carries with it agreement to items, terms and conditions required by the Contract Documents.
7. Where minor adjustments of the work are necessary for purposes of fabrication or installation of items, or resolution of conflicts between items within the intent of the Contract Documents, the Contractor shall make such adjustments with no added compensation. Where such adjustments affect functional or aesthetic design of the work, they shall first be submitted to the Architect for review and approval.

F. Site Visit:

1. Contractor shall visit the site and verify the exact conditions relating to the work and obtain such information as may be necessary to present a complete and comprehensive bid. No allowance will be made for any **extra expense due to Contractor's failure to make such a visit and reasonably verify all actual/existing conditions**. In the event of a conflict between existing conditions and the requirements of the Contract Documents, perform the necessary work to conform to Design Intent. The Owner or his representative will be the sole individual to interpret the intent of the Drawings in the event of a conflict between (1) existing conditions and those shown on the drawings, or (2) quality of existing material and quality of material indicated on the drawings or in the specifications. Wherever a conflict such as this occurs, the higher standard shall prevail.

G. Conditions:

1. Conform to all Bidding Requirements and general conditions.
2. The Contractor is obligated to comply with the above in addition to the requirements of this Section.
3. Modifications by this Section do not nullify any other portions of the above-referenced conditions.

H. Make complete system installation, connecting to all equipment shown on the plans, or called for in the specifications. Contractor to provide any additional extra valves not shown on plans to obtain design criteria as required for a complete system and by the balancing contractor.

I. Drawings:

1. Drawings do not attempt to show all aspects of building construction, which will affect the installation of the systems. The drawings are diagrammatic and do not intend to show all offsets and fittings that may be required for a complete installation. Locations of equipment, pipes, valves, traps, ductwork, etc. shown on the drawings, shall be followed as closely as conditions will permit. Review all project drawings, including, but not limited to, architectural, structural, plumbing and electrical drawings; and coordinate with all trades involved so there is no conflict with work of other trades and so Owner secures best arrangement of work consistent with use of space.
2. Verify exact distances between points shown on drawings by actual measurement at site, as no extra cost will be allowed for differences between actual measurements and scaled measurements.
3. Changes in design, configuration, or location of equipment, piping, or ductwork, advisable in the opinion of Contractor, shall be submitted to Architect/Engineer for approval before proceeding with work, with written assurance from other trades that such changes will not interfere with their installation, nor cause any extra cost on their part. Such changes shall be made at no additional cost to Owner.
4. Check location of all work of all trades and avoid interferences. Conflicts shall be reported to Architect/Engineer for decision and direction. Special attention is called to the following items:
  - . Exact location of outlets shown on architectural details.
  - a. Location of suspended ceilings.

#### 1.4 SPECIAL REQUIREMENTS

- A. When applicable, Contractor acknowledges the ongoing operations of the Owner at or in close proximity to the **Project and agrees to coordinate the timing of the Work with the Owner's ongoing operations; perform the Work in a manner that minimizes or eliminates and adverse impact upon the Owner's ongoing operations; confine**

operations at the site to areas approved by Owner, permitted by law, permits and the Contract Documents; comply **with the Owner's standard** security, health and safety policies and procedures; not unreasonably encumber the site with any materials or equipment; and not place signs or advertising on or about the site without prior approval of Owner.

- B. Where applicable, all seismic construction, restraints, bracing, mounts and hanging systems shall be in full **compliance with the requirements of all Authorities Having Jurisdiction (AHJ's)**, pre-approval, certification and engineering (including certified engineering calculations and stamps). Contractor shall be solely responsible for obtaining and complying with all requirements of the AHJ.

## 1.5 DEFINITIONS AND ABBREVIATIONS

- A. Finished Spaces: Spaces other than mechanical, plumbing and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical, electrical and plumbing equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include spaces above hard or lay-in type ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The word "provide," means "furnish and install."
- G. The word "approved," means acceptance by the Architect or Engineer.
- H. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the drawings, or other paragraphs or schedules in the specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited.
- I. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted," mean directed by the Architect/Engineer, requested by the Architect/Engineer, and similar phrases.

## 1.6 REFERENCE STANDARDS AND GUIDELINES

- A. Include but are not limited to the latest adopted editions from:
1. ADA Americans with Disabilities Act
  2. AHRI Air-Conditioning Heating & Refrigeration Institute
  3. AMCA Air Moving and Conditioning Association
  4. ANSI American National Standards Institute
  5. ARI Air Conditioning and Refrigeration Institute
  6. ASHRAE American Society of Heating, Refrigerating, and Air Conditioning Engineers
  7. ASME American Society of Mechanical Engineers
  8. ASPE American Society of Plumbing Engineers
  9. ASSE American Society of Sanitary Engineering
  10. ASTM American Society of Testing Materials
  11. AWWA American Water Works Association

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| 12. | AWS    | American Welding Society  |
| 13. | CFR    | Code of Federal Regulations   |
| 14. | CISPI  | Cast Iron Soil Pipe Institute   |
| 15. | EPA    | Environmental Protection Agency   |
| 16. | FM     | Factory Mutual Engineering Corporation                                  |
| 17. | GAMA   | Gas Appliance Manufacturers Association                                 |
| 18. | IAPMO  | International Association of Plumbing & Mechanical Officials            |
| 19. | ISO    | International Organization for Standardization                          |
| 20. | MSS    | Manufacturers Standardization Society                                   |
| 21. | NEBB   | National Environmental Balancing Bureau                                 |
| 22. | NEC    | National Electric Code  |
| 23. | NEMA   | National Electrical Manufacturers Association                           |
| 24. | NFPA   | National Fire Protection Association                                    |
| 25. | OSHA   | Occupational Safety and Health Administration                           |
| 26. | SMACNA | Sheet Metal and Air Conditioning Contractors National Association, Inc. |
| 27. | UL     | Underwriters Laboratories   |

#### 1.7 SCOPE

- A. The work includes, but is not necessarily limited to, the furnishing of all labor, materials, equipment, tools, appliances, hoisting, scaffolding, supervision, for the proper execution and completion of the plumbing work and services necessary for, and reasonably incidental to, providing and installing complete piping systems, plumbing systems, and other plumbing work as shown or indicated in the Drawings and Specifications.
- B. The contractor is responsible for a complete and operational system installation. Contractor shall provide all necessary components for a complete and operational system even if such components are not specified or shown in the drawings or specifications. The contractor shall notify the Architect/Engineer of such mission for resolution prior to system installation.
- C. All new equipment and products as noted in Part 2 of each section shall be installed as per manufacturer's recommendations.
- D. Provide all additional piping, caps, and valves not shown on drawings, to maintain fully operational systems during the project at no additional cost to the owner.
- E. Consult all other Sections to determine the extent and character of this work specified else where.
- F. Make all connections to equipment requiring service from systems installed under this Section.

#### 1.8 SUBMITTALS

- A. Reference Division 1 for submittal requirements when available. If not available the contractor shall meet the requirements of these specifications.
- B. General
  - 1. Review is for general conformance with the Contract Documents and is not intended to otherwise approve or verify dimensions, quantities, or to coordinate the Work shown on shop drawings on or between Contractor and the work of other trades or Sections. Contractor is solely responsible for quantities, dimensions, means and methods. Dimensions shall be confirmed and correlated by Contractor at the jobsite prior to the start of the Work (procurement, fabrication, construction or other commencement **activities**). **Contractor's failure to fully verify conditions at the jobsite prior to commencement of the work** shall not relieve Contractor of its obligations under the Contract Documents and Contractor shall be

- responsible for all damages caused by or related to its failure to comply with the requirements of this provision.
2. Submittal review shall be performed to show compliance with the design intent. Contractor shall specifically note any deviations from the Contract Documents and explain the reason and nature of the deviation. Such deviations will be reviewed or rejected on the submittal. Deviations not so identified shall not relieve the Contractor from the requirements of the Contract Documents.
  3. Resubmittals will be reviewed for compliance with comment(s) made on the original submittal only. Architect/Engineer shall not be responsible for changes made upon resubmittal that are not clearly identified (highlighted), and responsive directly to the initial rejection. Resubmittals should not be packaged with non-related first-time submittals, all resubmittals must be marked with the resubmittal number and date and must otherwise comply with all submittal requirements.
  4. Submit shop drawings, commissioning plan(s) and checklists, penetration locations, supplemental data, etc. as may be required by the Contract Documents for all materials, equipment and other components of the work included in all Sections of this Division and other provisions of the Contract Documents in accordance with the requirements of this Division and referenced sections.
  5. All submittals must be reviewed by Contractor, and bear Contractor's review stamp and signoff for Conformity to the Contract Documents, prior to the submission of any required submittal to Architect/Engineer. Submittals that fail to meet this requirement will be considered incomplete, will not be reviewed by Architect/Engineer and will be returned to Contractor, without review and/or rejected and resubmittal will be required. Contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
  6. Forward all submittals to Architect/Engineer in a coherent, organized fashion, complete and packaged as required herein, Architect/Engineer may reject submittals that fail to comply with this or any other provision of the Contract Documents and Contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
  7. Subject to other provisions of the Contract Documents and in the absence of a more stringent requirement, Architect/Engineer will review a submittal not more than two (2) times. If a submittal is required to be reviewed more than twice due to incomplete, or incorrect information the contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
  8. Identify each submittal item by reference to Specification Section paragraph in which item is specified, or drawing/detail number, as applicable. In addition, for equipment submittals, include identification numbers appearing on the equipment schedule.
  9. Identify each item by manufacturer, brand, trade name, number, size, rating, or whatever other data is **necessary to properly identify and check materials and equipment. Words "as specified" are not** sufficient identification.
  10. Organize submittals in same sequence as they appear in specification sections, articles or paragraphs.
  11. All materials and equipment submittals shall have a summary sheet at the front complete with catalog numbers. Where materials or equipment pertain to more than one building, submittals shall clearly indicate at which locations the materials or equipment is to be installed.
  12. Submittals shall show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping and/or conduit entrance, access requirements for installation and maintenance, physical size and dimension, electrical characteristics and requirements, foundation/curbs and all permanent and temporary support details as well as all information relating to weight, including but not limited to live and dead weights and other information necessary for component verification and coordination with other trades.
    - a. Submittal Schedule – Provide a detailed submittal schedule including all requirements of this Division and its subdivisions to the Architect and Engineer within thirty (30) days of contract award.

- i. **Contractor shall submit for the Engineer's approval a Submittal Schedule for the performance** of the work that is consistent with the requirements of the project schedule. The Submittal Schedule shall allow reasonable time for the Architect and other consultants review. If the time for Architects/Engineers review is not otherwise specified, the review period (from date of receipt) shall be a minimum of ten (10) business days. Once approved by the Architect/Engineer, submittal dates and time limits established by the Submittal Schedule shall not, except for reasonable cause, be changed or exceeded by the Contractor.
  - ii. For each submittal required by the Contract Documents, the schedule shall include: specification section number, subsection/paragraph identification number, item description (as stated in the applicable specification section, subsection or other Contract Document) and the scheduled delivery date to the Architect/Engineer.
  - iii. Contractor shall be responsible to the Architect/Engineer and/or Owner for all costs, expenses and impact to the project schedule resulting from any deviation to the approved Submittal Schedule, including but not limited to: payment for required overtime, out-of-house resources/consultants or other higher cost resources of the Architect/Engineer as may be required to perform out of sequence, stacked, critical, delayed, unscheduled or multiple reviews of required submittals necessitated by rejection of a prior submittal, (cumulatively and **hereinafter, "Additional Review Costs"**)
- b. Catalog Cuts & Submittal Literature
- i. Catalog cuts, submittal literature and published material may be included to supplement scale drawings provided that the actual make and model of equipment being submitted on is identified.
  - ii. Submittal literature, drawings and diagrams shall be specifically applicable to this project and shall not contain extraneous material or optional choices. Clearly mark literature to indicate the proposed item.
- c. Shop Drawings:
- i. Shop drawings shall include all significant systems, equipment and components, including but not limited to all equipment, devices, connections and elevations. Include all related specialty rooms (i.e. mechanical, electrical, data/technology). Drawings shall be at a minimum scale of **¼" per 1'-0"** and shall be **fully coordinated with the work of other trades and/or sections**.
  - ii. Identify congested areas and clearly indicate solutions to space problems, developed in conjunction with the work of other trades and/or Sections. Identification of space problems without proposed solutions is not acceptable and is grounds for rejection. For such areas indicate, superimposed, the work of all trades and/or Sections involved and:
    1. Clearly identify each area of congestion and deviations from the Contract Documents, and:
    2. Proposed solution(s), clearly documented and signed-off by all other trades and/or Sections involved.
- d. Anchorage and Supports: Submit details and calculations for support and anchors that are not specifically detailed on the drawings. All calculations must meet current seismic and structural code.
- i. Provide details and calculations for equipment per local adopted building codes:
    1. Having an operating weight over 400 pounds or more and mounted directly to the floor.
    2. Having an operating weight over 20 pounds and suspended from the roof, floor, or wall or supported by vibration isolation devices.
  - ii. 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.
- iii. Where anchorage, support, and bracing are not detailed on the drawings, and pre-approved systems are not used, submit details and calculations of proposed systems. Include:
  1. Anchorage and Supports
    - a. Where equipment substitutions change the weight, size, configuration, or other aspects of systems and equipment that will affect the performance of anchorages and/or supports, submit calculations for proposed anchors and supports, and install them as shown in these calculations.
    - b. Where substitutions will have no effect on anchors and supports detailed on Contract Documents, submit information on sizes, weights, center of gravity and other relevant information to demonstrate this fact.
- e. **Shop Fabrication Drawings: Drawings are for the Contractor's use and shall be its responsibility. Do not submit shop fabrication documents unless specifically requested.**
- f. Testing: Coordinate Shop Drawings to include any additional components for proper system testing.
- g. Certificates: Submit final inspection certificates signed by governing authorities.
- h. Operating and Maintenance Instructions and Manuals.
  - i. Three (3) complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished to the Owner within ninety (90) days of issuance of final occupancy permit. Each set shall be electronic or permanently bound with a hard cover. The following identification shall be inscribed on the covers, "OPERATING AND MAINTENANCE INSTRUCTIONS", the name and location of the building, the name of the Contractor, and the Contract number. Flysheets shall be placed before instructions covering each subject. The instruction sheets shall be approximately 8 1/2" x 11" with large sheets of Drawings folded in.
  - ii. Instructions on major items, including but not limited to: pumps, air compressors, water heaters, water softeners, specialty units, controls, shall be by representative of manufacturer of respective equipment.
  - iii. Submit as identified below and as noted in other specification references.
    1. Names, addresses and phone numbers of contractors and subcontractors. List of all system components, with the name, address, and 24-hour phone number of the company responsible for servicing each item during the first year of operation.
    2. Complete operating and maintenance instructions and parts lists of all equipment and component parts. Data sheets to show all connections, ratings, characteristics, wiring connections, catalog data on component parts whether furnished by equipment manufacturer or others, names, addresses and telephone numbers of source of supply for parts subject to wear or failure, and description of operating, test, adjustment, and maintenance procedures.
      - a. Where data sheets included in manual cover equipment, options, or other features not part of equipment actually furnished, line out these references or otherwise clearly mark so remaining text, diagrams, drawings, schedules, and similar information shall apply specifically to equipment furnished.
    3. Operating Instructions should include, but not be limited to:



- a. Normal starting, operational and shutdown procedures, including emergency procedures for each type of equipment/system.
  - b. Equipment wiring and control diagrams.
  - c. All other items as may be specified/required by this Section and the Contract Documents.
4. Maintenance Instructions
- a. All items as may be specified/required by this Section and the Contract Documents.
5. Manufacturers Data (each piece of equipment)
- a. Installation instructions
  - b. Drawings & specifications
  - c. Parts List, including recommended stock and long lead parts/components.
  - d. Wiring and riser diagrams.
  - e. Warranties and guarantees for all equipment, materials and components, including repair, replacement and labor from both Contractor and manufacturer as required by the Contract Documents.
  - f. Certificates of Installation – **manufacturer's certification of supervision** during equipment installation and start-up procedures.
  - g. All other items as may be specified/required by this Section and the Contract Documents.
- i. Record Documents.
- i. Maintain one (1) complete set of prints and specifications at the job site exclusively for recording deviations from the drawings which are necessary because of job conditions, request for information and/or approved change orders. Record locations and depths of buried and concealed system components from fixed, easily identifiable objects, such as building walls or other fixed physical objects. Where systems are concealed in walls or other fixed physical objects, indicate distances from building corners or other building features not likely to be disturbed by fixture alterations.
  - ii. Submit Record Drawings within 90 days of system acceptance by owner.
- j. Drawings, specifications (as-builts) and approved submittals.
- i. Where the project uses a BIM model the contractor shall keep the model updated in a similar fashion, maintaining the current project record as described above and submit, in addition to all other requirements of this Section and other provisions of the Contract Documents a complete and accurate BIM model for the project.
  - ii. Prior to Substantial Completion, obtain from the Architect a complete set of printed drawings at **the Contractor's cost. Record all revisions to these drawings to indicate as-built conditions. Indicate all changes, including RFI's, on this set of documents. Submit one set of blueprints of** these revised drawings for review. Make necessary changes and deliver to Architect one set of electronic documents, including any BIM model, upon Final Completion and Acceptance.
  - iii. All test reports, certifications, and inspection reports.
  - iv. AHJ/Specialty AHJ Approvals (i.e. Fire Marshal and/or Fire Department system approvals).
  - v. Substantial and Final inspection certificate signed by governing authorities.
  - vi. All other items as may be specified/required by this Section and/or other provisions of the Contract Documents.

## 1.9 EQUIPMENT DEVIATIONS AND SUBSTITUTIONS

- A. Substitutions will only be considered after project award. No substitutions will be considered during bid and/or negotiation periods.
- B. No substitutions will be allowed and/or considered unless the description of a product includes the phrase **“approved equal” and then only upon a determination as to equivalency and impact upon the project budget**, schedule and the work of others, including any redesign of the project or its system components by the Architect, Engineer or other trades. The final determination as to sufficiency or acceptance of any such substitution and/or deviation properly requested and submitted by Contractor will lie solely with the Architect/Engineer. Contractor may not implement substitutions that have not been approved by Architect/Engineer.
- C. Unless specified elsewhere in the Contract Documents, a minimum of two (2) weeks shall be allowed for evaluation of any substitution. The burden of all systems re-engineering/design, testing, suitability and constructability is solely placed upon the Contractor for all deviations from the basis of design as reflected in the Contract Documents.
- D. If approved by Architect/Engineer, all such redesign, including all new drawings and detailing required, will be prepared by the Architect/Engineer and their sub-consultants for Change Order documentation for approval by Owner and the Authority Having Jurisdiction will be paid by the Contractor as part of the Deviation Review Costs.
- E. When the Engineer approves a substitution, the approval is given with the understanding that the Contractor guarantees the article or material substituted to be equal to or better in every respect than the article or material specified. The Contractor shall also assume complete responsibility that the article or material will fit the job as far as space, access, and servicing requirements.
- F. Where several materials are specified by name for one use, select for use any of those so specified subject to compliance with specified requirements.
- G. Whenever item or class of material is specified exclusively by detail specification, trade name, manufacturer's name or by catalog reference, use only such item, unless written approval is given. Submit written requests in accordance with these and referenced specifications.
- H. Make no substitutions for materials, articles or process required under contract unless written approval is obtained.

## 1.10 COORDINATION

- A. Prior to construction, coordinate installation and location of systems, devices and equipment with architectural and structural requirements, and other trades (including ceiling suspension, and tile systems), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.
- B. Drawings and corresponding electronic media are diagrammatic and indicate the general arrangement of systems and work included in the Work. Consult the drawings, details and other electronic media for locations of fixtures and equipment; where same are not definitely located, obtain this information from the Architect/Engineer.
- C. Take all dimensions from Architectural and Structural Drawings, certified equipment drawings and from the actual field measurements before fabricating work. All conflicts shall immediately be reported to the Architect/Engineer. Contractor is solely responsible for conflicts known or which reasonably should have been known but not reported or resolved before commencement of the work.
- D. Coordinate connection of systems with interior/exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- E. Before submitting a bid for the work the Contractor shall visit the site and become familiar with all the work on other related Drawings and Specifications, and plan the work to provide the best possible assembly of the combined work of all trades. No additional costs will be considered for work which has to be relocated due to conflicts with other trades.
- F. If, after examination of the bidding documents relating to the work, the Contractor has queries concerning the nature and scope of the work or intent of the Specifications, he/she shall promptly request clarification from the

Architect/Engineer. After contract award, claims of ignorance of the intent and scope of the contract shall not be allowed.

- G. Contractor is responsible for coordinating the schedule of inspections by Engineer at appropriate stages of construction such as rough-in, pre-final, and final, and at other times required by the Specifications or by the construction. Notify Architect and Engineer seven (7) days in advance of proposed site visit. Notification constitutes certification that construction is, or will be, complete and ready for observation. In the event that construction is not ready for observation, contractor shall bear the cost of additional site visits.

#### 1.11 COORDINATION DRAWINGS

- A. Detail major elements, components, systems, equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
  - a. Planned system distribution layout, including specialty device locations and access for operation
  - b. Clearances for installing and maintaining insulation.
  - c. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
  - d. Equipment and accessory service connections and support details.
  - e. Other systems installed in same space.
  - f. Exterior wall and foundation penetrations.
  - g. Fire-rated wall and floor penetrations.
  - h. Ceiling and wall-mounted access doors and panels required to provide access to operating devices or items needing access for proper maintenance
  - i. Sizes and location of required concrete pads and bases.
  - j. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
  - k. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

#### 1.12 SEQUENCING AND SCHEDULING

- A. Coordinate equipment installation with other building components.
- B. Arrange for space, chases, slots, and openings in building structure during progress of construction to allow for distribution system installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of all materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
- E. Some equipment may require temporary installation during one phase and require relocation to final location under another phase. Provide all associated labor and materials to accommodate this phasing.
- F. Coordinate connection of all systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate requirements for access panels and doors if items requiring access are concealed behind finished surfaces. Access panels and doors will be required.

#### 1.13 ACCESSIBILITY

- A. Contractor is responsible for verifying that equipment and devices will fit within the space shown on the drawings. Contractor shall locate all equipment which must be serviced, operated or maintained, in fully accessible locations.
- B. Minor deviations from the drawings may be made to allow for better accessibility, but changes of magnitude or which involve extra cost shall not be made without approval from the Architect/Engineer.

#### 1.14 QUALITY ASSURANCE

- A. Regulatory Requirements: Work and materials installed shall conform with all local, State, Federal and other applicable laws and regulations.
- B. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.
- C. Installer Qualifications: Company specializing in performing the work of this section. Company personnel shall be approved by manufacturer for all product installations and required training.
- D. Conform to all applicable standards, codes and regulation and industry best practice requirements.
- E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.
- F. **All materials and equipment shall be new, shall bear manufacturer's name, and shall conform to the grade, quality and standards specified herein.** Type, capacity and application shall be suitable and capable of satisfactory operation for the purpose intended. All equipment and components shall include UL label and/or marking on **equipment body/device including manufacturer's name, pressure rating(s), electrical classification(s), limits and ratings** as applicable to individual components for the purpose specified and intended.
- G. Equipment Selection: Equipment allowed by the specifications but with different electrical characteristics, physical dimensions, capacities, and/or ratings than what is shown on the Drawings may be furnished, provided such proposed equipment is approved in writing and connecting plumbing and electrical services, such as pipe and/or duct connection sizes, circuit breakers, conduit, motors, bases, and equipment spaces are revised to accommodate such equipment. Maintain a minimum duct length of three straight diameters at all fan inlets and outlets. All expenses shall be borne by the Contractor. Specified minimum energy ratings and/or equipment efficiencies must meet design and commissioning requirements.
- H. ASME Compliance: ASME listed water heaters and boilers with an input of 200,000 BTUH and higher, hot water storage tanks which exceed 120 gallons, and hot water expansion tanks which are connected to ASME rated equipment or required by code or local jurisdiction.
- I. Provide safety controls required by National Boiler Code (ASME CSD 1) for boilers and water heaters with an input of 400,000 BTUH and higher.
- J. **Listing and labeling: Provide motors that are listed and labeled. Terms "listed and labeled": as defined by UL, NEC, Article 100 or other applicable recognized agency as specified in the Contract Documents.**
- K. Cutting & Patching: Unless otherwise required by the Contract Documents, Contractor shall be responsible for all cutting, fitting and patching required to complete the Work, or to make portions of the Work and existing conditions fit together properly, and all such areas shall be restored to the conditions existing prior to the cutting, fitting and patching unless otherwise provided in the Contract Documents
- L. Lead Free Requirements: Contractor shall endeavor to use lead free products and where required by law, ordinance, regulation or standard all materials products and practices shall comply with limitations and requirements as to the allowable limits and/or percentages of lead. Lead free products must be certified by and independent 3<sup>rd</sup> party.
- M. This provision shall apply to any and all similarly regulated materials, products and practices that may be considered hazardous or are otherwise regulated by applicable law, ordinance regulation or standard in the project local.

#### 1.15 DELIVERY, STORAGE, AND HANDLING

- A. All materials and equipment shall be adequately covered and protected against dirt, water, chemical or mechanical damage, and theft. At completion, all work, equipment and materials shall be cleaned, and damage repaired by Contractor. Damaged equipment will be replaced by the contractor if Owner does not accept repairs done to the equipment. Such replacement shall be scheduled to minimize building system interruption of occupied or scheduled for occupancy.
- B. Material delivered at the site shall not be left exposed to the weather or left unattended. Deliver pipes, tubes and conduit with factory-applied end-caps. Contractor shall be responsible to maintain end-caps or provide temporary end caps on all open-ended piping, tubes and conduit through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.
- C. Protect bright finished shafts, bearing housings and similar items until in service.
- D. Protect plastic pipes and materials from sunlight and support to prevent sagging and bending.
- E. Elevate stored materials above grade. When stored inside, do not exceed structural capacity of the floor.
- F. Provide protective coatings to materials to prevent damage and/or infiltration of moisture and dirt on all materials and equipment including but not limited to cast iron and steel valves.
- G. Contractor shall check the openings in the building and the size of the doors, passages, and openings through which equipment is to be admitted. Wherever necessary, he shall provide the equipment in sections or knocked down in order to admit the equipment through these openings.
- H. Contractor shall provide all rigging, erection and hoisting equipment as required to handle or place equipment and piping in position. This rigging and hoisting equipment shall only be attached and placed on the structure in locations as approved by Architect/Engineer at the site.

#### 1.16 PERMITS AND FEES

- A. Contractor shall arrange and pay for all permits, fees, and inspections required to perform the Work. The Contractor shall present the Owner with properly signed certificates of final inspection before the Work will be accepted.
- B. Contractor shall call for all inspections by local building official(s) when they become due, and shall not cover any work until approved by these governing authorities.
- C. Contractor shall make all arrangements with utility companies for water, steam, gas and drainage services, etc., associated with the work and include required payments for meters, piping, services, connection charges and materials furnished and installed by utility companies. Work and materials shall be in strict accordance with rules of respective authorities.

#### 1.7 DOCUMENT OWNERSHIP

- A. The Drawings and Specifications, combined with the calculations, field data, notes, and reports, are the intellectual and real property of the Architect and/or Engineer. This covers all forms of written and recorded or electronic media. The reuse of these documents without specific permission of the Architect and Engineer is prohibited. The Drawings may be employed by the Owner and Contractor for the express use of constructing, commissioning and operating the facility only upon proper execution of an Agreement for Use of Electronic Files & Data.

#### 1.8 GUARANTEE AND WARRANTY

- A. Contractor warrants to Owner that the materials and equipment provided under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects. Work, materials and equipment not conforming to these requirements, including substitutions not properly approved by Change Order, shall be considered defective. This warranty excludes remedy for damage caused by improper or insufficient maintenance, improper operation or normal wear, tear and usage. Contractor shall assign to Owner, or otherwise assure the Owner has the full benefit of, all warranties and guarantees of manufacturer, subcontractors, sub-subcontractors and suppliers, and Contractor shall perform the Work in a manner that does not adversely affect or invalidate any available warranties or guarantees.

- B. Contractor shall warrant and guarantee all work against faulty material or workmanship for a period of one (1) year from the date of final completion and written acceptance by the Owner, unless specified more stringently elsewhere in the Contract Documents.
- C. If the project is occupied or the systems placed in operation in several phases at the request of the Owner, the guarantee of each system or piece of equipment used shall begin on the date each system or piece of equipment was placed in satisfactory operation, tested, commissioned and accepted, in writing, by the Owner. The use of building equipment for temporary service and testing or phases of work completed prior to the projects final completion and acceptance by the Owner does not constitute the commencement of the warranty period.
- D. If a defect or deficiency in the Work is discovered within the one (1) year Warranty & Guarantee period or within such longer period as may be prescribed by the Laws or by any specific guarantee, and Owner elects to have Contractor correct such defect or deficiency, Owner shall notify Contractor of such defect or deficiency in writing. This period of correction relates only to the specific obligation to correct defects and deficiencies and in no way **otherwise limits the Contractor's responsibility** for Work that is not in accordance with the Contract Documents, If Contractor fails to timely correct defects or deficiencies in the Work, Owner may, at its sole option, correct them and charge contractor for all cost therefore.
- E. Specific exclusions, if any, from this one (1) year warranty and guarantee period are listed in the individual specification sections.

#### 1.9 LIMITATIONS OF LIABILITY

- A. To the extent any of the following provisions are not more stringently included in the Contract Document the following Limitations of Liability shall apply:
- B. **Architect/Engineer is not responsible for Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, and is not responsible for Contractor's failure to perform or furnish the work in accordance with the Contract Documents.**
- C. **In the event that Architect/Engineer's employees or sub-consultants make comments or issue warnings about safety issues, such comments and warnings shall be considered to have been offered by a Good Samaritan and shall not impose any obligation or responsibility.**
- D. Engineer will not be responsible for the acts or omissions of Owner, Contractor, any subcontractor, any supplier, or of any other person or organization performing or furnishing any of the portions of the work
- E. Contractor understands and acknowledges that Engineer is not authorized to order extra work or issue Change Orders to the work, however in the event and to the degree that Engineer may offer advice, suggestions, and opinions Contractor shall not rely on such advice, suggestions, and opinions unless directed in writing by Owner or its designated representative, and shall, in no event, make any claim against the Engineer for any such advice, suggestions, and opinions.
- F. To the fullest extent permitted by law, Contractor shall indemnify and hold harmless Architect, Engineer, and their joint ventures, officers, directors, partners, employees and agents from and against any and all claims, costs, loses and damages (including but not limited to all fees and charge of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused in whole or in part by the negligent acts or omissions of Contractor, **Contractor's officers, directors, partners, employees, agents; or contractor's subcontractors or material men in the performance of Work. Contractor shall direct its insurer to list Architect, Engineer, and their joint ventures, as Additional Insureds on general liability insurance policies covering this project. Prior to commencing work, Contractor shall submit copies of its certificate of insurance to both Architect and Engineer.**

#### 1.10 SAFETY

- A. Contractors must conduct a weekly safety meeting with their employees and provide documentation as to attendance and topics of discussion. Engineer's construction support services do not constitute review or approval of Contractor's safety procedures. Contractor shall comply with all OSHA regulations. Contractor is required to obtain and pay for insurance required to cover all activities within Contractor's Scope of Work.

#### 1.11 TEMPORARY CONSTRUCTION WATER

- A. The Plumbing Contractor shall make all arrangements and provide necessary facilities for the temporary construction water from the Owner's source. Costs for the temporary construction water shall be paid for by Owner.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

- A. See Drawings for equipment data, capabilities, and requirements. Manufacturers are identified for the purpose of establishing quality; alternative manufacturers of equal quality are acceptable. If alternative manufacturers **are proposed it is the contractor's responsibility to verify and demonstrate the proposed alternative is equivalent.**
- B. Provide like items from one manufacturer, including but not limited to pumps, fans, valves, control devices, air handlers, vibration isolation devices, etc.

### 2.2 MATERIALS

- 3. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL approved or have adequate approval or be acceptable by State, County, and City authorities. Provide all materials omitted herein but necessary to complete the work.
- D. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.
- E. All electrical materials shall bear the label of, or be listed by, the Underwriters' Laboratories (UL), unless the material is of a type for which label or listing service is not provided.
- F. Hazardous Materials: Comply with local, State of California, and Federal regulations relating to hazardous materials. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

### 2.3 ACCESS PANELS

- A. Confirm Access Panel requirements in individual Division 22 sections. Comply with the following:
  - 1. Provide flush mounting access panels for service of systems and individual components requiring maintenance or inspection. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly. Ceiling access panels to be minimum of 24 x 24 or as required and approved size. Wall access panels to be minimum of 12 x 12 or as required and approved size.

### 2.4 DRAIN PANS

- A. Provide drip pans under all hot water heaters, above-ceiling inline pumps, cooling coils and heat recovery coils. **Locate pan immediately below piping and equipment, and extend a minimum of 6" on each side and lengthwise 18" beyond equipment being protected. Pans shall be 2" deep and fabricated from reinforced sheet metal (20 gauge copper or 20 gauge steel with two ounces zinc finish hot dipped after fabrication) with rolled edges and soldered or welded seams. Provide 3/4" copper drainage piping, properly discharged to floor drain, hub drain, or as shown on Drawings. Provide condensate pumps as necessary. Comply with California Mechanical Specialty Code for overflow protection and pipe sizing.**

### 2.5 GUARDS

- A. Provide guards in accordance with State Safety Code and OSHA requirements over all rotating equipment including belts, shafts and couplings. Drive guards over belts and sheaves shall include 2-1/2" diameter access opening at shaft ends for speed counter.

### 2.6 PENETRATION FIRE STOPPING

- A. Through-penetration fire stopping system tested and listed by Underwriters Laboratories. 3M, Metacaulk, SpecSeal, or approved equivalent.
- B. Select system for proper application based on wall construction, type of penetrating item, wall rating, etc.

## 2.7 MISCELLANEOUS STEEL

- A. Provide all steel as required for adequate support of all equipment. Use standard angle or channel, I or H sections as required by application. Adequately cross-braced and welded pipe stands may be used for tank supports. Provide suitable base plates for all stands and anchors for all hanging equipment. Drill or burn support holes only in flanges of structural shapes and only in one leg of any one angle, and as far from center of length as possible.
- B. Paint: Apply one coat of black Rustoleum primer to shop fabricated items before delivery to the job; other painting as specified herein.

## PART 3 – EXECUTION

### 3.1 GENERAL PLUMBING INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of plumbing systems, materials, and equipment. Comply with the following requirements:
- B. Coordinate systems, equipment, and materials installation with other building components.
- C. Verify all dimensions by field measurements.
- D. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for system installations.
- E. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
- F. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.
- G. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
- H. Coordinate connection of systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
- I. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
- J. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
- K. Install equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
- L. Install access panel or doors where units are concealed behind finished surfaces. Coordinate with other divisions.
- M. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
- N. Do not install piping in elevator machine rooms, electrical and/or communication rooms unless it directly services that room.

### 3.2 CONTINUITY OF SERVICE



- A. Contractor, in the performance of the Work shall plan for and incorporate into the work the continuity of services. Where the continuity of service(s) is required to be interrupted Contractor shall plan and schedule the work to minimize interruptions to the facility and its normal operations, prearrange and coordinate all **outages/interruptions with Owner's representative, utilities and the work of others. Requests for system interruptions/outages must be submitted at least (5) days prior to intended shutdown time and then subject to Owner's adjustment and/or approval.**
- B. For connections that require a significant interruption to facility operations (as determined by the Owner), Contractor shall provide for **Owner's** written approval a detailed plan, schedule and description of the work for each system interruption. The plan shall include a description and schedule of each work item to be completed, designation of site supervisor and contact information, designated work crew as well as facility access and egress points for materials, manpower and equipment, contingency plan for parts, materials and equipment as well as a program to restore systems in the event of unplanned disruption or inability to complete the work in the timeframe scheduled and approved by Owner. Contractor shall confirm scheduled dates with the Owner and provide a minimum of five (5) days advance notice for each operation.
- C. Where possible and subject to Owners sole discretion, connections to existing systems shall be performed during normal operating conditions. Unless required otherwise (specifications, code, practice, etc.) all tap **connections shall be 'live', 'wet' or 'hot', with the proper safety programs and procedures** for isolating system components to ensure the safety of the workforce, occupants and the facility.
- D. Contractor shall include all costs for overtime labor, expedited materials, equipment and contingency planning as necessary to maintain continuity of services, schedule and complete necessary connections. Contractor shall also include provisions for maintaining any and all supplemental systems that may be required to remain in service for the safety, protection and critical operations of the facility and its occupants including but not limited to: Fire Alarm, Security, Phone/Data, BAS, Emergency Power and similarly related critical or emergency systems. Such provisions shall include but not be limited to temporary power, lighting, materials, equipment and/or installations (including removal and cleanup thereof) required to maintain such systems and as required to safely and properly complete the work.
- E. Contractor shall be liable for any and all damages resulting from unscheduled outages/interruptions or for those not confined to the pre-approved timeframes to complete the work.

### 3.3 DEMOLITION

- A. Comply with individual Division 22 sections and the following:
  - 1. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas.
  - 2. Existing Conditions: Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to exactly locate and preserve utilities. Replace damaged items with new material to match existing. Promptly notify Owner if utilities are found which are not shown on Drawings.
  - 3. Equipment: Unless otherwise directed, equipment, fixtures, or fittings being removed as part of demolition process are Owner's property. Remove other items not scheduled to be reused or relocated from job site as directed by Owner.
  - 4. Unless specifically indicated otherwise on Drawings, remove exposed, unused systems to behind finished surfaces (floor, walls, ceilings, etc.). Cap and patch surfaces to match surrounding finish.
  - 5. Unless specifically indicated otherwise on Drawings, remove unused equipment, fixtures, fittings, rough-ins, and connectors. Removal is to be to a point behind finished surfaces (floors, walls, and ceilings).
- B. If duct, pipe, insulation, conduits, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Reuse of Materials: Reuse of materials is prohibited unless specifically indicated or approved by Architect.
- D. Notify Architect in discovery of any hazardous materials.

- E. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

### 3.4 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General: Install piping systems as described below, unless piping Sections specify otherwise. Individual Division 22 piping Sections specify unique piping installation requirements.
- B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.
- C. Install piping at indicated slope.
- D. Install components with pressure rating equal to or greater than system operating pressure.
- E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
- F. Install piping free of sags and bends.
- G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- I. Install piping to allow application of insulation plus 1-inch clearance around insulation.
- J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- K. **Install flexible connectors according to manufacturer's written instructions and where indicated and specified in other Division 22 sections.**
- L. **Install flexible expansion loops according to manufacturer's written instructions and where indicated and specified in other Division 22 sections.**
- M. Install fittings for changes in direction and branch connections.
- N. Install couplings according to manufacturer's written instructions.
- O. Install Portable Instrument Connections in all piping systems where DDC temperature and/or pressure sensors and thermometers and/or pressure gauges are located.
- P. Do not route piping through elevator equipment rooms, unless specifically allowed by local authority.
- Q. Do not route piping over electrical panels, transformers, switchgear or other electrical equipment.
- R. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
  - 1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish. Use split-casting escutcheons if required, for existing piping.
  - 2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
  - 3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
  - 4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
  - 5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.
- S. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - a. Cut sleeves to length for mounting flush with both surfaces.

1. Exception: Extend sleeves installed in floors of Plumbing equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
2. Build sleeves into new walls and slabs as work progresses.
3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
  - a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
  - b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.
  - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. If available, refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.
    1. Seal space outside of sleeve fittings with non-shrink, nonmetallic grout.
      - i. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.
    2. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and Plumbing sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing Plumbing sleeve seals.
      - i. Install steel pipe for sleeves smaller than 6 inches in diameter.
      - ii. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
      - iii. Assemble and install Plumbing sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
    3. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe **penetrations using Plumbing sleeve seals. Size sleeve for manufacturer's recommended clear space between pipe and sleeve.**
      - i. Assemble and install Plumbing sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
      - ii. Caulk exterior side of annular space once the Plumbing sleeve seal is in place using an elastomeric joint sealant.
4. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials. If available, Refer to Division 7 Section "Firestopping" for materials.
5. Verify final equipment locations for roughing-in.
6. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
7. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
  - i. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
  - ii. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
  - iii. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."

- iv. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
  - v. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - vi. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
  - vii. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
  - viii. Align threads at point of assembly.
  - ix. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
8. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- i. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators.
  - ii. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench to recommended torque values.
9. Piping Connections: Make connections according to the following, unless otherwise indicated:
- i. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
  - ii. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
  - iii. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  - iv. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.
10. Identification
1. Valves:
    - . Attach 1 1/2" square brass tags stamped with designating number 1/2" high, filled in with red enamel, to each valve.
    - a. Securely fasten valve tag to valve spindle or handle with a brass chain.
  2. Schedules and Charts:
    - . Furnish to Owner's representative three (3) complete framed plastic laminated valve tag schedules. Schedule shall indicate tag number, valve location by floor and nearest column number, valve size and fire area controlled.
    - a. Furnish three (3) framed plastic laminated diagrammatic charts showing schematically the complete sprinkler system, with major control valves and valve numbers.
    - b. Furnish one (1) framed plastic laminated placard at each sprinkler riser, indicating the basic hydraulic data as required by NFPA 13 or local Fire Marshal.

3. Piping Identification:
    - . Apply color coded polyvinyl chloride pipe bands identifying service and direction of flow.
    - a. On exposed piping, apply bands at 20'0" on centers at straight runs, at valve locations, and at points where piping enters and leaves a partition, wall, floor, or ceiling.
    - b. On concealed piping installed above removable ceiling construction, apply bands in manner described for exposed piping.
    - c. On concealed piping installed above non-removable ceiling construction, or in pipe shafts, apply bands at valves or other devices that are made accessible by means of access doors or panels.
    - d. Apply bands at exit and entrance points at each piece of equipment.
    - e. Band widths shall be 8" for pipes up to 10" diameter, and 16" for larger diameter piping. Letter heights stating service shall be pre-printed on band, 3/4" high for 8" bands and 1 1/4" high for 16" bands.
    - f. Colors shall conform to ASA Standard A13.1.
    - g. Tags and bands shall be approved for this service.
  4. Sprinkler Drains and Test Connection
  5. Provide all necessary drain valves, drain risers, capped nipples, auxiliary piping, etc. as required to drain the system risers and mains, and all trapped portions of the system. Drain valves which are not connected to drain pipes leading to floor drains shall be hose end type.
  6. Main drains and test connections shall be piped to spill on/in floor drain or grade on concrete splash block.
  7. Provide all piping required to spill the drains and test connections to the floor, funnel or other drainage connections provided under the plumbing contract, or arrange with the plumbing trade to provide additional drainage facilities, in which case pay all charges related to the additional plumbing construction work.
- 3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS
- A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
  - B. Install equipment according to approved submittal data.
  - C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
  - D. Install Plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
  - E. Install equipment giving right of way to piping installed at required slope.
- 3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGE
- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor Plumbing materials and equipment.
  - B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."
- 3.7 DRAWINGS
- A. The Drawings show the general arrangement and location of the piping and equipment. Work shall be installed in accordance with the Drawings, except for changes required by conflicts with the work of other trades. The Contractor shall provide for the support, expansion, and pitch of any rearranged piping in conformance with the intent of the Drawings, Specifications, and codes.
  - B. Note that certain mechanical work is shown, wholly or in part, on Architectural Drawings.

- C. Mechanical Drawings are diagrammatic and are intended to show the approximate location of equipment and piping. Dimensions shown on Drawings shall take precedence over scaled dimensions on Drawings. All dimensions shall be verified in the field by the Contractor.
- D. The exact location of apparatus, equipment, and piping shall be ascertained from the Owner or the representative in the field, and work shall be laid out accordingly. Should the Contractor fail to ascertain such locations the work shall be changed at Contractor's own expense when so ordered by the Owner. The Engineer reserves the right to make minor changes in the location of piping and equipment up to the time of installation without additional cost.
- E. It is the intention of the Drawings and Specifications that, where certain mechanical items such as unions, expansion joints, and other mechanical components are not shown, but where such items are required by the nature of the work, shall be furnished and installed.
- F. The Mechanical Drawings and Specifications are intended to supplement each other. Any material or labor called for in one shall be furnished even though not specifically mentioned in the other.
- G. Pipe and duct sizes shown are the minimum allowable and shall be increased in size if required by code or wherever necessary to meet unusual conditions.

#### I DAMAGE

1. Repair any damage to the building, premises, and equipment occasioned by the work under this Section.
2. Repair all damage to any part of the building or premises caused by leaks or breaks in pipe, or malfunctions of equipment furnished or installed under this Section until the warranty period expiration date.

#### II. EARTHWORK

1. General: Perform earthwork required for installation of new work below grade in accordance with referenced specifications.
2. Excavate trenches to uniform widths to provide a working clearance on each side of the pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated. Grade trench bottoms to provide uniform bearing and support for each section of pipe. Form holes and depressions for joints after trench bottom has been graded. Provide temporary pumping equipment to keep excavation free from water. Install pipe bedding in rock excavation consisting of not less than 6 inch of sand or equivalent material.
3. Provide bracing and shoring as necessary.
4. Backfill trenches only after completion of pressure tests and inspection. Carefully compact material under pipe and bring backfill evenly up on both sides and along the full length of piping or conduit. Cover to 12-inch thickness over top of pipe. Fill and tamp remainder of backfill material in 6-inch layers. Provide backfill materials generally consisting of clean earth or sand relatively free of clods or stones. For sewer and water piping, use pea gravel. For gas piping, use sand. Backfill under, around, and to 6 inch above top of piping.
5. Compact soil to 6-inch layer (maximum) loose thickness of backfill. Where roadway or parking area surfaces will be placed over backfill, provide moisture conditions, which will produce compacted density of 95 percent of maximum density. Elsewhere, 90 percent. Test in accordance with Divisions 1 and 2 (if available) and code (most stringent to prevail).
6. Take special care in compacting under services where they enter building to prevent settling. Contractor fully responsible for damage to piping and property as a result of settling around service piping.
7. Dispose surplus materials off-site in a suitable location.
8. Place and maintain barricades, construction signs, torches, lanterns, and guards as required during periods of open excavation to protect persons from injury and to avoid property damage.
9. Leave premises thoroughly clean at completion of earthwork.

10. Wherever piping is to be installed in areas, which have been excavated below pipe inverts, for any purpose, install piping to prevent subsequent settlement. Do not install piping until backfill is to full compaction, completed to minimum 18 inch above installed pipe. Install piping in re-excavated trenches and backfill as previously specified.

### III. CONCRETE WALLS AND CONCRETE FOOTINGS

1. Where pipes must pass through concrete walls and footings, they shall pass through SDR 35 PVC pipe sleeves with 1/2" annular space set in place at time of construction.
2. Sheetmetal sleeves set into concrete walls: Provide steel frame around opening where required by Structural Engineer.
3. Coordinate core drilled openings with other divisions. Coordination shall include location, size, and spacing of openings. No slot openings will be allowed. Coordinate openings to avoid critical structural items such as reinforcing bars, tensioning tendons, etc.

### IV. ELECTRICAL REQUIREMENTS - CONTROLS AND COORDINATION WITH ELECTRICAL CONTRACTOR

1. Contractor shall coordinate with the Electrical Contractor on furnishing and installing of controls, motors, starters, etc. Coordinate means informing Electrical Contractor of items requiring electrical connection, providing copies of submittal data, installation data, scheduling work to insure efficient progress, and promptly supplying those items to be installed by Electrical Contractor.
2. The specific requirements for electrical power and/or devices for each and every piece of mechanical and plumbing equipment requiring electrical service, supplied and/or installed under this Contract, shall be coordinated and verified with the Mechanical and Plumbing Drawings, the Mechanical and Plumbing Sections of these Specifications, and with the manufacturers of the mechanical and plumbing equipment supplied. This shall include the voltage, phase, and ampacity; conduit requirements; and exact location and type of disconnect, control, and/or connection required. Any changes from the Drawings and Specifications required as a result of this coordination shall be part of this Contract.
3. Electrical Contractor shall furnish and install the following for all mechanical equipment:
  - a. Conduit and wiring for line voltage power to the equipment.
  - b. Disconnect switches.
  - c. Manual motor starters.
  - d. Magnetic motor starters when part of a motor control center. See Division 26 and Drawings for further information.
4. The work under this Section shall include furnishing and installing all controls on low and manual line voltage, including thermostats, auxiliary switches, relay wiring, interlock wiring; equipment control panels and transformers; and controls conduit unless specifically indicated as part of other work. Materials and methods of the control installation shall be in accordance with the Electrical Specifications.
5. The Mechanical Contractor shall review all wiring connections which have any influence on this equipment or work and verify that these connections are correct before permitting any equipment to be operated which is furnished, installed, or modified under this Contract.

### V. ELECTRICAL EQUIPMENT ROOM PRECAUTIONS

1. Ductwork or piping for mechanical systems shall not be installed in any switchgear room, transformer vault, telephone room or electric closet except as indicated. In any case, no ductwork or piping for mechanical systems shall be installed in the space equal to the width and depth of any electrical service equipment, switchboards, panel boards, or motor control centers and extending from the floor to a height of six feet above the equipment or to the structural ceiling, whichever is lower.

### VI. CUTTING AND REPAIRING

1. No cutting shall be done except with approval. Cutting of structural members or footings is prohibited without the prior written consent of the Structural Engineer.
2. Where cutting of paving, walls, ceilings, etc. is necessary for the installation of the mechanical work, it shall be done under the direction of this Section. Damage caused by this cutting shall be repaired to match original and adjacent surfaces without additional expense to the Owner. Cutting of new construction shall be by the installing Contractor of that construction as directed by this Contractor.

#### VII. ACCESSIBILITY

1. General: Valves, damper operators, filters, thermometers, pressure gauges, clean-out fittings, and indicating equipment or specialties requiring reading, adjusting, inspection, repairing, removal, or replacement shall be conveniently and accessibly located with reference to finished building. Thermometers and gauges installed to be easily read from floor.
2. Panels: No unions, flanges, valves, dampers, controls, or equipment shall be placed in a location that will be inaccessible after the system is complete. Access panels or doors shall be provided where required whether or not shown on Drawings.
3. Access Panels in Walls or Ceilings:
  - a. Provide access panels in walls or ceilings. Milcor or approved equal, where indicated and where required to provide access to valves, dampers, and other appurtenances. Panels shall be style as selected by and as directed by wall or ceiling construction. Panel size shall be 24" x 24" unless indicated otherwise. Panels in acoustical barriers shall have same transmission loss as barrier. Panels in rated construction shall have same rating as construction in which installed.
  - b. Door panels shall be no lighter than 14 gauge steel. Doors shall be equipped with concealed spring hinges and flush, screwdriver operated locks, except that key operated locks shall be used for all access doors in walls where door is within 6'0" of floor. Locks for all key operated doors shall be keyed alike.
  - c. Doors in ceramic tile surfaces shall be stainless steel or chrome plated. Doors in other finished surfaces shall be prime coated.
4. Equipment Spaces: Provide aisles between equipment and piping, ducts, electrical gear, etc. for complete service and inspection of equipment. Maintain minimum 6'6" headroom in all access aisles. Maintain minimum 36" clearance at all service panels. Provide minimum clearances at electrical equipment per NEC. Provide 36" wide, 3/4" thick plywood covered catwalks in attics from access door to equipment.

#### VIII. TESTING

1. Test all piping, ductwork, equipment, and systems as called for in the Specifications. Notify and inspection authorities prior to testing so that they may be witnessed. Protect all personnel and equipment during testing. Where Specifications do not cover specific points or methods, conform to manufacturer's specifications.

#### IX. OPENINGS

1. Locating and sizing of all openings for pipe, conduit and ductwork through walls, roof, etc. shall be done under this Division. Framing of openings shall be done by the respective trades in whose work the opening is made.

#### X. EQUIPMENT

1. All equipment shall be accurately set and leveled. Supports shall be neatly placed and properly fastened. All equipment shall be fastened in place with bolts.
2. Keep all openings closed with plugs or caps to prevent entrance of foreign matter. Protect all piping, ductwork, fixtures, and equipment against dirt, water, chemical, or mechanical damage both before and



after installation. Any equipment or apparatus damaged prior to final acceptance shall be restored to original condition or replaced at the discretion and at no additional cost to the Owner.

3. Start-Up: Equipment shall be adjusted, lubricated, aligned, etc. prior to start-up. Inspect each piece of equipment prior to start-up. Start each piece of equipment in accordance with manufacturer's directions and warranty requirements.
4. Finish: Protect all equipment and materials until in use. Any visible rust or corrosion shall be removed as directed prior to installation. All damaged factory painted finishes shall be cleaned and painted with manufacturer provided paint.

#### XI. MANUFACTURER'S DIRECTIONS

1. Materials and equipment shall be installed in accordance with manufacturer's application and recommendations, requirements, and instructions, and in accordance with Contract Documents. Where manufacturer's instructions differ from those indicated or specified, they shall be brought to attention for resolution prior to equipment ordering and installation.
2. Where requirements indicated in Contract Documents exceed manufacturer's requirements, Contract Documents shall govern.

#### XII. FURRING AND PIPE SPACES

1. Spaces provided in the design of the building shall be utilized and the work shall be kept within the furring lines established on the Drawings.
2. Layout: Maintain maximum head room under piping and equipment. Contractor to coordinate line locations with beams, windows, etc. to provide maximum clearance. From Drawings, ascertain heights of suspended ceilings and size of pipe shafts in which piping is concealed, and location and size of structural members in and adjacent to pipe shafts. Coordinate piping installation with ductwork, lighting, and other equipment. Ensure necessary clearances on trim plates at exposed penetrations of walls and floors. If sufficient room is not available above suspended ceiling or vertical shafts obtain clarification from before work is started.

#### XIII. CLEAN-UP

1. During the course of work under this Section, all rubbish, debris, surplus materials, tools, etc. resulting from this work shall be removed from work area and shall be disposed of off-site at the end of each working day. The Owner's premises shall be left clean and in a condition acceptable to the .
2. Clean all work installed under this Contract to satisfaction of Owner and submit documentation that each system has been cleaned and results witnessed by the representative.
3. All water distribution and piping systems, including those for cold water and hot water systems, shall be flushed thoroughly until piping is cleaned to satisfaction of the . See other Specification Sections for additional requirements.

#### XIV. ENGRAVED NAMEPLATES

1. Furnish and install plastic laminated engraved nameplates with 1/4" minimum lettering at panel mounted control devices, manual control stations, power disconnects, motor starters and pieces of equipment. Nameplates exposed to weather shall be engraved brass.

#### XV. FINAL INSPECTION

1. The Contractor shall furnish the certificates of final inspection and approval from the inspection authorities having jurisdiction.

#### XVI. SITE VISITS BY ENGINEER

1. Engineer's responsibility is limited to normal construction support services only, consisting of office consultation, site visits, and reports at appropriate stages of construction such as rough-in, pre-final, and final.

2. If the Engineer is requested for a site visit and the work performed to that point is not able to be reviewed, requiring an additional site visit, all costs incurred by the Engineer for additional site visits or office shall be paid for by that Contractor.

END OF SECTION

## SECTION 220516

## EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

## PART 1 - GENERAL

## 1.1 SECTION INCLUDES

- A. Flexible pipe connectors.
- B. Expansion joints and compensators.
- C. Pipe loops, offsets, and swing joints.

## 1.2 REFERENCE STANDARDS

- A. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250 2015.
- B. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard 2017.
- C. EJMA (STDS) - EJMA Standards Tenth Edition.
- D. UL (DIR) - Online Certifications Directory Current Edition.

## PART 2 - PRODUCTS

## 2.1 FLEXIBLE PIPE CONNECTORS - COPPER PIPING

- A. Inner Hose: Bronze.
- B. Exterior Sleeve: Braided bronze.
- C. Pressure Rating: 125 psi and 450 degrees F (862 kPa and 232 degrees C).
- D. Joint: Flanged.
- E. Size: Use pipe sized units.
- F. Application: Copper piping.

## 2.2 EXPANSION JOINTS - TWO-PLY BRONZE BELLOWS TYPE

- A. Construction: Bronze with anti-torque device, limit stops, internal guides.
- B. Pressure Rating: 125 psi and 400 degrees F (862 kPa and 204 degrees C).
- C. Maximum Compression: 1-3/4 inches (45 mm).
- D. Maximum Extension: 1/4 inch (6 mm).
- E. Joint: Soldered.
- F. Size: Use pipe sized units.
- G. Application: Copper piping.

## 2.3 EXPANSION JOINTS - HOSE AND BRAID

- A. Provide flexible loops with two flexible sections of hose and braid, two 90 degree elbows, and 180 degree return with support bracket and air release or drain plug.
  
- B. Provide flexible loops capable of movement in the x, y, and z planes. Flexible loops to impart no thrust loads to the building structure.

## PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.
- C. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.
- D. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

END OF SECTION

SECTION 220517  
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Pipe sleeves.
- B. Manufactured sleeve-seal systems.

1.2 REFERENCE STANDARDS

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type) 2016.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).

1.3 QUALITY ASSURANCE

- A. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

PART 2 - PRODUCTS

2.1 PIPE SLEEVES

- A. Vertical Piping:
  - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
  - 2. Provide sealant for watertight joint.
  - 3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.
  - 4. Drilled Penetrations: Provide 1-1/2 inch (40 mm) angle ring or square set in silicone adhesive around penetration.
- B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C. Pipe Passing Through Below Grade Exterior Walls:
  - 1. Zinc coated or cast iron pipe.
  - 2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.
- D. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:
  - 1. Galvanized steel pipe or black iron pipe with asphalt coating.
  - 2. Connect sleeve with floor plate except in mechanical rooms.
- E. Clearances:
  - 1. Provide allowance for insulated piping.
  - 2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external pipe diameter.
  - 3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.2 MANUFACTURED SLEEVE-SEAL SYSTEMS

- A. Modular/Mechanical Seal:

1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
2. Provide watertight seal between pipe and wall/casing opening.
3. Elastomer element size and material in accordance with manufacturer's recommendations.
4. Glass reinforced plastic pressure end plates.

## PART 3 – EXECUTION

### 3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.

### 3.2 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Structural Considerations:
  1. Do not penetrate building structural members unless indicated.
- E. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
  1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
  2. Aboveground Piping:
    - a. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.
  3. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
  4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- F. Manufactured Sleeve-Seal Systems:
  1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
  2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
  3. Locate piping in center of sleeve or penetration.
  4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
  5. Tighten bolting for a water-tight seal.
  6. Install in accordance with manufacturer's recommendations.
- G. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

### 3.3 CLEANING

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

END OF SECTION

SECTION 220519  
METERS AND GAUGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Pressure gauges and pressure gauge taps.
- B. Thermometers and thermometer wells.
- C. Static pressure gauges.

1.2 REFERENCE STANDARDS

- A. ASME B40.100 - Pressure Gauges and Gauge Attachments 2013.
- B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers 2014.
- C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers 2014, with Editorial Revision (2017).
- D. UL 393 - Indicating Pressure Gauges for Fire-Protection Service Current Edition, Including All Revisions.

PART 2 - PRODUCTS

2.1 PRESSURE GAUGES

- A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
  - 1. Case: Steel with brass bourdon tube.
  - 2. Size: 4-1/2 inch (115 mm) diameter.
  - 3. Mid-Scale Accuracy: One percent.
  - 4. Scale: Psi and kPa.

2.2 PRESSURE GAUGE TAPPINGS

- A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi (1034 kPa).

2.3 STEM TYPE THERMOMETERS

- A. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
  - 1. Size: 9 inch (225 mm) scale.
  - 2. Window: Clear Lexan.
  - 3. Accuracy: 2 percent, per ASTM E77.
  - 4. Calibration: Degrees F.



## 2.4 DIAL THERMOMETERS

- A.** Thermometers - Fixed Mounting: Dial type bimetallic actuated; ASTM E1; stainless steel case, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
  - 1. Size: 5 inch (125 mm) diameter dial.
  - 2. Lens: Clear glass.
  - 3. Accuracy: 1 percent.
  - 4. Calibration: Degrees F.

## 2.5 TEST PLUGS

- A.** Test Plug: 1/4 inch (6 mm) or 1/2 inch (13 mm) brass fitting and cap for receiving 1/8 inch (3 mm) outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F (93 degrees C).

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A.** Install in accordance with manufacturer's instructions.
- B.** Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.
- C.** Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch (60 mm) for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- D.** Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets. Refer to Section 230943. Where thermometers are provided on local panels, duct or pipe mounted thermometers are provided on local panels, duct or pipe mounted thermometers are not required.
- E.** Provide instruments with scale ranges selected according to service with largest appropriate scale.
- F.** Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- G.** Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.
- H.** Locate test plugs adjacent thermometers and thermometer sockets.

END OF SECTION

SECTION 220523  
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Applications.
- B. General requirements.
- C. Ball valves.
- D. Butterfly valves.
- E. Check valves.
- F. Gate valves.

1.2 REFERENCE STANDARDS

- A.** API STD 594 - Check Valves: Flanged, Lug Wafer, and Butt-Welding 2017.
- B.** ASME B1.20.1 - Pipe Threads, General Purpose (Inch) 2013.
- C.** ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard 2017.
- D.** ASME B16.34 - Valves - Flanged, Threaded and Welding End 2017.
- E.** ASME B31.9 - Building Services Piping 2014.
- F.** ASTM A536 - Standard Specification for Ductile Iron Castings 1984 (Reapproved 2014).
- G.** ASTM B61 - Standard Specification for Steam or Valve Bronze Castings 2015.
- H.** ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings 2017.
- I.** MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service 2010a.
- J.** MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves 2013.
- K.** MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010.
- L.** MSS SP-125 - Gray Iron and Ductile Iron In-Line, Spring-Loaded, Center-Guided Check Valves 2010.
- M.** NSF 61 - Drinking Water System Components - Health Effects 2017.
- N.** NSF 372 - Drinking Water System Components - Lead Content 2016.

1.3 QUALITY ASSURANCE

- A.** Manufacturer:
  - 1. Obtain valves for each valve type from single manufacturer.

PART 2 - PRODUCTS

2.1 APPLICATIONS

- A. See drawings for specific valve locations.

2.2 GENERAL REQUIREMENTS

- A.** Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

- B.** Valve Sizes: Match upstream piping unless otherwise indicated.
- C.** Valve Actuator Types:
  - 1. Gear Actuator: Quarter-turn valves 8 NPS (200 DN) and larger.
  - 2. Handwheel: Valves other than quarter-turn types.
  - 3. Hand Lever: Quarter-turn valves 6 NPS (150 DN) and smaller except plug valves.
- D.** Valves in Insulated Piping: With 2 NPS (50 DN) stem extensions and the following features:
  - 1. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
- E.** Valve-End Connections:
  - 1. Threaded End Valves: ASME B1.20.1.
  - 2. Pipe Flanges and Flanged Fittings 1/2 NPS (15 DN) through 24 NPS (600 DN): ASME B16.5.
- F.** General ASME Compliance:
- G.** Source Limitations: Obtain each valve type from a single manufacturer.

## 2.3 EXAMINATION

- A.** Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
- B.** Verify valve parts to be fully operational in all positions from closed to fully open.
- C.** Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D.** Should valve is determined to be defective, replace with new valve.

## 2.4 INSTALLATION

- A.** Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B.** Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.
- C.** Install check valves where necessary to maintain direction of flow as follows:
  - 1. Lift Check: Install with stem plumb and vertical.
  - 2. Swing Check: Install horizontal maintaining hinge pin level.

END OF SECTION

SECTION 220529  
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

## PART 1 - GENERAL

## 1.1 SECTION INCLUDES

- A. Support and attachment components for equipment, piping, and other plumbing work.

## 1.2 ADMINISTRATIVE REQUIREMENTS

## A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

## B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

## 1.3 QUALITY ASSURANCE

- A. Comply with applicable building code.

## PART 2 - PRODUCTS

## 2.1 SUPPORT AND ATTACHMENT COMPONENTS

## A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor. Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Do not use wire, chain, perforated pipe strap or wood for permanent supports unless specifically indicated or permitted.
5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
  - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
  - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
  - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
  - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

- B. Metal Channel (Strut) Framing Systems:**
1. Provide factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
  2. Comply with MFMA-4.
- C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.**
1. Minimum Size, Unless Otherwise Indicated or Required:
    - a. Equipment Supports: 1/2 inch (13 mm) diameter.
    - b. Piping up to 1 inch (27 mm) nominal: 1/4 inch (6 mm) diameter.
    - c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch (10 mm) diameter.
    - d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) diameter.
- D. Thermal Insulated Pipe Supports:**
1. General Construction and Requirements:
    - a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
    - b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
    - c. Pipe supports to be provided for nominally sized, 1/2 inch to 30 inch (12.7 mm to 762 mm) iron pipes.
    - d. Insulation inserts to consist of polyisocyanurate (urethane) insulation surrounded by a 360 degree, PVC jacketing.
  2. PVC Jacket:
    - a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
    - b. Moisture Vapor Transmission: 0.0071 perm inch (0.0092 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
    - c. Thickness: 60 mil (1.524 mm).
- E. Anchors and Fasteners:**
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
  2. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    - a. Comply with MFMA-4.
    - b. Channel Material: Use galvanized steel.
    - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
  3. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A.** Verify that field measurements are as indicated.
- B.** Verify that mounting surfaces are ready to receive support and attachment components.
- C.** Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A.** Install products in accordance with manufacturer's instructions.

- B.** Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
  - C.** Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
  - D.** Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
  - E.** Unless specifically indicated or approved by Architect, do not provide support from roof deck.
  - F.** Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
  - G.** Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
  - H.** Equipment Support and Attachment:
    - 1.** Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
    - 2.** Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
    - 3.** Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
    - 4.** Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
  - I.** Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
  - J.** Secure fasteners according to manufacturer's recommended torque settings.
  - K.** Remove temporary supports.
- 3.3 FIELD QUALITY CONTROL**
- A.** Inspect support and attachment components for damage and defects.
  - B.** Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
  - C.** Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

## SECTION 220719

## PLUMBING PIPING INSULATION

## 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 insulating the following plumbing piping services:
  - 1. Domestic cold-water piping.
  - 2. Domestic hot-water piping.
  - 3. Domestic recirculating hot-water piping.
  - 4. Sanitary waste piping exposed to freezing conditions.
  - 5. Storm-water piping exposed to freezing conditions.
  - 6. Roof drains and rainwater leaders.
  - 7. Supplies and drains for handicap-accessible lavatories and sinks.
- B. Related Sections:
  - 1. Section 220716 "Plumbing Equipment Insulation" for equipment insulation.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

## 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less and smoke-developed index of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less and smoke-developed index of 150 or less.
- C. Comply with the following applicable standards and other requirements specified for miscellaneous components:
  - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

### 1.6 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

### 1.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come into contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable in accordance with ASTM C795.
- E. Mineral-Fiber, Preformed Pipe: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C547.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Johns Manville; a Berkshire Hathaway company.
    - b. Knauf Insulation.  
Owens Corning.
  - 2. Preformed Pipe Insulation: Type I, Grade A with factory-applied ASJ-SSL.
  - 3. 850 deg F
  - 4. Factory fabricate shapes in accordance with ASTM C450 and ASTM C585.
  - 5. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

### 2.2 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:



1. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.

## 2.3 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Buckaroos, Inc.
    - b. McGuire Manufacturing.
    - c. Truebro
  2. Description: Manufactured plastic wraps for covering plumbing hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  1. Verify that systems to be insulated have been tested and are free of defects.
  2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the tradesman installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless steel surfaces, use demineralized water.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet.

- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends attached to structure with vapor-barrier mastic.
  - 3. Install insert materials and insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Cut insulation in a manner to avoid compressing insulation more than 25 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches in similar fashion to butt joints.
- O. For above-ambient services, do not install insulation to the following:
  - 1. Vibration-control devices.
  - 2. Testing agency labels and stamps.
  - 3. Nameplates and data plates.
  - 4. Cleanouts.

### 3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
  - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
  - 4. Seal jacket to wall flashing with flashing sealant.

- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
  - E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
    - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
  - F. Insulation Installation at Floor Penetrations:
    - 1. Pipe: Install insulation continuously through floor penetrations.
    - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."
- 3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials, except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, Mechanical Couplings, and Unions:
  - 1. Install insulation over fittings, valves, strainers, flanges, mechanical couplings, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
  - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as that of adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as that used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
  - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
  - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers, so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
  - 6. Insulate flanges, mechanical couplings, and unions, using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Stencil or label the outside insulation jacket of each union with the word "union" matching size and color of pipe labels.
  - 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
  - 8. For services not specified to receive a field-applied jacket, except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing, using PVC tape.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as that of adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union at least 2 times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

### 3.6 INSTALLATION OF MINERAL-FIBER INSULATION

#### A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.

#### B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch and seal joints with flashing sealant.

#### C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as that of straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

#### D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as that of straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

### 3.7 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
1. Drainage piping located in crawl spaces.
  2. Underground piping.
  3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

### 3.8 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. NPS 1 and Smaller: Insulation shall be the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch.
2. NPS 1-1/4 and Larger: Insulation shall be the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch

B. Domestic Hot and Recirculated Hot Water:

1. NPS < 1 and Smaller: Insulation shall be the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 thick.
2. NPS 1 to <1-1/2": Insulation shall be the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 thick.
3. NPS 1-1/2 to <4": Insulation shall be the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1.5 thick.

C. Stormwater and Overflow:

1. All Pipe Sizes: Insulation shall be [one of] the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

D. Roof Drain and Overflow Drain Bodies:

1. All Pipe Sizes: Insulation shall be the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

E. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities: As scheduled on drawings.

F. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be [one of] the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

END OF SECTION 22 07 19

SECTION 221116  
DOMESTIC WATER PIPING

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. Copper tube and fittings.
  2. PEX tube and fittings.
  3. Piping joining materials.
  4. Transition fittings.
  5. Dielectric fittings.

1.3 ACTION SUBMITTALS

- A. Product Data:
1. Pipe and tube.
  2. Fittings.
  3. Joining materials.
  4. Transition fittings.

1.4 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.

1.5 FIELD CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
1. Notify Architect Construction Manager no fewer than two days in advance of proposed interruption of water service.
  2. Do not interrupt water service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Include marking "NSF-pw" on piping.

## 2.2 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tube: ASTM B88, Type L and ASTM B88, Type M.
- B. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings.
- C. Cast Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
- D. Wrought Copper Unions: ASME B16.22.
- E. Copper-Tube, Mechanically Formed Tee Fitting: For forming T-branch on copper water tube.
  - 1. Description: Tee formed in copper tube in accordance with ASTM F2014.
- F. Copper Tube, Pressure-Seal-Joint Fittings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Apollo Flow Controls; Conbraco Industries, Inc.
    - b. Mueller Industries, Inc.
    - c. NIBCO INC.
    - d. Viega LLC.
  - 2. Fittings: Cast-brass, cast-bronze, or wrought-copper with EPDM O-ring seal in each end.
  - 3. Minimum 200-psig working-pressure rating at 250 deg F.

## 2.3 PEX TUBE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Apollo Flow Controls; Conbraco Industries, Inc.
  - 2. HeatLink Group Inc.
  - 3. Infloor Radiant Heating Inc.
  - 4. REHAU.
  - 5. Sioux Chief Manufacturing Company, Inc.
  - 6. Uponor.
  - 7. Vanguard Piping Systems, Inc.
  - 8. Viega LLC.
  - 9. Warmboard, Inc.
- B. Fittings: ASTM F1807, metal insert and copper crimp rings ASTM F1960, cold expansion fittings and reinforcing rings.
- C. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F876; with plastic or corrosion-resistant-metal valve for each outlet.

## 2.4 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
  - 1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
  - 2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

- C. Solder Filler Metals: ASTM B32, lead-free alloys.
- D. Flux: ASTM B813, water flushable.
- E. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

## 2.5 TRANSITION FITTINGS

- A. General Requirements:
  - 1. Same size as pipes to be joined.
  - 2. Pressure rating at least equal to pipes to be joined.
  - 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Sleeve-Type Transition Coupling: AWWA C219.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Romac Industries, Inc.

## 2.6 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. A.Y. McDonald Mfg. Co.
  - 2. Standard: ASSE 1079.
  - 3. Pressure Rating: 250 psig.
  - 4. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
  - 1. Standard: ASSE 1079.
  - 2. Factory-fabricated, bolted, companion-flange assembly.
  - 3. Pressure Rating: 150 psig.
  - 4. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Insulating Kits:
  - 1. Nonconducting materials for field assembly of companion flanges.
  - 2. Pressure Rating: 150 psig.
  - 3. Gasket: Neoprene or phenolic.
  - 4. Bolt Sleeves: Phenolic or polyethylene.
  - 5. Washers: Phenolic with steel backing washers.
- E. Dielectric Nipples:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:



- a. Sioux Chief Manufacturing Company, Inc.
2. Standard: IAPMO PS 66.
3. Electroplated steel nipple complying with ASTM F1545.
4. Pressure Rating and Temperature: 300 psig at 225 deg F.
5. End Connections: Male threaded or grooved.
6. Lining: Inert and noncorrosive, propylene.

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- C. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be one of the following:
  1. Annealed-temper copper tube, ASTM B88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
- D. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 8 and larger, shall be one of the following:
  1. Annealed-temper copper tube, ASTM B88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
- E. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be one of the following:
  1. annealed-temper copper tube, ASTM B88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
- F. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:
  1. Drawn-temper copper tube, ASTM B88, Type L; wrought-copper, solder-joint fittings; and soldered joints.
  2. Drawn-temper copper tube, ASTM B88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
  3. PEX tube, NPS 1 and smaller.
    - a. Fittings for PEX tube:
      - 1) ASTM F1807, metal insert and copper crimp rings.
      - 2) ASTM F1960, cold expansion fittings and reinforcing rings.
      - 3) ASSE 1061, push-fit fittings.
- G. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be one of the following:
  1. Drawn-temper copper tube, ASTM B88, Type L; wrought-copper, solder-joint fittings; and soldered joints.
  2. Drawn-temper copper tube, ASTM B88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
- H. Aboveground domestic water piping, NPS 5 to NPS 8, shall be one of the following:

1. Drawn-temper copper tube, ASTM B88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

### 3.2 EARTHWORK

- A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

### 3.3 INSTALLATION OF PIPING

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.
- D. Install underground copper tube in PE encasement according to ASTM A674 or AWWA C105/A21.5.
- E. Install valves according to the following:
  1. Section 220523.12 "Ball Valves for Plumbing Piping."
  2. Section 220523.13 "Butterfly Valves for Plumbing Piping."
  3. Section 220523.14 "Check Valves for Plumbing Piping."
  4. Section 220523.15 "Gate Valves for Plumbing Piping."
- F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."
- G. Install domestic water piping level without pitch and plumb.
- H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- I. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- M. Install piping to permit valve servicing.
- N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- O. Install piping free of sags and bends.
- P. Install fittings for changes in direction and branch connections.
- Q. Install PEX tubing with loop at each change of direction of more than 90 degrees.

- R. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- S. Install pressure gauges on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gauges in Section 220519 "Meters and Gages for Plumbing Piping."
- T. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123 "Domestic Water Pumps."
- U. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."
- V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

### 3.4 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B828 or CDA's "Copper Tube Handbook."
- F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools and procedure recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly.
- G. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- H. Joints for PEX Tubing, ASTM: Join according to ASTM F1807 for metal insert and copper crimp ring fittings and ASTM F1960 for cold expansion fittings and reinforcing rings.
- I. Joints for PEX Tubing, ASSE: Join according to ASSE 1061 for push-fit fittings.
- J. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

### 3.5 INSTALLATION OF TRANSITION FITTINGS

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
  2. Fittings for NPS 2 and Larger: Sleeve-type coupling.
- C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition .

### 3.6 INSTALLATION OF DIELECTRIC FITTINGS

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples unions.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric nipples.
- D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

### 3.7 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for hangers, supports, and anchor devices in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- C. Install hangers for copper, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Install vinyl-coated hangers for piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- E. Install vinyl-coated hangers for PEX tubing, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- F. Support horizontal piping within 12 inches of each fitting.
- G. Support vertical runs of copper to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- H. Support vertical runs of piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- I. Support vertical runs of PEX tubing to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

### 3.8 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

### 3.9 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

### 3.10 ADJUSTING

- A. Perform the following adjustments before operation:
  1. Close drain valves, hydrants, and hose bibbs.
  2. Open shutoff valves to fully open position.
  3. Open throttling valves to proper setting.
  4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
    - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
    - b. Adjust calibrated balancing valves to flows indicated.
  5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
  6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
  7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
  8. Check plumbing specialties and verify proper settings, adjustments, and operation.

### 3.11 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
  1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
  2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Fill and isolate system according to either of the following:
      - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
      - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
    - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    - d. Repeat procedures if biological examination shows contamination.
    - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Clean non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
  - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
  - b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION

## SECTION 221316

## SANITARY WASTE AND VENT PIPING

## 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. ABS pipe and fittings.
- 2. PVC pipe and fittings.
- 3. Specialty pipe fittings.

- B. Related Requirements:

- 1. Section 221313 "Facility Sanitary Sewers" for sanitary sewerage piping and structures outside the building.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Sustainable Design Submittals:

- 1. Product Data: For adhesives, indicating VOC content.
- 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

- C. Shop Drawings: For hubless, single-stack drainage system. Include plans, elevations, sections, and details.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

- 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
- 2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

- B. Field quality-control reports.

## 1.5 FIELD CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Construction Manager's written permission.

## 1.6 WARRANTY

- A. Listed manufacturers to provide labeling and warranty of their respective products.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
  1. Soil, Waste, and Vent Piping: 10-foot head of water.
  2. Waste, Force-Main Piping: 150 psig.
- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

### 2.2 PIPING MATERIALS

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

### 2.3 ABS PIPE AND FITTINGS

- A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.
- B. Solid-Wall ABS Pipe: ASTM D 2661, Schedule 40.
- C. Cellular-Core ABS Pipe: ASTM F 628, Schedule 40.
- D. ABS Socket Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste, and vent patterns.
- E. Solvent Cement: ASTM D 2235.
  1. Solvent cement shall have a VOC content of 325 g/L or less.
  2. Solvent cement shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
  3. Solvent cement shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."



4. Solvent cement shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
5. Solvent cement shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.

## 2.4 PVC PIPE AND FITTINGS

- A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.
- B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- C. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.
- D. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- E. Adhesive Primer: ASTM F 656.
  1. Adhesive primer shall have a VOC content of 550 g/L or less.
  2. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
  3. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
  4. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
  5. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- F. Solvent Cement: ASTM D 2564.
  1. Solvent cement shall have a VOC content of 510 g/L or less.

## 2.5 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
  1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
  2. Unshielded, Nonpressure Transition Couplings:
    - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
      - 1) Dallas Specialty & Mfg. Co.
      - 2) Fernco Inc.
      - 3) Froet Industries LLC.

- 4) Mission Rubber Company, LLC; a division of MCP Industries.
  - 5) Plastic Oddities.
  - b. Standard: ASTM C 1173.
  - c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
  - d. End Connections: Same size as and compatible with pipes to be joined.
  - e. Sleeve Materials:
    - 1) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
    - 2) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
3. Shielded, Nonpressure Transition Couplings:
- a. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - 1) Cascade Waterworks Mfg. Co.
    - 2) Mission Rubber Company, LLC; a division of MCP Industries.
  - b. Standard: ASTM C 1460.
  - c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
  - d. End Connections: Same size as and compatible with pipes to be joined.
4. Pressure Transition Couplings:
- a. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - 1) Apollo Flow Controls; Conbraco Industries, Inc.
    - 2) Cascade Waterworks Mfg. Co.
    - 3) Dresser, Inc.
    - 4) EBAA Iron, Inc.
    - 5) Ford Meter Box Company, Inc. (The).
    - 6) Jay R. Smith Mfg. Co.
    - 7) JCM Industries, Inc.
    - 8) Romac Industries, Inc.
    - 9) Viking Johnson.
    - 10) Insert manufacturer's name.
  - b. Standard: AWWA C219.
  - c. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
  - d. Center-Sleeve Material: Manufacturer's standard Carbon steel Stainless steel Ductile iron Malleable iron.
  - e. Gasket Material: Natural or synthetic rubber.
  - f. Metal Component Finish: Corrosion-resistant coating or material.

## PART 3 - EXECUTION

### 3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

### 3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
  2. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
  2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
    - a. Straight tees, elbows, and crosses may be used on vent lines.
  3. Do not change direction of flow more than 90 degrees.
  4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
    - a. Reducing size of waste piping in direction of flow is prohibited.
- L. Lay buried building waste piping beginning at low point of each system.
1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
  2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
  3. Maintain swab in piping and pull past each joint as completed.
- M. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
1. Building Sanitary Waste: 2 percent downward in direction of flow for piping NPS 3 and smaller; percent downward in direction of flow for piping NPS 4 and larger.
  2. Horizontal Sanitary Waste Piping: 2 percent downward in direction of flow.
  3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- N. Install steel piping according to applicable plumbing code.
- O. Install stainless-steel piping according to ASME A112.3.1 and applicable plumbing code.

- P. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
- Q. Install aboveground ABS piping according to ASTM D 2661.
- R. Install aboveground PVC piping according to ASTM D 2665.
- S. Install underground ABS and PVC piping according to ASTM D 2321.
- T. Install engineered soil and waste and vent piping systems as follows:
1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
  2. Hubless, Single-Stack Drainage System: Comply with ASME B16.45 and hubless, single-stack aerator fitting manufacturer's written installation instructions.
  3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- U. Install force mains at elevations indicated.
- V. Plumbing Specialties:
1. Install backwater valves in sanitary waster gravity-flow piping.
    - a. Comply with requirements for backwater valves specified in Section 221319 "Sanitary Waste Piping Specialties."
  2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
    - a. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
    - b. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
  3. Install drains in sanitary waste gravity-flow piping.
    - a. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
- W. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- X. Install sleeves for piping penetrations of walls, ceilings, and floors.
  1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- Y. Install sleeve seals for piping penetrations of concrete walls and slabs.
  1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- Z. Install escutcheons for piping penetrations of walls, ceilings, and floors.
  1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

### 3.3 JOINT CONSTRUCTION

- A. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.
- B. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.
- C. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
  - 3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 appendixes.

### 3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
  - 1. Install transition couplings at joints of piping with small differences in ODs.
  - 2. In Waste Drainage Piping: Unshielded Shielded, nonpressure transition couplings.

### 3.5 VALVE INSTALLATION

- A. Comply with requirements in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping" for general-duty valve installation requirements.
- B. Shutoff Valves:
  - 1. Install shutoff valve on each sewage pump discharge.
  - 2. Install gate or full-port ball valve for piping NPS 2 and smaller.
  - 3. Install gate valve for piping NPS 2-1/2 and larger.
- C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.
- D. Backwater Valves: Install backwater valves in piping subject to backflow.
  - 1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
  - 2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.
  - 3. Install backwater valves in accessible locations.
  - 4. Comply with requirements for backwater valve specified in Section 221319 "Sanitary Waste Piping Specialties."

### 3.6 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment"
  - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
  - 2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
  - 3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.

4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
  5. Vertical Piping: MSS Type 8 or Type 42, clamps.
  6. Install individual, straight, horizontal piping runs:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
  7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  8. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Install hangers for steel stainless-steel copper soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Install hangers for ABS PVC piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- E. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- F. Support vertical runs of steel stainless-steel copper soil piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- G. Support vertical runs of ABS PVC piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

### 3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect waste and vent piping to the following:
1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
  2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
  3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
  4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
  5. Install horizontal backwater valves in pit with pit cover flush with floor.
  6. Comply with requirements for backwater valves, cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
  7. Equipment: Connect waste piping as indicated.
    - a. Provide shutoff valve if indicated and union for each connection.
    - b. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

### 3.8 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping.
- B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

### 3.9 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
  1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
    - a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.
    - a. Expose work that was covered or concealed before it was tested.
  3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
    - a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
    - b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
    - c. Inspect joints for leaks.
  4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.
    - a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg.
    - b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
    - c. Air pressure must remain constant without introducing additional air throughout period of inspection.
    - d. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  6. Prepare reports for tests and required corrective action.
- E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved.
    - a. Expose work that was covered or concealed before it was tested.
  2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials.
    - a. Isolate test source and allow to stand for four hours.
    - b. Leaks and loss in test pressure constitute defects that must be repaired.
  3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  4. Prepare reports for tests and required corrective action.

### 3.10 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed ABS PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.
- E. Repair damage to adjacent materials caused by waste and vent piping installation.

### 3.11 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be of any the following:
  1. Solid-wall Cellular-core ABS pipe, ABS socket fittings, and solvent-cemented joints.
  2. Solid-wall Cellular-core PVC pipe, PVC socket fittings, and solvent-cemented joints.
  3. Dissimilar Pipe-Material Couplings: Unshielded Shielded, nonpressure transition couplings.
- C. Aboveground, vent piping NPS 4 and smaller shall be any of the following:
  1. Solid-wall Cellular-core ABS pipe, ABS socket fittings, and solvent-cemented joints.
  2. Solid-wall Cellular-core PVC pipe, PVC socket fittings, and solvent-cemented joints.
  3. Dissimilar Pipe-Material Couplings: Unshielded Shielded, nonpressure transition couplings.
- D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:
  1. Cellular-core ABS pipe, ABS socket fittings, and solvent-cemented joints.
  2. Solid wall Cellular-core PVC pipe, PVC socket fittings, and solvent-cemented joints.
  3. Dissimilar Pipe-Material Couplings: Unshielded Shielded, nonpressure transition couplings.



- E. Underground, soil and waste piping NPS 5 and larger shall be any of the following:
1. PVC piping in first subparagraph below is limited to NPS 12 (DN 300).
  2. Solid-wall Cellular-core PVC pipe; PVC socket fittings; and solvent-cemented joints.
  3. Dissimilar Pipe-Material Couplings: Unshielded Shielded, nonpressure transition couplings.

END OF SECTION 221316

SECTION 224000  
PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Water closets.
- B. Urinals.
- C. Lavatories.
- D. Sinks.
- E. Service sinks.
- F. Under-lavatory pipe supply covers.
- G. Electric water coolers.
- H. Drinking fountains.
- I. Bathtubs.
- J. Showers.

1.2 REFERENCE STANDARDS

- A.** ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B.** ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 2011.
- C.** ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping 2015.
- D.** ANSI Z124.1.2 - American National Standard for Plastic Bathtub and Shower Units 2005.
- E.** ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use 1997 (Reaffirmed 2017).
- F.** ASME A112.18.1 - Plumbing Supply Fittings 2018.
- G.** ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures 2018.
- H.** ASME A112.19.2 - Ceramic Plumbing Fixtures 2013.
- I.** ASME A112.19.3 - Stainless Steel Plumbing Fixtures 2017.
- J.** ASME A112.19.4M - Porcelain Enameled Formed Steel Plumbing Fixtures 1994 (R2009).
- K.** ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks 2017.
- L.** ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers 2005.
- M.** ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices 2015.
- N.** ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
- O.** NSF 61 - Drinking Water System Components - Health Effects 2017.
- P.** NSF 372 - Drinking Water System Components - Lead Content 2016.

1.3 SUBMITTALS

- A.** Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- B.** Manufacturer's Instructions: Indicate installation methods and procedures.

- C.** Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner 's name and registered with manufacturer.

#### 1.4 QUALITY ASSURANCE

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

#### 1.5 DELIVERY, STORAGE, AND HANDLING

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

#### 1.6 WARRANTY

- A.** Provide five year manufacturer warranty for electric water cooler.

### PART 2 - PRODUCTS

#### 2.1 GENERAL

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

### PART 3 - EXECUTION

#### 3.1 PREPARATION

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

#### 3.2 INSTALLATION

- A.** Install components level and plumb.

#### 3.3 INTERFACE WITH WORK OF OTHER SECTIONS

- A.** Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

#### 3.4 ADJUSTING

#### 3.5 CLEANING

- A.** Clean plumbing fixtures and equipment.

#### 3.6 PROTECTION

- A.** Protect installed products from damage due to subsequent construction operations.
- B.** Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 224000

SECTION 23 0000  
GENERAL REQUIREMENTS FOR HVAC

PART 1 – GENERAL

1.1 APPLICABLE REQUIREMENTS

- A. All work to be furnished and installed under this section shall comply with Division 01 – General Requirements when available. If not available, the Contractor shall meet the requirements of these specifications.
- B. Where the Owner-Contractor Agreement contradicts this division, the more stringent shall apply.

1.2 RELATED REQUIREMENTS

- A. Codes to include latest adopted editions, including current amendments, supplements, and local jurisdiction requirements in effect as of the date of the Contract Documents, including state/local building code, mechanical code, plumbing code, electrical code, fire code, and energy code.

1.3 GENERAL

- A. Work included in 23 00 00 applies to Division 23 work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of mechanical systems for proposed project.
- B. Contract Documents include, but are not limited to, Specifications, Drawings, Addenda, Owner/ Engineer Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.
- C. In the event there is a discrepancy between the drawings, specifications and current code, the more stringent shall apply.
- D. Examine the Drawings, specifications and other Contract Documents relating to the Work and the work of all trades and become fully informed as to the extent and character of work required. Coordinate all work with that of others to ensure proper and complete installation of all materials, equipment and supports.
- E. Intent:
  - 1. The intent of the Contract Documents is for the Contractor to include all work necessary for the complete **systems, tested and ready for operation (hereinafter "Design Intent")**.
  - 2. Provide all items not specifically shown on the drawings, called for in the specifications or related Contract Documents, but required to conform to the labor, material and equipment to achieve the Design Intent.
  - 3. Provide all scaffolding, access provisions, tools, appliances, consumables, fees, permits and licenses, debris removal/disposal, supervision and labor, including required start-up, check-out and training to provide complete and fully operable systems in full compliance with the Contract Documents.
  - 4. Before submitting a bid and prior to the start of work, Contractor shall examine all conditions relating to the **Work, including that associated with the work of other trades upon which Contractor's work may rely or** otherwise depend, to achieve the Design Intent, in accordance with the best trade practices, workmanship and highest quality product installation, taking into account the sequence of the work, delivery, storage and hoisting requirements, requirements for access, testing and temporary services and all other site limitations and project complexities. Report to the Architect/Engineer any conditions which might prevent installation of materials and/or equipment in the manner intended by the Contract Documents or contrary to applicable codes, standards or regulations.
  - 5. By submitting a bid, the Contractor represents that it has made a thorough examination of the site, of the work, including that associated with the work of other trades, all existing conditions and limitations, and that it has examined the Contract Documents in complete detail and has determined beyond doubt that the drawings, specifications, and existing conditions are sufficient, adequate and satisfactory for the construction of the work under the Contract.

6. No consideration or allowance will be granted for any alleged misunderstanding of materials, equipment or components to be furnished or work to be done; it being agreed that tender of proposal carries with it agreement to items, terms and conditions required by the Contract Documents.
  7. Where minor adjustments of the work are necessary for purposes of fabrication or installation of items, or resolution of conflicts between items within the intent of the Contract Documents, the Contractor shall make such adjustments with no added compensation. Where such adjustments affect functional or aesthetic design of the work, they shall first be submitted to the Architect for review and approval.
- F. Site Visit:
1. Contractor shall visit the site and verify the exact conditions relating to the work and obtain such information as may be necessary to present a complete and comprehensive bid. No allowance will be made for any **extra expense due to Contractor's failure to make such a visit and reasonably verify all actual/existing conditions**. In the event of a conflict between existing conditions and the requirements of the Contract Documents, perform the necessary work to conform to Design Intent. The Owner or his representative will be the sole individual to interpret the intent of the Drawings in the event of a conflict between (1) existing conditions and those shown on the drawings, or (2) quality of existing material and quality of material indicated on the drawings or in the specifications. Wherever a conflict such as this occurs, the higher standard shall prevail.
- G. Conditions:
1. Conform to all Bidding Requirements and General Conditions
  2. The Contractor is obligated to comply with the above in addition to the requirements of this Section.
  3. Modifications by this Section do not nullify any other portions of the above-referenced conditions.
- H. Make complete system installation, connecting to all equipment shown on the plans, or called for in the specifications. Contractor to provide any additional extra valves not shown on plans to obtain design criteria as required for a complete system and by the balancing contractor.
- I. Drawings:
1. Drawings do not attempt to show all aspects of building construction, which will affect the installation of the systems. The drawings are diagrammatic and do not intend to show all offsets and fittings that may be required for a complete installation. Locations of equipment, pipes, valves, traps, ductwork, etc. shown on the drawings, shall be followed as closely as conditions will permit. Review all project drawings, including, but not limited to, architectural, structural, plumbing and electrical drawings; and coordinate with all trades involved so there is no conflict with work of other trades and so Owner secures best arrangement of work consistent with use of space.
  2. Verify exact distances between points shown on drawings by actual measurement at site, as no extra cost will be allowed for differences between actual measurements and scaled measurements on drawings.
  3. Changes in design, configuration, or location of equipment, piping, or ductwork, advisable in the opinion of Contractor, shall be submitted to Architect/Engineer for approval before proceeding with work, with written assurance from other trades that such changes will not interfere with their installation, nor cause any extra cost on their part. Such changes shall be made at no additional cost to Owner.
  4. Check location of all work of all trades and avoid interferences. Conflicts shall be reported to Architect/Engineer for decision and direction. Special attention is called to the following items:
    - a. Exact location of outlets shown on architectural details.
    - b. Location of suspended ceilings.

#### 1.4 SPECIAL REQUIREMENTS

- A. Where applicable, all seismic construction, restraints, bracing, mounts and hanging systems shall be in full **compliance with the requirements of all Authorities Having Jurisdiction (AHJ's)**, pre-approval, certification and engineering (including certified engineering calculations and stamps). Contractor shall be solely responsible for obtaining and complying with all requirements of the AHJ.

#### 1.5 DEFINITIONS AND ABBREVIATIONS

- A. Finished Spaces: Spaces other than mechanical, plumbing and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical, electrical and plumbing equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include spaces above hard or lay-in type ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The word "provide," means "furnish and install."
- G. The word "approved," means acceptance by the Architect or Engineer
- H. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the drawings, or other paragraphs or schedules in the specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited.
- I. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted," mean directed by the Architect/Engineer, requested by the Architect/Engineer, and similar phrases.

#### 1.6 REFERENCE STANDARDS AND GUIDELINES

- A. Include but are not limited to the latest adopted editions from:
  - 1. ADA Americans with Disabilities Act
  - 2. AHRI Air-Conditioning Heating & Refrigeration Institute
  - 3. AMCA Air Moving and Conditioning Association
  - 4. ANSI American National Standards Institute
  - 5. ARI Air Conditioning and Refrigeration Institute
  - 6. ASHRAE American Society of Heating, Refrigerating, and Air Conditioning Engineers
  - 7. ASME American Society of Mechanical Engineers
  - 8. ASPE American Society of Plumbing Engineers
  - 9. ASSE American Society of Sanitary Engineering
  - 10. ASTM American Society of Testing Materials
  - 11. AWWA American Water Works Association
  - 12. AWS American Welding Society
  - 13. CFR Code of Federal Regulations
  - 14. EPA Environmental Protection Agency

- |     |        |   |
|-----|--------|---|
| 15. | FM     | Factory Mutual Engineering Corporation                                  |
| 16. | IAPMO  | International Association of Plumbing & Mechanical Officials            |
| 17. | ISO    | International Organization for Standardization                          |
| 18. | MSS    | Manufacturers Standardization Society                                   |
| 19. | NEBB   | National Environmental Balancing Bureau                                 |
| 20. | NEC    | National Electric Code  |
| 21. | NEMA   | National Electrical Manufacturers Association                           |
| 22. | NFPA   | National Fire Protection Association                                    |
| 23. | OSHA   | Occupational Safety and Health Administration                           |
| 24. | SMACNA | Sheet Metal and Air Conditioning Contractors National Association, Inc. |
| 25. | UL     | Underwriters Laboratories   |

#### 1.7 SCOPE

- A. The work includes, but is not necessarily limited to, the furnishing of all labor, materials, equipment, tools, appliances, hoisting, scaffolding, supervision, for the proper execution and completion of the mechanical work and services necessary for, and reasonably incidental to, providing and installing complete mechanical systems and other work as shown or indicated in the Drawings and Specifications.
- B. The contractor is responsible for a complete and operational system installation. Contractor shall provide all necessary components for a complete and operational system even if such components are not specified or shown in the drawings or specifications. The contractor shall notify the Architect/Engineer of such omission for resolution prior to system installation. All new equipment and products as noted in Part 2 of each section shall be installed as per manufacturer's recommendations.
- C. Provide all additional piping, caps, and valves not shown on drawings, to maintain fully operational systems during the project at no additional cost to the owner.
- D. Consult all other Sections to determine the extent and character of this work specified elsewhere.
- E. Make all connections to equipment requiring service from systems installed under this Section.

#### 1.8 SUBMITTALS

- A. Reference Division 1 for submittal requirements when available. If not available, the contractor shall meet the requirements of these specifications.
- B. General
  - 1. Review is for general conformance with the Contract Documents and is not intended to otherwise approve or verify dimensions, quantities, or to coordinate the Work shown on shop drawings on or between Contractor and the work of other trades or Sections. Contractor is solely responsible for quantities, dimensions, means and methods. Dimensions shall be confirmed and correlated by Contractor at the jobsite prior to the start of the Work (procurement, fabrication, construction or other commencement activities). **Contractor's failure to fully verify conditions at the jobsite prior to commencement of the work shall not relieve Contractor of its obligations under the Contract Documents and Contractor shall be responsible for all damages caused by or related to its failure to comply with the requirements of this provision.**
  - 2. Submittal review shall be performed to show compliance with the design intent. Contractor shall specifically note any deviations from the Contract Documents and explain the reason and nature of the deviation. Such deviations will be reviewed or rejected on the submittal. Deviations not so identified shall not relieve the Contractor from the requirements of the Contract Documents.

3. Resubmittals will be reviewed for compliance with comment(s) made on the original submittal only. Architect/Engineer shall not be responsible for changes made upon resubmittal that are not clearly identified (highlighted), and responsive directly to the initial rejection. Resubmittals should not be packaged with non-related first-time submittals, all resubmittals must be marked with the resubmittal number and date and must otherwise comply with all submittal requirements.
  4. Submit shop drawings, penetration locations, supplemental data, etc. as may be required by the Contract Documents for all materials, equipment and other components of the work included in all Sections of this Division and other provisions of the Contract Documents in accordance with the requirements of this Division and referenced sections.
  5. All submittals must be reviewed by Contractor, and have Contractor's review stamp and signoff for Conformity to the Contract Documents, prior to the submission of any required submittal to Architect/Engineer. Submittals that fail to meet this requirement will be considered incomplete, will not be reviewed by Architect/Engineer and will be returned to Contractor, without review and/or rejected and resubmittal will be required. Contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
  6. Forward all submittals to Architect/Engineer in a coherent, organized fashion, complete and packaged as required herein, Architect/Engineer may reject submittals that fail to comply with this or any other provision of the Contract Documents and Contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
  7. Subject to other provisions of the Contract Documents and in the absence of a more stringent requirement, Architect/Engineer will review a submittal not more than two (2) times. If a submittal is required to be reviewed more than twice due to incomplete, or incorrect information the contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
  8. Identify each submittal item by reference to Specification Section paragraph in which item is specified, or drawing/detail number, as applicable. In addition, for equipment submittals, include identification numbers appearing on the equipment schedule.
  9. Identify each item by manufacturer, brand, trade name, number, size, rating, or whatever other data is **necessary to properly identify and check materials and equipment. Words "as specified" are not sufficient** identification.
  10. Organize submittals in same sequence as they appear in specification sections, articles or paragraphs.
  11. All materials and equipment submittals shall have a summary sheet at the front complete with catalog numbers. Where materials or equipment pertain to more than one building, submittals shall clearly indicate at which locations the materials or equipment is to be installed.
  12. Submittals shall show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping and/or conduit entrance, access requirements for installation and maintenance, physical size and dimension, electrical characteristics and requirements, foundation/curbs and all permanent and temporary support details as well as all information relating to weight, including but not limited to live and dead weights and other information necessary for component verification and coordination with other trades.
- C. Submittal Schedule – Provide a detailed submittal schedule including all requirements of this Division and its subdivisions to the Architect and Engineer within thirty (30) days of contract award.
1. **Contractor shall submit for the Engineer's approval a Submittal Schedule for the performance of the work** that is consistent with the requirements of the project schedule. The Submittal Schedule shall allow reasonable time for the Architect and other consultants review. If the time for Architects/Engineers review is not otherwise specified, the review period (from date of receipt) shall be a minimum of ten (10) business days. Once approved by the Architect/Engineer, submittal dates and time limits established by



the Submittal Schedule shall not, except for reasonable cause, be changed or exceeded by the Contractor.

2. For each submittal required by the Contract Documents, the schedule shall include: specification section number, subsection/paragraph identification number, item description (as stated in the applicable specification section, subsection or other Contract Document) and the scheduled delivery date to the Architect/Engineer.
  3. Contractor shall be responsible to the Architect/Engineer and/or Owner for all costs, expenses and impact to the project schedule resulting from any deviation to the approved Submittal Schedule, including but not limited to: payment for required overtime, out-of-house resources/consultants or other higher cost resources of the Architect/Engineer as may be required to perform out of sequence, stacked, critical, delayed, unscheduled or multiple reviews of required submittals necessitated by rejection of a prior **submittal, (cumulatively and hereinafter, "Additional Review Costs")**
- D. Catalog Cuts & Submittal Literature
1. Catalog cuts, submittal literature and published material may be included to supplement scale drawings provided that the actual make and model of equipment being submitted on is identified.
  2. Submittal literature, drawings and diagrams shall be specifically applicable to this project and shall not contain extraneous material or optional choices. Clearly mark literature to indicate the proposed item.
- E. Shop Drawings:
1. Shop drawings shall include all significant systems, equipment, and components, including but not limited to all equipment, devices, connections and elevations. Include all related specialty rooms (i.e. **mechanical, electrical, data/technology**). **Drawings shall be at a minimum scale of 1/4" per 1'-0" and shall be fully coordinated with the work of other trades and/or sections.**
  2. Identify congested areas and clearly indicate solutions to space problems, developed in conjunction with the work of other trades and/or Sections. Identification of space problems without proposed solutions is not acceptable and is grounds for rejection. For such areas indicate, superimposed, the work of all trades and/or Sections involved and:
    - a. Clearly identify each area of congestion and deviations from the Contract Documents, and:
    - b. Proposed solution(s), clearly documented and signed-off by all other trades and/or Sections involved.
- F. Anchorage and Supports: Submit details and calculations for support and anchors that are not specifically detailed on the drawings. All calculations must meet current seismic and structural code.
1. Provide details and calculations for equipment per local adopted building codes:
    - a. Having an operating weight over 400 pounds or more and mounted directly to the floor.
    - b. Having an operating weight over 20 pounds and suspended from the roof, floor, or wall or supported by vibration isolation devices.
  2. Where pre-approved bracing systems will be employed, submit:
    - a. System component brochure describing components used and detailed installation instructions.
    - b. Loads to be transmitted to the structure at anchor points.
  3. Where anchorage, support, and bracing are not detailed on the drawings, and pre-approved systems are not used, submit details and calculations of proposed systems. Include:
    - a. Anchorage and Supports
      - 1) Where equipment substitutions change the weight, size, configuration, or other aspects of systems and equipment that will affect the performance of anchorages and/or supports,

- submit calculations for proposed anchors and supports, and install them as shown in these calculations.
- 2) Where substitutions will have no effect on anchors and supports detailed on Contract Documents, submit information on sizes, weights, center of gravity and other relevant information to demonstrate this fact.
- G. **Shop Fabrication Drawings: Drawings are for the Contractor's use and shall be its responsibility. Do not submit shop fabrication documents unless specifically requested.**
- H. Testing: Coordinate Shop Drawings to include any additional components for proper system testing.
- I. Certificates: Submit final inspection certificates signed by governing authorities.
- J. Operating and Maintenance Instructions and Manuals.
1. Three (3) complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished to the Owner within ninety (90) days of issuance of final occupancy permit. Each set shall be electronic or permanently bound with a hard cover. The following identification shall be inscribed on the covers, "OPERATING AND MAINTENANCE INSTRUCTIONS", the name and location of the building, the name of the Contractor, and the Contract number. Flysheets shall be placed before instructions covering each subject. The instruction sheets shall be approximately 8 1/2" x 11" with large sheets of Drawings folded in.
  2. Instructions on major items, including but not limited to: switchgear, generators, pumps, air compressors, boilers, specialty units, fans, air handlers, AC units and temperature controls, shall be by representative of manufacturer of respective equipment.
  3. Submit as identified below and as noted in other specification references.
    - a. Names, addresses and phone numbers of contractors and subcontractors. List of all system components, with the name, address, and 24-hour phone number of the company responsible for servicing each item during the first year of operation.
    - b. Complete operating and maintenance instructions and parts lists of all equipment and component parts. Data sheets to show all connections, ratings, characteristics, wiring connections, catalog data on component parts whether furnished by equipment manufacturer or others, names, addresses and telephone numbers of source of supply for parts subject to wear or failure, and description of operating, test, adjustment, and maintenance procedures.
      - 1) Where data sheets included in manual cover equipment, options, or other features not part of equipment actually furnished, line out these references or otherwise clearly mark so remaining text, diagrams, drawings, schedules, and similar information shall apply specifically to equipment furnished.
    - c. Operating Instructions should include, but not be limited to:
      - 1) Normal starting, operational and shutdown procedures, including emergency procedures for each type of equipment/system.
      - 2) Equipment wiring and control diagrams.
      - 3) All other items as may be specified/required by this Section and the Contract Documents.
    - d. Maintenance Instructions
      - 1) All items as may be specified/required by this Section and the Contract Documents.
    - e. Manufacturers Data (each piece of equipment)
      - 1) Installation instructions
      - 2) Drawings & specifications

- 3) Parts List, including recommended stock and long lead parts/components.
  - 4) Wiring and riser diagrams.
  - 5) Warranties and guarantees for all equipment, materials and components, including repair, replacement and labor from both Contractor and manufacturer as required by the Contract Documents.
  - 6) Certificates of Installation – **manufacturer's certification of supervision during equipment installation and start-up procedures.**
  - 7) All other items as may be specified/required by this Section and the Contract Documents.
- K. Record Documents.
1. Maintain one (1) complete set of prints and specifications at the job site exclusively for recording deviations from the drawings which are necessary because of job conditions, request for information and/or approved change orders. Record locations and depths of buried and concealed system components from fixed, easily identifiable objects, such as building walls or other fixed physical objects. Where systems are concealed in walls or other fixed physical objects, indicate distances from building corners or other building features not likely to be disturbed by fixture alterations.
  2. Submit Record Drawings within 90 days of system acceptance by owner.
- L. Drawings, specifications (as-builts) and approved submittals.
1. Where the project uses a BIM model the contractor shall keep the model updated in a similar fashion, maintaining the current project record as described above and submit, in addition to all other requirements of this Section and other provisions of the Contract Documents a complete and accurate BIM model for the project.
  2. Prior to Substantial Completion, obtain from the Architect a complete set of printed drawings at the **Contractor's cost. Record all revisions to these drawings to indicate as-built conditions.** Indicate all **changes, including RFI's, on this set of documents.** Submit one set of blueprints of these revised drawings for review. Make necessary changes and deliver to Architect one set of electronic documents, including any BIM model, upon Final Completion and Acceptance.
  3. All test reports, certifications, and inspection reports.
  4. AHJ/Specialty AHJ Approvals (i.e. Fire Marshal and/or Fire Department system approvals).
  5. Substantial and Final inspection certificate signed by governing authorities.
  6. All other items as may be specified/required by this Section and/or other provisions of the Contract Documents.
- 1.9 EQUIPMENT DEVIATIONS AND SUBSTITUTIONS
- A. Substitutions will only be considered after project award. No substitutions will be considered during bid and/or negotiation periods.
  - B. No substitutions will be allowed and/or considered unless the description of a product includes the phrase **"approved equal" and then only upon a determination as to equivalency and impact upon the project budget,** schedule and the work of others, including any redesign of the project or its system components by the Architect, Engineer or other trades. The final determination as to sufficiency or acceptance of any such substitution and/or deviation properly requested and submitted by Contractor will lie solely with the Architect/Engineer. Contractor may not implement substitutions that have not been approved by Architect/Engineer.
  - C. Unless specified elsewhere in the Contract Documents, a minimum of two (2) weeks shall be allowed for evaluation of any substitution. The burden of all systems re-engineering/design, testing, suitability and constructability is solely placed upon the Contractor for all deviations from the basis of design as reflected in the Contract Documents.

- D. If approved by Architect/Engineer, all such redesign, including all new drawings and detailing required, will be prepared by the Architect/Engineer and their sub-consultants for Change Order documentation for approval by Owner and the Authority Having Jurisdiction will be paid by the Contractor as part of the Deviation Review Costs.
- E. When the Engineer approves a substitution, the approval is given with the understanding that the Contractor guarantees the article or material substituted to be equal to or better in every respect than the article or material specified. The Contractor shall also assume complete responsibility that the article or material will fit the job as far as space, access, and servicing requirements.
- F. Where several materials are specified by name for one use, select for use any of those so specified subject to compliance with specified requirements.
- G. Whenever item or class of material is specified exclusively by detail specification, trade name, manufacturer's name or by catalog reference, use only such item, unless written approval is given. Submit written requests in accordance with these and referenced specifications.
- H. Make no substitutions for materials, articles or process required under contract unless written approval is obtained.

#### 1.10 COORDINATION

- A. Prior to construction, coordinate installation and location of systems, devices and equipment with architectural and structural requirements, and other trades (including ceiling suspension, and tile systems), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.
- B. Drawings and corresponding electronic media are diagrammatic and indicate the general arrangement of systems and work included in the Work. Consult the drawings, details and other electronic media for locations of fixtures and equipment; where same are not definitely located, obtain this information from the Architect/Engineer.
- C. Take all dimensions from Architectural and Structural Drawings, certified equipment drawings and from the actual field measurements before fabricating work. All conflicts shall immediately be reported to the Architect/Engineer. Contractor is solely responsible for conflicts known or which reasonably should have been known but not reported or resolved before commencement of the work.
- D. Coordinate connection of systems with interior/exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- E. Before submitting a bid for the work the Contractor shall visit the site and become familiar with all the work on other related Drawings and Specifications, and plan the work to provide the best possible assembly of the combined work of all trades. No additional costs will be considered for work which has to be relocated due to conflicts with other trades.
- F. If, after examination of the bidding documents relating to the work, the Contractor has queries concerning the nature and scope of the work or intent of the Specifications, he/she shall promptly request clarification from the Architect/Engineer. After contract award, claims of ignorance of the intent and scope of the contract shall not be allowed.
- G. Contractor is responsible for coordinating the schedule of inspections by Engineer at appropriate stages of construction such as rough-in, pre-final, and final, and at other times required by the Specifications or by the construction. Notify Architect and Engineer seven (7) days in advance of proposed site visit. Notification constitutes certification that construction is, or will be, complete and ready for observation. In the event that construction is not ready for observation, contractor shall bear the cost of additional site visits.

#### 1.11 COORDINATION DRAWINGS

- A. Detail major elements, components, systems, equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
  - 1. Planned system distribution layout, including specialty device locations and access for operation
  - 2. Clearances for installing and maintaining insulation.
  - 3. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
  - 4. Equipment and accessory service connections and support details.
  - 5. Other systems installed in same space.
  - 6. Exterior wall and foundation penetrations.
  - 7. Fire-rated wall and floor penetrations.
  - 8. Ceiling and wall-mounted access doors and panels required to provide access to operating devices or items needing access for proper maintenance
  - 9. Sizes and location of required concrete pads and bases.
  - 10. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
  - 11. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

#### 1.12 SEQUENCING AND SCHEDULING

- A. Coordinate equipment installation with other building components.
- B. Arrange for space, chases, slots, and openings in building structure during progress of construction to allow for distribution system installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of all materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
- E. Some equipment may require temporary installation during one phase and require relocation to final location under another phase. Provide all associated labor and materials to accommodate this phasing.
- F. Coordinate connection of all systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate requirements for access panels and doors if items requiring access are concealed behind finished surfaces. Access panels and doors will be required.

#### 1.13 ACCESSIBILITY

- A. Contractor is responsible for verifying that equipment and devices will fit within the space shown on the drawings. Contractor shall locate all equipment which must be serviced, operated or maintained, in fully accessible locations.
- B. Minor deviations from the drawings may be made to allow for better accessibility, but changes of magnitude or which involve extra cost shall not be made without approval from the Architect/Engineer.

#### 1.14 QUALITY ASSURANCE

- A. Regulatory Requirements: Work and materials installed shall conform with all local, State, Federal and other applicable laws and regulations.
- B. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.

- C. Installer Qualifications: Company specializing in performing the work of this section. Company personnel shall be approved by manufacturer for all product installations and required training.
- D. Conform to all applicable standards, codes and regulation and industry best practice requirements.
- E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.
- F. All materials and equipment shall be new, shall bear **manufacturer's name, and shall conform to the grade, quality and standards** specified herein. Type, capacity and application shall be suitable and capable of satisfactory operation for the purpose intended. All equipment and components shall include UL label and/or marking on **equipment body/device including manufacturer's name, pressure rating(s), electrical classification(s), limits and ratings** as applicable to individual components for the purpose specified and intended.
- G. Equipment Selection: Equipment allowed by the specifications but with different electrical characteristics, physical dimensions, capacities, and/or ratings than what is shown on the Drawings may be furnished, provided such proposed equipment is approved in writing and connecting mechanical and electrical services, such as pipe and/or duct connection sizes, circuit breakers, conduit, motors, bases, and equipment spaces are revised to accommodate such equipment. Maintain a minimum duct length of three straight diameters at all fan inlets and outlets. All expenses shall be borne by the Contractor. Specified minimum energy ratings and/or equipment efficiencies must meet design and commissioning requirements.
- H. ASME Compliance: ASME listed water heaters and boilers with an input of 200,000 BTUH and higher, hot water storage tanks which exceed 120 gallons, and hot water expansion tanks which are connected to ASME rated equipment or required by code or local jurisdiction.
- I. Provide safety controls required by National Boiler Code (ASME CSD 1) for boilers and water heaters with an input of 400,000 BTUH and higher.
- J. **Listing and labeling: Provide motors that are listed and labeled. Terms "listed and labeled": as defined by UL, NEC, Article 100 or other applicable recognized agency as specified in the Contract Documents.**
- K. Cutting & Patching: Unless otherwise required by the Contract Documents, Contractor shall be responsible for all cutting, fitting and patching required to complete the Work, or to make portions of the Work and existing conditions fit together properly, and all such areas shall be restored to the conditions existing prior to the cutting, fitting and patching unless otherwise provided in the Contract Documents
- L. Lead Free Requirements: Contractor shall endeavor to use lead free products and where required by law, ordinance, regulation or standard all materials products and practices shall comply with limitations and requirements as to the allowable limits and/or percentages of lead. Lead free products must be certified by and independent 3<sup>rd</sup> party.
  - 1. This provision shall apply to any and all similarly regulated materials, products and practices that may be considered hazardous or are otherwise regulated by applicable law, ordinance regulation or standard in the project local.

#### 1.15 DELIVERY, STORAGE, AND HANDLING

- A. All materials and equipment shall be adequately covered and protected against dirt, water, chemical or mechanical damage, and theft. At completion, all work, equipment and materials shall be cleaned, and damage repaired by Contractor. Damaged equipment will be replaced by the contractor if Owner does not accept repairs done to the equipment. Such replacement shall be scheduled to minimize building system interruption of occupied or scheduled for occupancy.
- B. Material delivered at the site shall not be left exposed to the weather or left unattended. Deliver pipes, tubes and conduit with factory-applied end-caps. Contractor shall be responsible to maintain end-caps or provide temporary end caps on all open-ended piping, tubes and conduit through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.
- C. Protect bright finished shafts, bearing housings and similar items until in service.

- D. Protect plastic pipes and materials from sunlight and support to prevent sagging and bending.
- E. Elevate stored materials above grade. When stored inside, do not exceed structural capacity of the floor.
- F. Provide protective coatings to materials to prevent damage and/or infiltration of moisture and dirt on all materials and equipment including but not limited to cast iron and steel valves.
- G. Contractor shall check the openings in the building and the size of the doors, passages, and openings through which equipment is to be admitted. Wherever necessary, he shall provide the equipment in sections or knocked down in order to admit the equipment through these openings.
- H. Contractor shall provide all rigging, erection and hoisting equipment as required to handle or place equipment and piping in position. This rigging and hoisting equipment shall only be attached and placed on the structure in locations as approved by Architect/Engineer at the site.

#### 1.16 PERMITS AND FEES

- A. Contractor shall arrange and pay for all permits, fees, and inspections required to perform the Work. The Contractor shall present the Owner with properly signed certificates of final inspection before the Work will be accepted.
- B. Contractor shall call for all inspections by local building official(s) when they become due, and shall not cover any work until approved by these governing authorities.
- C. Contractor shall make all arrangements with utility companies for water, steam, gas and drainage services, etc., associated with the work and include required payments for meters, piping, services, connection charges and materials furnished and installed by utility companies. Work and materials shall be in strict accordance with rules of respective authorities.

#### 1.17 DOCUMENT OWNERSHIP

- A. The Drawings and Specifications, combined with the calculations, field data, notes, and reports, are the intellectual and real property of the Architect and/or Engineer. This covers all forms of written and recorded or electronic media. The reuse of these documents without specific permission of the Architect and Engineer is prohibited. The Drawings may be employed by the Owner and Contractor for the express use of constructing, commissioning and operating the facility only upon proper execution of an Agreement for Use of Electronic Files & Data.

#### 1.18 GUARANTEE AND WARRANTY

- A. Contractor warrants to Owner that the materials and equipment provided under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects. Work, materials and equipment not conforming to these requirements, including substitutions not properly approved by Change Order, shall be considered defective. This warranty excludes remedy for damage caused by improper or insufficient maintenance, improper operation or normal wear, tear and usage. Contractor shall assign to Owner, or otherwise assure the Owner has the full benefit of, all warranties and guarantees of manufacturer, subcontractors, sub-subcontractors and suppliers, and Contractor shall perform the Work in a manner that does not adversely affect or invalidate any available warranties or guarantees.
- B. Contractor shall warrant and guarantee all work against faulty material or workmanship for a period of one (1) year from the date of final completion and written acceptance by the Owner, unless specified more stringently elsewhere in the Contract Documents.
- C. If the project is occupied or the systems placed in operation in several phases at the request of the Owner, the guarantee of each system or piece of equipment used shall begin on the date each system or piece of equipment was placed in satisfactory operation, tested, commissioned and accepted, in writing, by the Owner. The use of building equipment for temporary service and testing or phases of work completed prior to the project's final completion and acceptance by the Owner does not constitute the commencement of the warranty period.

- D. If a defect or deficiency in the Work is discovered within the one (1) year Warranty & Guarantee period or within such longer period as may be prescribed by the Laws or by any specific guarantee, and Owner elects to have Contractor correct such defect or deficiency, Owner shall notify Contractor of such defect or deficiency in writing. This period of correction relates only to the specific obligation to correct defects and deficiencies and in **no way otherwise limits the Contractor's responsibility for Work that is not in accordance** with the Contract Documents. If Contractor fails to timely correct defects or deficiencies in the Work, Owner may, at its sole option, correct them and charge contractor for all costs theretofore.
- E. Specific exclusions, if any, from this one (1) year warranty and guarantee period are listed in the individual specification sections.

#### 1.19 LIMITATIONS OF LIABILITY

- A. To the extent any of the following provisions are not more stringently included in the Contract Document the following Limitations of Liability shall apply:
- B. **Architect/Engineer is not responsible for Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, and is not responsible for Contractor's failure to perform or furnish the work in accordance with the Contract Documents.**
- C. **In the event that Architect/Engineer's employees or sub-consultants** make comments or issue warnings about safety issues, such comments and warnings shall be considered to have been offered by a Good Samaritan and shall not impose any obligation or responsibility.
- D. Engineer will not be responsible for the acts or omissions of Owner, Contractor, any subcontractor, any supplier, or of any other person or organization performing or furnishing any of the portions of the work
- E. Contractor understands and acknowledges that Engineer is not authorized to order extra work or issue Change Orders to the work, however in the event and to the degree that Engineer may offer advice, suggestions, and opinions Contractor shall not rely on such advice, suggestions, and opinions unless directed in writing by Owner or its designated representative, and shall, in no event, make any claim against the Engineer for any such advice, suggestions, and opinions.
- F. To the fullest extent permitted by law, Contractor shall indemnify and hold harmless Architect, Engineer, and their joint ventures, officers, directors, partners, employees and agents from and against any and all claims, costs, loses and damages (including but not limited to all fees and charge of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused in whole or in part **by the negligent acts or omissions of Contractor, Contractor's officers, directors, partners, employees, agents; or contractor's subcontractors or material men in the performance of Work. Contractor shall direct its insurer to list Architect, Engineer, and their joint ventures, as Additional Insureds on general liability insurance policies covering this project. Prior to commencing work, Contractor shall submit copies of its certificate of insurance to both Architect and Engineer.**

#### 1.20 SAFETY

- A. Contractors must conduct a weekly safety meeting with their employees and provide documentation as to attendance and topics of discussion. Engineer's construction support services do not constitute review or approval of Contractor's safety procedures. Contractor shall comply with all OSHA regulations. Contractor is required to obtain and pay for insurance required to cover all activities within Contractor's Scope of Work.

### PART 2 – PRODUCTS

#### 2.1 MANUFACTURERS

- A. See Drawings for equipment data, capabilities, and requirements. Manufacturers are identified for the purpose of establishing quality; alternative manufacturers of equal quality are acceptable. If alternative manufacturers **are proposed it is the contractor's responsibility to verify and demonstrate the proposed** alternative is equivalent.



- B. Provide like items from one manufacturer, including but not limited to pumps, fans, valves, control devices, air handlers, vibration isolation devices, etc.

## 2.2 MATERIALS

- A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL approved or have adequate approval or be acceptable by State, County, and City authorities. Provide all materials omitted herein but necessary to complete the work.
- B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.
- C. All electrical materials shall bear the label of, or be listed by, the Underwriters' Laboratories (UL), unless the material is of a type for which label or listing service is not provided.
- D. Hazardous Materials: Comply with local, State of Oregon, and Federal regulations relating to hazardous materials. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

## 2.3 ACCESS PANELS

- A. Confirm Access Panel requirements in individual Division 23 sections. Comply with the following:
  1. Provide flush mounting access panels for service of systems and individual components requiring maintenance or inspection. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly. Ceiling access panels to be minimum of 24 x 24 or as required and approved size. Wall access panels to be minimum of 12 x 12 or as required and approved size.

## 2.4 DRAIN PANS

- A. Provide drip pans under all hot water heaters, above-ceiling inline pumps, cooling coils and heat recovery coils. **Locate pan immediately below piping and equipment, and extend a minimum of 6" on each side and lengthwise 18" beyond equipment being protected. Pans shall be 2" deep and fabricated from reinforced sheet metal (20 gauge copper or 20 gauge steel with two ounces zinc finish hot dipped after fabrication) with rolled edges and soldered or welded seams. Provide 3/4" copper drainage piping, properly discharged to floor drain, hub drain, or as shown on Drawings. Provide condensate pumps as necessary. Comply with Oregon Mechanical Specialty Code for overflow protection and pipe sizing.**

## 2.5 GUARDS

- A. Provide guards in accordance with State Safety Code and OSHA requirements over all rotating equipment including belts, shafts and couplings. Drive guards over belts and sheaves shall include **2-1/2" diameter access** opening at shaft ends for speed counter.

## 2.6 PENETRATION FIRE STOPPING

- A. Through-penetration fire stopping system tested and listed by Underwriters Laboratories. 3M, Metacaulk, SpecSeal, or approved equivalent.
- B. Select system for proper application based on wall construction, type of penetrating item, wall rating, etc.

## 2.7 MISCELLANEOUS STEEL

- A. Provide all steel as required for adequate support of all mechanical equipment. Use standard angle or channel, I or H sections as required by application. Adequately cross-braced and welded pipe stands may be used for tank supports. Provide suitable base plates for all stands and anchors for all hanging equipment. Drill or burn support holes only in flanges of structural shapes and only in one leg of any one angle, and as far from center of length as possible.
- B. Paint: Apply one coat of black Rustoleum primer to shop fabricated items before delivery to the job; other painting as specified herein.

## PART 3 – EXECUTION

### 3.1 GENERAL MECHANICAL INSTALLATIONS

- A.** General: Sequence, coordinate, and integrate the various elements of the mechanical systems, materials, and equipment. Comply with the following requirements:
1. Coordinate systems, equipment, and materials installation with other building components.
  2. Verify all dimensions by field measurements.
  3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for system installations.
  4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
  5. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.
  6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
  7. Coordinate connection of systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
  8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
  9. Install systems, materials, and equipment level and plumb, and parallel or perpendicular to other building systems and components, where installed exposed in finished spaces.
  10. Install equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
  11. Install access panel or doors where units are concealed behind finished surfaces. Coordinate with other divisions.
  12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
  13. Replace all air filters with new filters upon Owner taking occupancy of the building or at a time mutually agreed upon between the Owner and Contractor.
  14. Do not install ductwork or piping in elevator machine rooms, electrical and/or communication rooms unless it directly services that room.
- B.** Locate wall, floor and ceiling fire ratings from architectural drawings for appropriate hourly rating of combination fire/smoke dampers or fire dampers shown on mechanical drawings.

### 3.2 MECHANICAL SYSTEMS - COMMON REQUIREMENTS

- A.** General: Install mechanical systems as described below, unless piping Sections specify otherwise. Individual Division 23 Sections specify unique installation requirements.
- B.** General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of systems. Indicated locations and arrangements were used to size pipe and duct and calculate

- friction loss, expansion, pump sizing, fan sizing, and other design considerations. Install piping and ductwork as indicated, unless deviations to layout are approved on Coordination Drawings.
- C. Install piping at indicated slope.
  - D. Install components with pressure rating equal to or greater than system operating pressure.
  - E. Install piping and ductwork in concealed interior and exterior locations, except in equipment rooms and service areas.
  - F. Install piping and ductwork free of sags and bends.
  - G. Install exposed interior and exterior piping and ductwork at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
  - H. Install piping and ductwork tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
  - I. Install piping and ductwork to allow application of insulation plus 1-inch clearance around insulation.
  - J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
  - K. **Install flexible connectors according to manufacturer's written instructions, and where indicated and specified in other Division 23 sections.**
  - L. **Install flexible expansion loops according to manufacturer's written instructions, and where indicated and specified in other Division 23 sections.**
  - M. Install fittings for changes in direction and branch connections.
  - N. Install couplings according to manufacturer's written instructions.
  - O. Install Portable Instrument Connections in all piping systems where DDC temperature and/or pressure sensors and thermometers and/or pressure gauges are located.
  - P. Do not route piping through elevator equipment rooms, unless specifically allowed by local authority.
  - Q. Do not route piping over electrical panels, transformers, switchgear or other electrical equipment.
  - R. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
    - 1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish. Use split-casting escutcheons if required, for existing piping.
    - 2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
    - 3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
    - 4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
    - 5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.
  - S. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
    - 1. Cut sleeves to length for mounting flush with both surfaces.
  - T. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
    - 1. Build sleeves into new walls and slabs as work progresses.
    - 2. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

- a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
  - b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.
  - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. If available, refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.
    - 1) Seal space outside of sleeve fittings with non-shrink, nonmetallic grout.
  - d. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.
- U. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing sleeve seals.
1. Install steel pipe for sleeves smaller than 6 inches in diameter.
  2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
  3. Assemble and install sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- V. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations **using sleeve seals. Size sleeve for manufacturer's recommended clear space between pipe and sleeve.**
1. Assemble and install sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
  2. Caulk exterior side of annular space once the sleeve seal is in place using an elastomeric joint sealant.
- W. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe and duct penetrations. Seal pipe and duct penetrations with firestopping materials. If available, refer to Division 7 Section "Firestopping" for materials.
- X. Verify final equipment locations for roughing-in.
- Y. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- Z. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
  2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
  3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
  4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
  5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  6. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
  7. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
  8. Align threads at point of assembly.

9. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
  10. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
    - a. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators.
    - b. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench to recommended torque values.
- AA. Piping Connections: Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
  2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
  3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.
- BB. Identification
1. Valves:
    - a. Attach 1 1/2" square brass tags stamped with designating number 1/2" high, filled in with red enamel, to each valve.
    - b. Securely fasten valve tag to valve spindle or handle with a brass chain.
  2. Schedules and Charts:
    - a. Furnish to Owner's representative three (3) complete framed plastic laminated valve tag schedules. Schedule shall indicate tag number, valve location by floor and nearest column number, valve size and fire area controlled.
    - b. Furnish three (3) framed plastic laminated diagrammatic charts showing schematically the complete sprinkler system, with major control valves and valve numbers.
    - c. Furnish one (1) framed plastic laminated placard at each sprinkler riser, indicating the basic hydraulic data as required by NFPA 13 or local Fire Marshal.
  3. Piping Identification:
    - a. Apply color coded polyvinyl chloride pipe bands identifying service and direction of flow.
    - b. On exposed piping, apply bands at 20'-0" on centers at straight runs, at valve locations, and at points where piping enters and leaves a partition, wall, floor, or ceiling.
    - c. On concealed piping installed above removable ceiling construction, apply bands in manner described for exposed piping.
    - d. On concealed piping installed above non-removable ceiling construction, or in pipe shafts, apply bands at valves or other devices that are made accessible by means of access doors or panels.
    - e. Apply bands at exit and entrance points at each piece of equipment.

- f. Band widths shall be 8" for pipes up to 10" diameter, and 16" for larger diameter piping. Letter heights stating service shall be pre-printed on band, 3/4" high for 8" bands and 1 1/4" high for 16" bands.
  - g. Colors shall conform to ASA Standard A13.1.
  - h. Tags and bands shall be approved for this service.
4. Sprinkler Drains and Test Connection
- a. Provide all necessary drain valves, drain risers, capped nipples, auxiliary piping, etc. as required to drain the system risers and mains, and all trapped portions of the system. Drain valves which are not connected to drain pipes leading to floor drains shall be hose end type.
  - b. Main drains and test connections shall be piped to spill on/in floor drain or grade on concrete splash block.

### 3.3 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- D. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- E. Install equipment giving right of way to piping installed at required slope.

### 3.4 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor materials and equipment.
- B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

### 3.5 DRAWINGS

- A. The Drawings show the general arrangement and location of the ductwork, piping and equipment. Work shall be installed in accordance with the Drawings, except for changes required by conflicts with the work of other trades. The Contractor shall provide for the support, expansion, and pitch of any rearranged piping in conformance with the intent of the Drawings, Specifications, and codes.
- B. Note that certain mechanical work is shown, wholly or in part, on Architectural Drawings.
- C. Mechanical Drawings are diagrammatic and are intended to show the approximate location of equipment and piping. Dimensions shown on Drawings shall take precedence over scaled dimensions on Drawings. All dimensions shall be verified in the field by the Contractor.
- D. The exact location of apparatus, equipment, and piping shall be ascertained from the Owner or the representative in the field, and work shall be laid out accordingly. Should the Contractor fail to ascertain such locations the work shall be changed at Contractor's own expense when so ordered by the Owner. The Engineer and owner reserve the right to make minor changes in the location of ductwork, piping and equipment up to the time of installation without additional cost.
- E. It is the intention of the Drawings and Specifications that, where certain mechanical items such as unions, expansion joints, and other mechanical components are not shown, but where such items are required by the nature of the work, shall be furnished and installed.
- F. The Mechanical Drawings and Specifications are intended to supplement each other. Any material or labor called for in one shall be furnished even though not specifically mentioned in the other.

- G. Pipe and duct sizes shown are the minimum allowable and shall be increased in size if required by code or wherever necessary to meet unusual conditions.

### 3.6 DAMAGE

- A. Repair any damage to the building, premises, and equipment occasioned by the work under this Section.
- B. Repair all damage to any part of the building or premises caused by leaks or breaks in pipe, or malfunctions of equipment furnished or installed under this Section until the warranty period expiration date.

### 3.7 CONCRETE WALLS AND CONCRETE FOOTINGS

- A. Where pipes must pass through concrete walls and footings, they shall pass through SDR 35 PVC pipe sleeves with 1/2" annular space set in place at time of construction.
- B. Ducts shall pass through 10 gauge galvanized sheet metal sleeves. Provide sheet metal closure collars at duct penetration.
- C. Sheetmetal sleeves set into concrete walls: Provide steel frame around opening where required by Structural Engineer.
- D. Coordinate core drilled openings with and General Contractor. Coordination shall include location, size, and spacing of openings. No slot openings will be allowed. Coordinate openings to avoid critical structural items such as reinforcing bars, tensioning tendons, etc.

### 3.8 ELECTRICAL REQUIREMENTS - CONTROLS AND COORDINATION WITH ELECTRICAL CONTRACTOR

- A. Contractor shall coordinate with the Electrical Contractor on furnishing and installing of controls, motors, starters, etc. Coordinate means informing Electrical Contractor of items requiring electrical connection, providing copies of submittal data, installation data, scheduling work to ensure efficient progress, and promptly supplying those items to be installed by Electrical Contractor.
- B. The specific requirements for electrical power and/or devices for each and every piece of mechanical equipment requiring electrical service, supplied and/or installed under this Contract, shall be coordinated and verified with the Mechanical drawings and specifications, and with the manufacturers of the equipment supplied. This shall include the voltage, phase, and ampacity; conduit requirements; and exact location and type of disconnect, control, and/or connection required. Any changes from the Drawings and Specifications required as a result of this coordination shall be part of this Contract.
- C. Electrical Contractor shall furnish and install the following for all mechanical equipment:
  - 1. Conduit and wiring for line voltage power to the equipment.
  - 2. Disconnect switches.
  - 3. Manual motor starters.
  - 4. Magnetic motor starters when part of a motor control center. See Division 26 and Drawings for further information.
- D. The work under this Section shall include furnishing and installing all controls on low and manual line voltage, including thermostats, auxiliary switches, relay wiring, interlock wiring; equipment control panels and transformers; and controls conduit unless specifically indicated as part of other work. Materials and methods of the control installation shall be in accordance with the Electrical Specifications.
- E. The Mechanical Contractor shall review all wiring connections which have any influence on this equipment or work and verify that these connections are correct before permitting any equipment to be operated which is furnished, installed, or modified under this Contract.

### 3.9 ELECTRICAL EQUIPMENT ROOM PRECAUTIONS

- A. Ductwork or piping for mechanical systems shall not be installed in any switchgear room, transformer vault, telephone room or electric closet except as indicated. In any case, no ductwork or piping for mechanical systems shall be installed in the space equal to the width and depth of any electrical service equipment,

switchboards, panel boards, or motor control centers and extending from the floor to a height of six feet above the equipment or to the structural ceiling, whichever is lower.

### 3.10 CUTTING AND REPAIRING

- A. No cutting shall be done except with approval. Cutting of structural members or footings is prohibited without the prior written consent of the structural engineer.
- B. Where cutting of paving, walls, ceilings, etc. is necessary for the installation of the mechanical work, it shall be done under the direction of this Section. Damage caused by this cutting shall be repaired to match original and adjacent surfaces without additional expense to the Owner. Cutting of new construction shall be by the installing Contractor of that construction as directed by this Contractor.

### 3.11 ACCESSIBILITY

- A. General: Valves, damper operators, filters, thermometers, pressure gauges, clean-out fittings, and indicating equipment or specialties requiring reading, adjusting, inspection, repairing, removal, or replacement shall be conveniently and accessibly located with reference to finished building. Thermometers and gauges installed to be easily read from floor.
- B. Panels: No unions, flanges, valves, dampers, controls, or equipment shall be placed in a location that will be inaccessible after the system is complete. Access panels or doors shall be provided where required whether or not shown on Drawings.
- C. Access Panels in Walls or Ceilings:
  - 1. Provide access panels in walls or ceilings. Milcor or approved equal, where indicated and where required to provide access to valves, dampers, and other appurtenances. Panels shall be style as selected by and as directed by wall or ceiling construction. Panel size shall be 24" x 24" unless indicated otherwise. Panels in acoustical barriers shall have same transmission loss as barrier. Panels in rated construction shall have same rating as construction in which installed.
  - 2. Door panels shall be no lighter than 14 gauge steel. Doors shall be equipped with concealed spring hinges and flush, screwdriver operated locks, except that key operated locks shall be used for all access doors in walls where door is within 6'-0" of floor. Locks for all key operated doors shall be keyed alike.
  - 3. Doors in ceramic tile surfaces shall be stainless steel or chrome plated. Doors in other finished surfaces shall be prime coated.
  - 4. Doors in fire rated grease exhaust duct shafts shall be fire rated and openable without the use of tools.
- D. Equipment Spaces: Provide aisles between equipment and ducts, electrical gear, etc. for complete service and inspection of equipment. Maintain minimum 6'-6" headroom in all access aisles. Maintain minimum 36" clearance at all service panels. Provide minimum clearances at electrical equipment per NEC. Provide 36" wide, 3/4" thick plywood covered catwalks in attics from access door to equipment.

### 3.12 TESTING

- A. Test all piping, ductwork, equipment, and systems as called for in the Specifications. Notify and inspection authorities prior to testing so that they may be witnessed. Protect all personnel and equipment during testing. Where Specifications do not cover specific points or methods, conform to manufacturer's specifications.

### 3.13 OPENINGS

- A. Locating and sizing of all openings for pipe, conduit and ductwork through walls, roof, etc. shall be done under this Division. Framing of openings shall be done by the respective trades in whose work the opening is made.

### 3.14 EQUIPMENT

- A. All equipment shall be accurately set and leveled. Supports shall be neatly placed and properly fastened. All equipment shall be fastened in place with bolts.



- B. Keep all openings closed with plugs or caps to prevent entrance of foreign matter. Protect all piping, ductwork, fixtures, and equipment against dirt, water, chemical, or mechanical damage both before and after installation. Any equipment or apparatus damaged prior to final acceptance shall be restored to original condition or replaced at the discretion and at no additional cost to the Owner.
- C. Start-Up: Equipment shall be adjusted, lubricated, aligned, etc. prior to start-up. Inspect each piece of equipment prior to start-up. Start each piece of equipment in accordance with manufacturer's directions and warranty requirements.
- D. Finish: Protect all equipment and materials until in use. Any visible rust or corrosion shall be removed as directed prior to installation. All damaged factory painted finishes shall be cleaned and painted with manufacturer provided paint.

### 3.15 MANUFACTURER'S DIRECTIONS

- A. Materials and equipment shall be installed in accordance with manufacturer's application and recommendations, requirements, and instructions, and in accordance with Contract Documents. Where manufacturer's instructions differ from those indicated or specified, they shall be brought to attention for resolution prior to equipment ordering and installation.
- B. Where requirements indicated in Contract Documents exceed manufacturer's requirements, Contract Documents shall govern.

### 3.16 FURRING AND PIPE SPACES

- A. Spaces provided in the design of the building shall be utilized and the work shall be kept within the furring lines established on the Drawings.
- B. Layout: Maintain maximum head room under piping and equipment. Contractor to coordinate line locations with beams, windows, etc. to provide maximum clearance. From Drawings, ascertain heights of suspended ceilings and size of pipe shafts in which piping is concealed, and location and size of structural members in and adjacent to pipe shafts. Coordinate piping installation with ductwork, lighting, and other equipment. Ensure necessary clearances on trim plates at exposed penetrations of walls and floors. If sufficient room is not available above suspended ceiling or vertical shafts obtain clarification from before work is started.

### 3.17 CLEAN-UP

- A. During the course of work under this Section, all rubbish, debris, surplus materials, tools, etc. resulting from this work shall be removed from work area and shall be disposed of off-site at the end of each working day. The Owner's premises shall be left clean and in a condition acceptable to the owner.
- B. Clean all work installed under this Contract to satisfaction of Owner and submit documentation that each system has been cleaned and results witnessed by the representative.
- C. All water distribution and piping systems, including those for cold water and hot water systems, shall be flushed thoroughly until piping is cleaned to satisfaction of the owner. See other Specification Sections for additional requirements.

### 3.18 ENGRAVED NAMEPLATES

- A. Furnish and install plastic laminated engraved nameplates with 1/4" minimum lettering at panel mounted control devices, manual control stations, power disconnects, motor starters and pieces of equipment. Nameplates exposed to weather shall be engraved brass.

### 3.19 FINAL INSPECTION

- A. The Contractor shall furnish the certificates of final inspection and approval from the inspection authorities having jurisdiction.

### 3.20 SITE VISITS BY ENGINEER

- A. Engineer's responsibility is limited to normal construction support services only, consisting of office consultation, site visits, and reports at appropriate stages of construction such as rough-in, pre-final, and final.

- B. If the Engineer is requested for a site visit and the work performed to that point is not able to be reviewed, requiring an additional site visit, all costs incurred by the Engineer for additional site visits or office shall be paid for by that Contractor.

END OF SECTION

SECTION 23 0593  
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Testing, adjusting, and balancing of air systems specified in Division 23.
- B. Work shall generally consist of volume adjustments, speed adjustments, performing tests, recording equipment data and measurements, and preparing reports to achieve system performance as required by Contract Documents.

1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. BAS: Building Automation System. Automatic control system consisting of standalone or integrated digital controllers used to control HVAC equipment.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. Project Supervisor: Individual employed by balancing contractor having administrative and technical responsibility for work performed under this Section.

1.3 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems 2008.
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems 2015, with Errata (2017).
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing 2002.

1.4 SUBMITTALS

- A. Special Requirements:
  - 1. Contractor Qualifications: Submit documentation within 14 days of the Contract Date demonstrating that TAB Contractor and Project Supervisor are NEBB certified.
  - 2. **Pre-balancing Submittal: Provide submittal 30 days after approval of contractor's qualifications including:**
    - a. Preliminary TAB report including report documentation form with design data and existing equipment data listed.
    - b. Description of balancing tolerances which are in accordance with NEBB standards.
    - c. Review Contract Documents and provide list of provisions that are not included but necessary to complete work such as balancing dampers, valves, flow measuring stations, test plugs, access doors, etc.
    - d. Review Contract Documents and provide a description of any conditions that are unclear, contradictory, or otherwise may prevent specified systems from achieving design performance.
    - e. Provide a written description of test procedures that are unique to this project and not specified by NEBB standards.
  - 3. Balancing Report: When balancing is complete in whole or for any major phase of work, provide balancing report to Engineer for review. Engineer shall provide written review comments to Balancing Contractor. Balancing report shall include information and data providing an exact record of system performance, documenting compliance with specification requirements, and enabling independent verification of all

measurements. Reports shall include notes and comments necessary to clearly communicate balancing results. Report contents shall include the following information:

- a. NEBB certification
- b. Identification of all test instruments used and the last calibration dates.
- c. Plans or schematic diagram showing the location of equipment, measurement locations, and terminal devices. Plans shall show equipment and terminal device designation corresponding to report forms.
- d. Testing and balancing documentation recorded on NEBB report forms. Each report form shall include the name of individual performing TAB work. Forms shall be fully completed with all relevant data entered.
- e. Summary of minimum outside air ventilation measurements and adjustments.
- f. Summary of all conditions which are not in conformance with Contract Documents.
- g. Copy of written directives from the Engineer and other relevant project correspondence.

#### 1.5 QUALITY ASSURANCE

- A. Balancing Contractor and Project Supervisor shall be certified by NEBB.
- B. Balancing Contractor must be approved prior to bid closing. Unless Balancing Contractor is listed as pre-approved below, Bidder must submit a request for approval, in writing, to the Engineer. The request must include documentation, including references, that demonstrates that the Balancing Contractor has the necessary training and experience to perform the Work specified. Approval determinations will be made by the Engineer. In addition to documentation provided by the Bidder, the Engineer may use any information available to him in determining qualifications/suitability of the Balancing Contractor.
- C. Pre-approved contractors: Air Balancing Specialties; Air Introduction & Regulation; Neudorfer Engineers.
- D. All work under this Section shall be performed under the direction of the Project Supervisor.
- E. Balancing Contractor shall attend a pre-**balancing coordination meeting with the Owner's Authorized Representative, Engineer, and Contractor**. Meeting agenda shall include: coordination of work between Balancing Contractor and Control Contractor, balancing procedures, and schedule of work. Meeting shall be attended by Project Supervisor.

#### 1.6 SEQUENCING

- A. Pre-balancing meeting shall be conducted 30 days prior to start of balancing.
- B. Begin testing, adjusting, and balancing of systems after Construction Check/Start-up Plans are certified by the Commissioning Authority.

### PART 2 – PRODUCTS

#### 2.1 MATERIALS

- A. Test Instruments: Furnished by Contractor.
- B. Plugs: Provide plastic plugs in test holes drilled in ductwork. Provide UV resistant plugs for equipment located outdoors.

### PART 3 - EXECUTION

#### 3.1 GENERAL REQUIREMENTS

- A. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

- B. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- C. TAB Agency Qualifications:
  - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
  - 2. Having minimum of three years documented experience.
  - 3. Certified by one of the following:
    - a. AABC, Associated Air Balance Council: upon completion submit AABC National Performance Guaranty.
    - b. NEBB, National Environmental Balancing Bureau.
    - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute.
- D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

### 3.2 EXAMINATION

- A. Examine Contract Documents for testing and balancing devices that are not included but necessary to complete work such as balancing dampers, valves, flow measuring stations, test plugs, access doors, etc. Submit list of recommended additional devices needed to perform work.
- B. Examine Contract Documents for any conditions that are unclear, contradictory, or otherwise may prevent specified systems from achieving design performance. Submit list of conditions observed.
- C. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
  - 1. Systems are started and operating in a safe and normal condition.
  - 2. Temperature control systems are installed complete and operable.
  - 3. Proper thermal overload protection is in place for electrical equipment.
  - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  - 5. Duct systems are clean of debris.
  - 6. Fans are rotating correctly.
  - 7. Fire and volume dampers are in place and open.
  - 8. Air coil fins are cleaned and combed.
  - 9. Access doors are closed and duct end caps are in place.
  - 10. Air outlets are installed and connected.
  - 11. Duct system leakage is minimized.
- D. Beginning of work means acceptance of existing conditions.

### 3.3 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 5 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design, maintaining overall pressurization (positive, negative or neutral) per plan in each room.

### 3.4 APPLICATION

- A. Work shall be performed in accordance with the latest addition of the NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
- B. Accuracy of measurements and balancing tolerances shall be in accordance with NEBB standards.

C. Special Balancing Procedures

1. Motors: Record starter overload settings. List overload part number and rating for bimetallic overloads or setpoint for adjustable overload devices.
2. Mark final position of balancing devices after balancing is complete.
3. Adjust slot diffusers so air flow is directed away from light fixtures, space temperature/humidity transmitters, and toward floor.

D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

H. Check and adjust systems approximately six months after final acceptance and submit report.

I. Balancing is complete when following conditions are achieved:

1. Systems and components are tested and balanced within specified tolerances.
2. All efforts within the extent of TAB have been exhausted, and systems or components are not operating within acceptable tolerances. Balancing is not complete until written notification of all abnormal or deficient conditions is provided to the Engineer, written direction is received, and all work required by Contract Documents is fully completed.

3.5 FIELD QUALITY CONTROL

A. Testing instruments shall be reliable, accurate, and in good working order. Calibration maintenance of all instruments shall be in accordance with NEBB requirements.

END OF SECTION

SECTION 23 0713  
DUCT INSULATION

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Duct insulation.
- B. Duct liner.
- C. Insulation jackets.

1.2 RELATED REQUIREMENTS

- A. Section 230553 - Identification for HVAC Piping and Equipment.
- B. Section 233100 - HVAC Ducts and Casings: Glass fiber ducts.

1.3 REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
- C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2017.
- D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2016.
- E. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013.
- F. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation 2014.
- G. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation 2014.
- H. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material) 2016.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.
- J. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- K. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015.
- L. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).
- M. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.1 SUBMITTALS

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

1.2 QUALITY ASSURANCE

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

1.3 DELIVERY, STORAGE, AND HANDLING

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

#### 1.4 FIELD CONDITIONS

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

### PART 2 – PRODUCTS

#### 2.1 REGULATORY REQUIREMENTS

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

#### 2.2 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
  - 1. Johns Manville: [www.jm.com](http://www.jm.com).
  - 2. Knauf Insulation; Atmosphere Duct Wrap: [www.knaufinsulation.com](http://www.knaufinsulation.com).
  - 3. Owens Corning Corporation: [www.ocbuildingspec.com](http://www.ocbuildingspec.com).
  - 4. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
  - 1. 'K' ('Ksi') value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.
- C. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
  - 3. Secure with pressure sensitive tape.
- D. Vapor Barrier Tape:
  - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- E. Outdoor Vapor Barrier Mastic:
  - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- F. Tie Wire: Annealed steel, 16 gauge, 0.0508 inch diameter (1.29 mm diameter).

#### 2.3 GLASS FIBER, RIGID

- A. Manufacturer:
  - 1. Johns Manville: [www.jm.com](http://www.jm.com).
  - 2. Knauf Insulation: [www.knaufinsulation.com](http://www.knaufinsulation.com).
  - 3. Owens Corning Corporation; 700 Series FIBERGLAS Insulation: [www.ocbuildingspec.com](http://www.ocbuildingspec.com).
  - 4. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
- B. Insulation: ASTM C612; rigid, noncombustible blanket.



1. 'K' ('Ksi') Value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C518.
- C. Vapor Barrier Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
  3. Secure with pressure sensitive tape.
- D. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- E. Indoor Vapor Barrier Finish:
1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight, glass fabric.
  2. Vinyl emulsion type acrylic, compatible with insulation, black color.

## 2.4 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturer:
1. Armacell LLC; [www.armacell.us](http://www.armacell.us).
  2. K-Flex USA LLC; Insul-Sheet: [www.kflexusa.com](http://www.kflexusa.com).
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
  2. Maximum Service Temperature: 180 degrees F (82 degrees C).
  3. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

## 2.5 JACKETS

- A. Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
1. Lagging Adhesive:
    - a. Compatible with insulation.
- B. Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square (2.45 kg/sq m).
- C. Aluminum Jacket: ASTM B209 (ASTM B209M).
1. Thickness: 0.016 inch (0.40 mm) sheet.
  2. Finish: Smooth.
  3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
  4. Fittings: 0.016 inch (0.4 mm) thick die shaped fitting covers with factory attached protective liner.
  5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.
  6. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.010 inch (0.25 mm) thick stainless steel.

## 2.6 DUCT LINER

- A. Manufacturers:
1. Armacell LLC; AP Coilflex: [www.armacell.us](http://www.armacell.us).
  2. Johns Manville: [www.jm.com](http://www.jm.com).

3. Knauf Insulation: [www.knaufinsulation.com](http://www.knaufinsulation.com).
  4. Owens Corning Corporation: [www.ocbuildingspec.com](http://www.ocbuildingspec.com).
  5. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
- B. Note: Choose the liner type - Elastomeric Foam.
- C. Elastomeric Foam Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
  2. Maximum Service Temperature: 180 degrees F (82 degrees C).
  3. Fungal Resistance: No growth when tested according to ASTM G21.
  4. Apparent Thermal Conductivity: Maximum of 0.28 at 75 degrees F (0.045 at 24 degrees C).
  5. Erosion Resistance: Does not show evidence of breaking away, flaking off, or delamination at velocities of 10,000 fpm (50.8 m/s) per ASTM C1071.
  6. Connection: Waterproof vapor barrier adhesive.
- D. Adhesive: Waterproof, fire-retardant type, ASTM C916.
- E. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Insulated ducts conveying air below ambient temperature:
  1. Provide insulation with vapor barrier jackets.
  2. Finish with tape and vapor barrier jacket.
  3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
  4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- C. Insulated ducts conveying air above ambient temperature:
  1. Provide with or without standard vapor barrier jacket.
  2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- D. External Duct Insulation Application:
  1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
  2. Secure insulation without vapor barrier with staples, tape, or wires.
  3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
  4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.

5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
- E. Duct and Plenum Liner Application:
1. Adhere insulation with adhesive for 90 percent coverage.
  2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
  3. Seal and smooth joints. Seal and coat transverse joints.
  4. Seal liner surface penetrations with adhesive.

### 3.3 SCHEDULES

- A. Insulation R-values shall comply with currently adopted version of ASHRAE 90.1.
- B. Supply and Return Ducts:
1. Exterior Locations (includes attics above insulated ceilings, crawl spaces and parking garages): R-12 minimum.
  2. Unconditioned Spaces and Buried Ducts: R-6 minimum.

END OF SECTION

SECTION 23 3100  
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal ductwork.
- B. Nonmetal ductwork.
- C. Casing and plenums.
- D. Duct cleaning.

1.2 RELATED REQUIREMENTS

- A. Section 230593 - Testing, Adjusting, and Balancing for HVAC.
- B. Section 230713 - Duct Insulation: External insulation and duct liner.
- C. Section 233300 - Air Duct Accessories.
- D. Section 233700 - Air Outlets and Inlets.

1.3 REFERENCE STANDARDS

- A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2018.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- E. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- F. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.
- H. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements 2015.
- I. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements 2015.
- J. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements 2015.
- K. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements 2016.
- L. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.
- M. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).
- N. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual 2012.
- O. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors current edition, including all revisions.

1.4 SUBMITTALS

- A. Product Data: Provide data for duct materials.
- B. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK).
- C. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of experience.

#### 1.6 FIELD CONDITIONS

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

### PART 2 – PRODUCTS

#### 2.1 DUCT ASSEMBLIES

- A. Regulatory Requirements: Construct ductwork to NFPA 90A standards.
- B. Ducts: Galvanized steel, unless otherwise indicated.
- C. Low Pressure Supply: 2 inch w.g. (500 Pa) pressure class, galvanized steel.
- D. Return and Relief: 1 inch w.g. (250 Pa) pressure class, galvanized steel.
- E. General Exhaust: 1 inch w.g. (250 Pa) pressure class, galvanized steel.
- F. Kitchen Cooking Hood Exhaust: 1 inch w.g. (250 Pa) pressure class, galvanized steel.
- G. Outside Air Intake: 1 inch w.g. (250 Pa) pressure class, galvanized steel.

#### 2.2 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Aluminum for Ducts: ASTM B209 (ASTM B209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.
- C. Stainless Steel for Ducts: ASTM A666, Type 304.
- D. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
  - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
  - 2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
  - 3. For Use with Flexible Ducts: UL labeled.
- E. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
- F. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
  - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
  - 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
  - 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
  - 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
  - 5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.

#### 2.3 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.

- B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated. Minimum thickness shall be 26 gauge.
- C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- E. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

## 2.4 MANUFACTURED DUCTWORK AND FITTINGS

- A. Flat Oval Ducts: Machine made from round spiral lockseam duct.
  - 1. Manufacture in accordance with SMACNA (DCS).
  - 2. Fittings: Manufacture at least two gages heavier metal than duct.
  - 3. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Spiral Ducts: Round spiral lockseam duct with galvanized steel outer wall.
  - 1. Manufacture in accordance with SMACNA (DCS).
- C. Round Ducts: Round lockseam duct with galvanized steel outer wall.
  - 1. Manufacture in accordance with SMACNA (DCS).
- D. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.
  - 1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
  - 2. Pressure Rating: 10 inches WG (2.50 kPa) positive and 1.0 inches WG (250 Pa) negative.
  - 3. Maximum Velocity: 4000 fpm (20.3 m/sec).
  - 4. Temperature Range: Minus 10 degrees F to 160 degrees F (Minus 23 degrees C to 71 degrees C).

## 2.5 CASINGS

- A. Fabricate casings in accordance with SMACNA (DCS) and construct for operating pressures indicated.
- B. Mount floor mounted casings on 4 inch (100 mm) high concrete curbs. At floor, rivet panels on 8 inch (200 mm) centers to angles. Where floors are acoustically insulated, provide liner of galvanized 18 gage, 0.0478 inch (1.21 mm) expanded metal mesh supported at 12 inch (300 mm) centers, turned up 12 inches (300 mm) at sides with sheet metal shields.
- C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.

## PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- C. Flexible Ducts: Connect to metal ducts with adhesive.
- D. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

- F.** Use crimp joints with or without bead for joining round duct sizes 8 inch (200 mm) and smaller with crimp in direction of air flow.
- G.** Use double nuts and lock washers on threaded rod supports.
- H.** Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet (1.5 m) maximum length of flexible duct held in place with strap or clamp.
- I.** At exterior wall louvers, seal duct to louver frame.
- J.** Grease duct shall be installed in accordance with all code requirements. Provide cleanouts where required. Slope horizontal ducts down toward hood at a minimum of 1/4" per foot of run. Provide required clearances to combustibles.

### 3.2 CLEANING

- A.** Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

END OF SECTION

SECTION 23 3300  
AIR DUCT ACCESSORIES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Backdraft dampers - metal.
- B. Combination fire and smoke dampers.
- C. Duct access doors.
- D. Duct test holes.
- E. Fire dampers.
- F. Flexible duct connections.
- G. Smoke dampers.
- H. Volume control dampers.

1.2 RELATED REQUIREMENTS

- A. Section 233100 - HVAC Ducts and Casings.

1.3 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).
- C. UL 33 - Safety Heat Responsive Links for Fire-Protection Service Current Edition, Including All Revisions.
- D. UL 555 - Standard for Fire Dampers Current Edition, Including All Revisions.
- E. UL 555S - Standard for Smoke Dampers Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.
- B. Manufacturer's Installation Instructions: Provide instructions for fire dampers.
- C. Project Record Drawings: Record actual locations of access doors and test holes.
- D. Maintenance Materials: Furnish the following for Owner 's use in maintenance of project.
  - a. Extra Fusible Links: One of each type and size.

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 BACKDRAFT DAMPERS - METAL



- A.** Manufacturers:
  - 1. Nailor Industries, Inc: [www.nailor.com](http://www.nailor.com).
  - 2. Ruskin Company, a brand of Johnson Controls: [www.ruskin.com](http://www.ruskin.com).
  - 3. Greenheck.
- B.** Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch (150 mm) width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

## 2.2 COMBINATION FIRE AND SMOKE DAMPERS

- A.** Manufacturers:
  - 1. Nailor Industries, Inc: [www.nailor.com](http://www.nailor.com).
  - 2. Pottorff: [www.pottorff.com](http://www.pottorff.com).
  - 3. Ruskin Company, a brand of Johnson Controls: [www.ruskin.com](http://www.ruskin.com).
  - 4. Greenheck.
- B.** Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.
- C.** Provide factory sleeve and collar for each damper.
- D.** Multiple Blade Dampers: Fabricate with 16 gage, 0.0598 inch (1.52 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch (3.2 by 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch (12.7 mm) actuator shaft.
- E.** Operators: UL listed and labelled spring return electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on exterior of duct and link to damper operating shaft.
- F.** Normally Closed Smoke Responsive Fire Dampers: Curtain type, opening by gravity upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure.
- G.** Normally Open Smoke Responsive Fire Dampers: Curtain type, closing upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure, stainless steel springs with locking devices to ensure positive closure for units mounted horizontally.
- H.** Electro Thermal Link: Fusible link melting at 165 degrees F (74 degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

## 2.3 DUCT ACCESS DOORS

- A.** Manufacturers:
  - 1. Nailor Industries, Inc: [www.nailor.com](http://www.nailor.com).
  - 2. Ruskin Company, a brand of Johnson Controls: [www.ruskin.com](http://www.ruskin.com).
- B.** Fabricate in accordance with SMACNA (DCS) and as indicated.

## 2.4 DUCT TEST HOLES

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

## 2.5 FIRE DAMPERS

- A.** Manufacturers:
  - 1. Nailor Industries, Inc: [www.nailor.com](http://www.nailor.com).

2. Pottorff: [www.pottorff.com](http://www.pottorff.com).
  3. Ruskin Company, a brand of Johnson Controls: [www.ruskin.com](http://www.ruskin.com).
  4. Greenheck.
- B.** Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- C.** Ceiling Dampers: Galvanized steel, 22 gauge, 0.0299 inch (0.76 mm) frame and 16 gage, 0.0598 inch (1.52 mm) flap, two layers 0.125 inch (3.2 mm) ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.
- D.** Horizontal Dampers: Galvanized steel, 22 gauge, 0.0299 inch (0.76 mm) frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.
- E.** Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1.0 inch (250 Pa) pressure class ducts up to 12 inches (300 mm) in height.
- F.** Multiple Blade Dampers: 16 gage, 0.0598 inch (1.52 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 by 1/2 inch (3.2 by 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.
- G.** Fusible Links: UL 33, separate at 160 degrees F (71 degrees C) with adjustable link straps for combination fire/balancing dampers.

## 2.6 FLEXIBLE DUCT CONNECTIONS

- A.** Fabricate in accordance with SMACNA (DCS) and as indicated.
- B.** Flexible Duct Connections: Fabric crimped into metal edging strip.
1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd (1.0 kg/sq m).
- C.** Maximum Installed Length: 60 inch.

## 2.7 SMOKE DAMPERS

- A.** Manufacturers:
1. Nailor Industries, Inc: [www.nailor.com](http://www.nailor.com).
  2. Ruskin Company, a brand of Johnson Controls: [www.ruskin.com](http://www.ruskin.com).
  3. Greenheck.
- B.** Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.
- C.** Dampers: UL Class 1 airfoil blade type smoke damper, normally open automatically operated by electric actuator.

## 2.8 VOLUME CONTROL DAMPERS

- A.** Manufacturers:
1. Nailor Industries, Inc: [www.nailor.com](http://www.nailor.com).
  2. Ruskin Company, a brand of Johnson Controls: [www.ruskin.com](http://www.ruskin.com).
  3. Greenheck.
- B.** Fabricate in accordance with SMACNA (DCS) and as indicated.
- C.** Single Blade Dampers:
1. Fabricate for duct sizes up to 6 by 30 inch (150 by 760 mm).
  2. Blade: 24 gage, 0.0239 inch (0.61 mm), minimum.

- D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch (200 by 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- E. End Bearings: Except in round ducts 12 inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

## PART 3 – EXECUTION

### 3.1 PREPARATION

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

### 3.2 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 233100 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 by 8 inch (200 by 200 mm) size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch (100 by 100 mm) for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where required for testing and balancing purposes.
- E. Provide fire dampers, combination fire and smoke dampers and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.
- G. Demonstrate re-setting of fire dampers to Owner 's representative.
- H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- I. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- J. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- K. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

**SECTION 26 00 00**  
**COMMON WORK RESULTS FOR ELECTRICAL**

**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Electrical materials and installation instruction common to most electrical systems and components including but not limited to: equipment, raceways, fittings, sleeve/seals, sleeves, wires & connectors, conductors, demolition, equipment installation requirements common to equipment sections, painting and finishing, concrete bases, supports and anchorages, general coordination, electrical wiring and device coordination.

**1.2 DEFINITIONS**

- A. Following is a list of abbreviations generally used in Division 26.
1. AHJ – Authority Having Jurisdiction.
  2. ETL – Electric Testing Laboratories.
  3. NEC – National Electric Code.
  4. NEMA – National Electrical Manufacturers Association.
  5. NFPA – National Fire Protection Association.
  6. OSHA – Occupational Safety and Health Administration.
  7. UL – Underwriters Laboratories Inc.
- B. Terms used on the drawings or in the specifications shall have the following meanings:
1. Approved Equal: An Item suggested by the Contractor that is allowed by the Engineer to replace an item listed in the Specifications or Drawings. The burden of proof of equality is the responsibility of the Contractor.
  2. Furnish: Supply and deliver, ready for installation, assembly or intended use, all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application for the particular work referred to.
  3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at the project site as required to complete all items of work as required for the intended use/operation including all testing, certification, commissioning, and other requirements for final turnover to the Owner.
  4. Provide: "Furnish" and "Install".
  5. Owner Furnished, Contractor Installed: The Owner will furnish at his cost and the Contractor shall receive, protect, store and install in the performance of the Work.
  6. Finished Spaces: Spaces other than electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
  7. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
  8. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include installations above ceilings, in shafts, trenches, partitions, or other enclosures.
  9. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations embedded in or below masonry or concrete construction, earthwork/trenches, within unheated shelters, crawl spaces or enclosures.
  10. Wiring: All wires, raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connectors, splices, and all other items necessary and/or required in connection with such work.
  11. Raceway: All raceways, conduit, fittings, hangers, supports, sleeves, etc.

**1.3 GENERAL REQUIREMENTS**

- A. Examine the Drawings, specifications and other Contract Documents relating to the Work and the work of all trades and become fully informed as to the extent and character of work required. Coordinate all work with that of others to ensure proper and complete installation of all materials, equipment and supports. It is the intent of the drawings,

specifications and related contract Documents to provide a complete working installation of all systems and equipment called for, in proper operating condition, finished, tested and ready for its intended use (hereinafter "Design Intent"). Provide all items not specifically shown on the drawings, called for in the specifications or related Contract Documents, but required to conform to the labor, material and equipment to achieve the Design Intent all and scaffolding, access provisions, tools, appliances, consumables, fees, permits and licenses, debris removal/disposal, supervision and labor, including required start-up, check-out and training to provide complete and fully operable systems in full compliance with the Contract Documents.

- B. Before submitting a bid and prior to the start of work, Contractor shall examine all conditions relating to the Work, including that associated with the work of other trades upon which Contractor's work may rely or otherwise depend, to achieve the Design Intent, in accordance with the best trade practices, workmanship and highest quality product installation, taking into account the sequence of the work, delivery, storage and hoisting requirements, requirements for access, testing and temporary services and all other site limitations and project complexities. Report to the Architect/Engineer any conditions which might prevent installation of materials and/or equipment in the manner intended by the Contract Documents or contrary to applicable codes, standards or regulations.
- C. No consideration or allowance will be granted for any alleged misunderstanding of materials, equipment or components to be furnished or work to be done; it being agreed that tender of proposal carries with it agreement to items, terms and conditions required by the Contract Documents.
- D. Site Visit – Visit the site and verify the exact conditions relating to the work and obtain such information as may be necessary to present a complete and comprehensive bid. No allowance will be made for any extra expense due to Contractor's failure to make such a visit and reasonably verify all actual/existing conditions. In the event of a conflict between existing conditions and the requirements of the Contract Documents, perform the necessary work to conform to Design Intent. The Owner or his representative will be the sole individual to interpret the intent of the Drawings in the event of a conflict between (1) existing conditions and those shown on the drawings, or (2) quality of existing material and quality of material indicated on the drawings or in the specifications. Wherever a conflict such as this occurs, the higher standard shall prevail.

#### **1.4 SPECIAL REQUIREMENTS**

- A. All seismic construction, restraints, bracing, mounts and hanging systems shall be in full compliance with the requirements of all Authorities Having Jurisdiction (AHJ's), pre-approval, certification and engineering (including certified engineering calculations and stamps). Contractor shall be solely responsible for obtaining and complying with all requirements of the AHJ.

#### **1.5 SUBMITTALS**

- A. Reference Division 1 for submittal requirements.
- B. Submittal Schedule – Provide a detailed submittal schedule including all requirements of this Division and its subdivisions to the Architect and Engineer within thirty (30) days of contract award.
  - 1. Contractor shall submit for the Engineer's approval a Submittal Schedule for the performance of the work that is consistent with the requirements of the project schedule. The Submittal Schedule shall allow reasonable time for the Architect and other consultants review as specified in Division 1 Submittal Procedures. If the time for Architects/Engineers review is not otherwise specified, the review period (from date of receipt) shall be fifteen (15) business days. Once approved by the Architect/Engineer, submittal dates and time limits established by the Submittal Schedule shall not, except for reasonable cause, be changed or exceeded by the Contractor.
  - 2. For each submittal required by the Contract Documents the schedule shall include: specification section number, subsection/paragraph identification number, item description (as stated in the applicable specification section, subsection or other Contract Document) and the scheduled delivery date to the Architect/Engineer.
  - 3. Contractor shall be responsible to the Architect/Engineer and/or Owner for all costs, expenses and impact to the project schedule resulting from any deviation to the approved Submittal Schedule, including but not limited to; payment for required overtime, out-of-house resources/consultants or other higher cost resources of the Architect/Engineer as may be required to perform out of sequence, stacked, critical, delayed, unscheduled or

multiple reviews of required submittals necessitated by rejection of a prior submittal, (cumulatively and hereinafter, "Additional Review Costs")

C. General

1. Review is for general conformance with the Contract Documents and is not intended to otherwise approve or verify dimensions, quantities, or to coordinate the Work shown on shop drawings on or between Contractor and the work of other trades or Sections. Contractor is solely responsible for quantities, dimensions, means and methods. Dimensions shall be confirmed and correlated by Contractor at the jobsite prior to the start of the Work (procurement, fabrication, construction or other commencement activities). Contractor's failure to fully verify conditions at the jobsite prior to commencement of the work shall not relieve Contractor of its obligations under the Contract Documents and Contractor shall be responsible for all damages caused by or related to its failure to comply with the requirements of this provision.
2. Submittal review shall be performed to show compliance with the design intent. Contractor shall specifically note any deviations from the Contract Documents and explain the reason and nature of the deviation. Such deviations will be reviewed or rejected on the submittal. Deviations not so identified shall not relieve the Contractor from the requirements of the Contract Documents.
3. Resubmittals will be reviewed for compliance with comment(s) made on the original submittal only. Architect/Engineer shall not be responsible for changes made upon resubmittal that are not clearly identified (highlighted), and respond directly to the initial rejection. Resubmittals should not be packaged with non-related first time submittals, all resubmittals must be marked with the resubmittal number and date and must otherwise comply with all submittal requirements.
4. Submit shop drawings, commissioning plan(s) and checklists, penetration locations, supplemental data, etc. as may be required by the Contract Documents for all materials, equipment and other components of the work included in all Sections of the Division and other provisions of the Contract Documents in accordance with the requirements of this Division and Division 1.
5. All submittals must be reviewed by Contractor, and bear Contractor's review stamp and signoff for Conformity to the Contract Documents, prior to the submission of any required submittal to Architect/Engineer. Submittals that fail to meet this requirement will be considered incomplete, will not be reviewed by Architect/Engineer and will be returned to Contractor, without review and/or rejected and resubmittal will be required. Contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
6. Forward all submittals to Architect/Engineer in a coherent, organized fashion, complete and packaged as required herein, Architect/Engineer may reject submittals that fail to comply with this or any other provision of the Contract Documents and Contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
7. Subject to other provisions of the Contract Documents and in the absence of a more stringent requirement, Architect/Engineer will review a submittal not more than two (2) times. Contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
8. Identify each submittal item by reference to Specification Section paragraph in which item is specified, or drawing/detail number, as applicable. In addition, for equipment submittals, include identification numbers appearing on the equipment schedule.
9. Identify each item by manufacturer, brand, trade name, number, size, rating, or whatever other data is necessary to properly identify and check materials and equipment. Words "as specified" are not sufficient identification.
10. Organize submittals in same sequence as they appear in specification sections, articles or paragraphs.
11. All materials and equipment submittals shall have a summary sheet at the front complete with catalog numbers. Where materials or equipment pertain to more than one building, submittals shall clearly indicate at which locations the materials or equipment is to be installed.
12. Submittals shall show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping and/or conduit entrance, access requirements for installation and maintenance, physical

size and dimension, electrical characteristics and requirements, foundation/curbs and all permanent and temporary support details as well as all information relating to weight, including but not limited to live and dead weights.

- D. Catalog Cuts & Submittal Literature: Catalog cuts, submittal literature and published material may be included to supplement scale drawings.
1. Prepare submittals electronically in accordance with the following and Division 1
  2. Submittal literature, drawings and diagrams shall be specifically applicable to this project and shall not contain extraneous material or optional choices. Clearly mark literature to indicate the proposed item. Substitutions: Comply with Division 1 Product Substitution Procedures.
- E. Shop Drawings:
1. Shop drawings shall include all significant Division systems, equipment and components, including but not limited to all terminal devices, connections and elevations. Include all related specialty rooms (i.e. electrical, data/technology). Drawings shall be at a minimum scale of 1/4" per 1'-0" and shall be fully coordinated with the work of other trades and/or Sections.
  2. Identify congested areas and clearly indicate solutions to space problems, developed in conjunction with the work of other trades and/or Sections. Identification of space problems without proposed solutions is not acceptable and is grounds for rejection. For such areas indicate, superimposed, the work of all trades and/or Sections involved and:
    - a. Clearly identify each area of congestion and deviations from the Contract Documents, and:
    - b. Proposed solution(s), clearly documented and signed-off by all other trades and/or Sections involved.
- F. Anchorage and Supports: Submit details and calculations for support and anchors that are not specifically detailed on the drawings. All calculations must meet 2018 IBC.
1. Provide details and calculations for electrical equipment per IBC 2018:
    - a. Having an operating weight over 400 pounds or more and mounted directly to the floor.
    - b. Having an operating weight over 20 pounds and suspended from the roof, floor, or wall or supported by vibration isolation devices.
  2. Where pre-approved bracing systems will be employed, submit:
    - a. System component brochure describing components used and detailed installation instructions.
    - b. Loads to be transmitted to the structure at anchor points.
  3. Where anchorage, support, and bracing are not detailed on the drawings, and pre-approved systems are not used, submit details and calculations of proposed systems.
    - a. Anchorage and Supports
      - 1) Where equipment substitutions change the weight, size, configuration, or other aspects of systems and equipment that will affect the performance of anchorages and/or supports, submit calculations for proposed anchors and supports, and install them as shown in these calculations.
      - 2) Where substitutions will have no effect on anchors and supports detailed on Contract Documents, submit information on sizes, weights, center of gravity and other relevant information to demonstrate this fact.
- G. Shop Fabrication Drawings: Drawings are for the Contractor's use and shall be its responsibility. Do not submit shop fabrication documents unless specifically requested.
- H. Testing and Balancing: Coordinate Shop Drawings to include any additional components for proper system testing and balancing.
- I. Certificates: Submit final inspection certificates signed by governing authorities.
- J. Operating and Maintenance Instructions and Manuals.
1. Instructions on major items, including but not limited to: switchgear, generators, pumps, air compressors, water heaters, water softeners, specialty units, fans, air handlers, AC units and temperature controls, shall be by representative of manufacturer of respective equipment.
  2. Submit as identified below and as directed in Division 1.
    - a. Names, addresses and phone numbers of contractors and subcontractors. Alphabetical list of all system components, with the name, address, and 24-hour phone number of the company responsible for servicing each item during the first year of operation.

- b. Complete operating and maintenance instructions and parts lists of all equipment and component parts. Data sheets to show complete internal wiring, and electrical ratings and characteristics, catalog data on component parts whether furnished by equipment manufacturer or others, names, addresses and telephone numbers of source of supply for parts subject to wear or failure, and description of operating, test, adjustment, and maintenance procedures.
    - 1) Where data sheets included in manual cover equipment, options, or other features not part of equipment actually furnished, line out these references or otherwise clearly mark so remaining text, diagrams, drawings, schedules, and similar information shall apply specifically to equipment furnished.
  - c. Operating Instructions should include, but not be limited to:
    - 1) Normal starting, operational and shutdown procedures, including emergency procedures for each type of equipment/system.
    - 2) Equipment wiring diagrams.
    - 3) All other items as may be specified/required by this Section and the Contract Documents.
  - d. Maintenance Instructions
    - 1) All items as may be specified/required by this Section and the Contract Documents.
  - e. Manufacturers Data (each piece of equipment)
    - 1) Installation instructions
    - 2) Drawings & specifications
    - 3) Parts List, including recommended stock and long lead parts/components.
    - 4) Wiring and riser diagrams.
    - 5) Warranties and guarantees for all equipment, materials and components, including repair, replacement and labor from both Contractor and manufacturer as required by the Contract Documents.
    - 6) Certificates of Installation – manufacturer’s certification of supervision during equipment installation and start-up procedures.
    - 7) Instruction certificates – certificates of compliance with Sections specific training and instruction programs.
    - 8) All other items as may be specified/required by this Section and the Contract Documents.
- K. Record Documents.
- 1. Maintain one (1) complete set of blueline prints and specifications at the job site exclusively for recording deviations from the drawings which are necessary because of job conditions, request for information and/or approved change orders. Record locations and depths of buried and concealed conduits or other systems components from fixed, easily identifiable objects, such as building walls or other fixed physical objects. Where conduits are concealed in walls or other fixed physical objects, indicate distances from building corners or other building features not likely to be disturbed by fixture alterations. Drawings, specifications (as-builts) and approved submittals.
  - 2. Where the project use a BIM model the contractor shall keep the model updated in a similar fashion, maintaining the current project record as described in (a), above and submit, an addition to all other requirements of this Section and other provisions of the Contract Documents a complete and accurate BIM model for the project.
  - 3. Prior to Substantial Completion, obtain from the Architect a complete set of electronic CADD drawings. Record all revisions to these drawings to indicate as-built conditions. Indicate all changes, including RFI’s, on this set of documents. Submit one set of blueprints of these revised drawings for review. Make necessary changes and deliver to Architect one set of reproducible and one electronic copy, including and BIM model, upon Final Completion and Acceptance. Refer to Division 1 for additional requirements.
  - 4. Provide full size copies of record one-line diagrams, in metal frames with glass front. Obtain Record prints from Owner’s Representative at Contractor’s cost and have prints framed by a firm normally engaged in this work. Locate diagrams as directed.
  - 5. All test reports, certifications, and inspection reports.
  - 6. AHJ/Specialty AHJ Approvals (i.e. Fire Marshal and/or Fire Department system approvals).
  - 7. Substantial and Final inspection certificate signed by governing authorities.



8. All other items as may be specified/required by this Section and/or other provisions of the Contract Documents.

#### **1.6 EQUIPMENT DEVIATIONS & SUBSTITUTIONS**

- A. See Division 1 for requirements and procedures related to Deviations and Substitutions. Unless specified elsewhere in the Contract Documents, a minimum of two (2) weeks shall be allowed for evaluation. The burden of all systems re-engineering/design, testing, suitability and constructability is solely placed upon the Contractor for all deviations from the basis of design as reflected in the Contract Documents.
- B. No substitutions will be allowed and/or considered unless the description of a product includes the phrase "approved equal" and then only upon a determination as to equivalency and impact upon the project budget, schedule and the work of others, including any redesign of the project or its system components by the Architect, Engineer or other trades. The final determination as to sufficiency or acceptance of any such substitution and/or deviation properly requested and submitted by Contractor will lie solely with the Architect/Engineer. Contractor may not implement substitutions that have not been approved by Architect/Engineer.
- C. Where the contractor proposes to use an item of equipment other than that specified or detailed on the drawings which requires any redesign of any portion of the project, including but not limited to the mechanical, electrical, plumbing, structure, or architectural design or any of their respective subcomponents. Contractor shall be responsible to the Architect/Engineer and/or Owner for all costs, expenses and impact to the project budget and/or schedule resulting from any required investigation, analysis or redesign, including but not limited to; payment for required overtime, out-of-house resources/consultants or other higher cost resources of the Architect/Engineer, Owner or AHJ as may be required to perform the investigation, analysis or redesign (cumulatively and hereinafter, "Deviation Review Costs")
- D. If approved by Architect/Engineer, all such redesign, including all new drawings and detailing required, will be prepared by the Architect/Engineer and their sub-consultants for Change Order documentation for approval by Owner and the Authority Having Jurisdiction will be paid by the Contractor as part of the Deviation Review Costs.
- E. Where such approved deviation requires a different quantity and arrangement of equipment, wiring, conduit, supports, foundations, pads, curbs, or equipment from that specified or indicated on the drawings or other Contract Documents, Contractor shall be responsible for all such costs, including the work of other trades and shall be solely responsible to furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system at no additional cost or schedule impact to the project (cumulatively and hereinafter "Deviation Construction Costs").

#### **1.7 COORDINATION**

- A. Drawings and corresponding electronic media are diagrammatic and indicate the general arrangement of systems and work included in the Work. Consult the drawings, details and other electronic media for locations of fixtures and equipment; where same are not definitely located, obtain this information from the Architect/Engineer.
- B. The drawings and related electronic media have been made to scale with the best knowledge of conditions, dimensions and space requirements available at the time of design and shall be followed as closely as possible during performance of the Work and coordination with the work of others. The foregoing however shall not relieve Contractor from its responsibility to verify all conditions. Dimensions and space requirements prior to commencement of the Work and to immediately report any errors or discrepancies to the Architect/Engineer.
- C. Check drawings and related electronic media of other trades to verify spaces and conditions in which work will be performed prior to commencement of the work.
- D. If directed by the Architect/Engineer or required for proper installation, execution and coordination of the work, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed.
- E. Take all dimensions from Architectural and Structural Drawings, certified equipment drawings and from the actual field measurements before fabricating work. All conflicts shall immediately be reported to the Architect/Engineer. Contractor is solely responsible for conflicts known or which reasonably should have been known but not reported or resolved before commencement of the work.

- F. Equipment furnished shall fit in allocated space with due provision for manufacturer's recommended access and proper maintenance requirements. Verify and coordinate space requirements with all trades and equipment which comprise the Work.
- G. Prior to construction, coordinate the Work with that of other trades and building components. Prepare coordination drawings (or other specified electronic media) for all major trades, utilities and other primary systems routing in conjunction with the contract documents to maximize the pre-installation planning and coordination of trades, utilities and systems and minimize the requirement to manage field coordination through the RFI's, ASI's or other similar processes.
- H. Coordinate connection of systems with interior/exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- I. Before starting work, carefully examine the site and all Contract Documents. Become thoroughly familiar with new and existing conditions governing work on this project. Verify indicated elevations, building measurements, rough-in dimensions and equipment locations before proceeding with any of the work.
- J. Drawings shall be accurately scaled to 1/8 inch – 1 foot or larger using the same version of AutoCAD or other electronic media as used by Architect/Engineer. Drawings shall include all addenda and Change Order items.
- K. Contractor shall be solely responsible for coordination and shall bear the cost of its failure to coordinate installation or of failure to advise Architect/Engineer of installation conflicts.
- L. Sequence, coordinate, and integrate installations of systems materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to building enclosure.

### 1.8 ELECTRICAL WIRING AND COORDINATION

- A. In general, power wiring will be provided under DIVISION 26 – ELECTRICAL, and control wiring will be provided under DIVISION 23 – HVAC, unless otherwise specified.
- B. The following schedule summarizes the division or work and material responsibilities.

| ITEM  | FURNISHED UNDER | SET IN PLACE OR MOUNTED UNDER | WIRED AND CONNECTED UNDER |
|---|-----------------|-------------------------------|---------------------------|
| Equipment motors  | MD 1            | MD 1                          | ED 2                      |
| Resistance heaters  | MD              | MD                            | ED                        |
| Fire protection controls, including remote switches, flow switches    | MD              | MD                            | ED                        |
| Motor controls where specified as an integral package                 | MD              | MD                            | ED                        |
| Motor controllers   | ED 4            | ED 4                          | ED                        |
| Resistance type heater controllers                                    | MD              | ED 4                          | ED                        |
| Magnetic contactors and magnetic starters with overload trip assembly | ED 4            | ED 4                          | ED                        |
| Integral control transformers   | MD              | ED 4                          | ED                        |
| Cover-mounted control devices   | MD              | ED 4                          | ED                        |
| Disconnect switches fused and unfused                                 | ED 4            | ED 4                          | ED                        |
| Thermal or thermal-magnetic circuit breakers                          | ED 4            | ED 4                          | ED                        |
| Fuses   | ED 4            | ED 4                          | ED                        |
| Duct smoke detectors  | ED              | MD                            | ED 3                      |
| Smoke and fire/smoke dampers (with and without end switches)          | MD              | MD                            | ED 3                      |

|  |    |      |      |
|--|----|------|------|
| Control power source for temperature and equipment control panels                          | ED | ED   | ED   |
| Electric temperature control relays and miscellaneous devices                              | MD | MD 5 | MD 5 |
| Level and float switches   | MD | MD 5 | MD 5 |
| Pipe mounted control devices such as flow switches, flow sensors, valves, and wells.       | MD | MD 5 | MD 5 |
| Thermostats and space sensors.   | MD | MD 5 | MD 5 |
| Duct mounted control devices such as temperature, humidity, flow and pressure sensors.     | MD | MD 5 | MD 5 |
| Damper actuators.  | MD | MD 5 | MD 5 |
| Control dampers.   | MD | MD   | --   |
| Variable frequency drives (vfd) specified to be mounted on or in the mechanical equipment. | MD | MD   | ED   |
| VFD specified to be mounted separately from the mechanical equipment                       | MD | ED   | ED   |

- C. Notes: (1) MD: Mechanical Divisions 21, 22, 23. (2) ED: Electrical Division 26. (3) Fire Alarm related and power wiring provided under Division 28; Control-related wiring and relays provided under Division 21, 22, 23. (4) If furnished as part of factory equipment under Division 21, 22, 23, wiring and connections only by Electrical Division 26. (5) If any control devices carry the Full Load Current to any motor, they shall be furnished under Division 21, 22, 23, but shall be set in place and connected under Division 26.

### 1.9 ACCESSIBILITY

- A. Contractor is responsible for verifying that equipment and devices will fit within the space shown on the drawings. Contractor shall locate all equipment which must be serviced, operated or maintained, in fully accessible positions.
- B. Minor deviations from the drawings may be made to allow for better accessibility, but changes of magnitude or which involve extra cost shall not be made without approval from the Architect/Engineer.

### 1.10 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum 5 years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with a minimum of 5 years documented experience. Company personnel shall be approved by manufacturer for all product installations and required training.
- C. Conform to all applicable standards, codes and regulation and industry best practice requirements.
- D. All materials and equipment shall be new, shall bear manufacturer's name, and shall conform to the grade, quality and standards specified herein. Type, capacity and application shall be suitable and capable of satisfactory operation for the purpose intended. All equipment and components shall include UL label and/or marking on equipment body/device including manufacturer's name, pressure rating(s), electrical classification(s), limits and ratings as applicable to individual components for the purpose specified and intended.
- E. Equipment Selection: All items of a given type shall be the product of the same manufacturer. Equipment of greater or larger power, dimensions, capacities, and ratings may be considered provided such proposed equipment is approved in writing by Architect/Engineer and connecting electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. See Deviations & Substitutions for requirements. No additional costs will be approved for these increases, if larger equipment is approved. If minimum energy ratings of efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.

- F. Listing and labeling: Provide motors that are listed and labeled. Terms "listed and labeled": as defined by UL, NEC, Article 100 or other applicable recognized agency as specified in the Contract Documents.
- G. Cutting & Patching: Unless otherwise required by the Contract Documents, Contractor shall be responsible for all cutting, fitting and patching required to complete the Work, or to make portions of the Work and existing conditions fit together properly, and all such areas shall be restored to the conditions existing prior to the cutting, fitting and patching unless otherwise provided in the Contract Documents.
- H. Contractor shall promptly correct any portion of the Work that is defective or not in accordance with the Contract Documents or rejected by the Architect/Engineer or Owner. Contractor shall be responsible for, and pay for all costs arising out of, any additional testing and inspections, demolition, uncovering and replacement and additional design and consulting services required to properly correct any portion of the Work.
- I. Contractor shall comply will comply with the Contract Documents and all Laws, standards and handling criteria regarding hazardous substances, wastes and materials, including asbestos-containing materials, lead-based paints, petroleum (or any constituent thereof), mold, radon, and polychlorinated biphenyl (PCB), ("Hazardous Materials") in performing the Work. Unless required by the Contract Documents, no Hazardous Materials shall be brought onto the Project.
- J. Lead Free Requirements: Contractor shall endeavor to use lead free products and where required by law, ordinance, regulation or standard all materials products and practices shall comply with limitations and requirements as to the allowable limits and/or percentages of lead. Lead free products must be certified by and independent 3rd party.
  - 1. This provision shall apply to any and all similarly regulated materials, products and practices that may be considered hazardous or are otherwise regulated by applicable law, ordinance regulation or standard in the project local.

#### **1.11 DELIVERY, STORAGE, AND HANDLING**

- A. All materials and equipment shall be adequately covered and protected against dirt, water, chemical or mechanical damage, and theft. At completion, all work, equipment and materials shall be cleaned, and damage repaired by Contractor. Damaged equipment will be replaced by the contractor if Owner does not accept repairs done to the equipment. Such replacement shall be scheduled to minimize building system interruption of occupied or scheduled for occupancy.
- B. Material delivered at the site shall not be left exposed to the weather or left unattended. Deliver pipes, tubes and conduit with factory-applied end-caps. Contractor shall be responsible to maintain end-caps or provide temporary end caps on all open-ended piping, tubes and conduit through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.
- C. Protect stored material from moisture and dirt. Protect plastic pipes and materials from sunlight and support to prevent sagging and bending.
- D. Elevate stored materials above grade. When stored inside, to not exceed structural capacity of the floor.
- E. Provide protective coatings to materials to prevent damage and/or infiltration of moisture and dirt on all materials and equipment including but not limited to cast iron and steel valves.
- F. Contractor shall check the openings in the building and the size of the doors, passages, and openings through which equipment is to be admitted. Wherever necessary, he shall provide the equipment in sections or knocked down in order to admit the equipment through these openings.
- G. Contractor shall provide all rigging, erection and hoisting equipment as required to handle or place equipment and piping in position. This rigging and hoisting equipment shall only be attached and placed on the structure in locations as approved by Architect/Engineer at the site. Section 016000 "Product Requirements."

#### **1.12 PERMITS, FEES & UTILITIES**

- A. Obtain and pay for all necessary permits, fees and utilities and inspections required to perform the Work.
- B. Coordinate work with local regulatory entities, utility companies and others as required to fully comply with the requirements of this section and the Contract Documents, including those for both temporary and permanent services.

- C. Permits, fees and utility expenses to be paid by Owner, if any, shall only where specifically required by the Contract Documents, and then only to the extent so specified.

#### **1.13 DOCUMENT OWNERSHIP**

- A. The Drawings and Specifications, combined with the calculations, field data, notes, and reports, are the intellectual and real property of the Architect and/or Engineer. This covers all forms of written and recorded or electronic media. The reuse of these documents without specific permission of the Engineer is prohibited. The Drawings may be employed by the Owner and Contractor for the express use of constructing, commissioning and operating the facility only upon proper execution of the Agreement for Use of Electronic Files & Data.

#### **1.14 GUARANTEE AND WARRANTY**

- A. Contractor warrants to Owner that the materials and equipment provided under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects. Work, materials and equipment not conforming to these requirements, including substitutions not properly approved by Change Order, shall be considered defective. This warranty excludes remedy for damage caused by improper or insufficient maintenance, improper operation or normal wear, tear and usage. Contractor shall assign to Owner, or otherwise assure the Owner has the full benefit of, all warranties and guarantees of manufacturer, subcontractors, sub-subcontractors and suppliers, and Contractor shall perform the Work in a manner that does not adversely affect or invalidate any available warranties or guarantees.
- B. Contractor shall warrant and guarantee all work against faulty material or workmanship for a period of one (1) year from the date of final completion and written acceptance by the Owner, unless specified more stringently elsewhere in the Contract Documents.
- C. If the project is occupied or the systems placed in operation in several phases at the request of the Owner, the guarantee of each system or piece of equipment used shall begin on the date each system or piece of equipment was placed in satisfactory operation, tested, commissioned and accepted, in writing, by the Owner. The use of building equipment for temporary service and testing or phases of work completed prior to the projects final completion and acceptance by the Owner does not constitute the commencement of the warranty period.
- D. If a defect or deficiency in the Work is discovered within the one (1) year Warranty & Guarantee period or within such longer period as may be prescribed by the Laws or by any specific guarantee, and Owner elects to have Contractor correct such defect or deficiency, Owner shall notify Contractor of such defect or deficiency in writing. This period of correction relates only to the specific obligation to correct defects and deficiencies and in no way otherwise limits the Contractor's responsibility for Work that is not in accordance with the Contract Documents, If Contractor fails to timely correct defects or deficiencies in the Work, Owner may, at its sole option, correct them and charge contractor for all cost therefore.
- E. See Division 1 – Closeout Submittals for additional warranty requirements.
- F. Specific exclusions, if any, from this one (1) year warrantee and guarantee period are listed in the individual specification sections.

#### **1.15 LIMITATIONS OF LIABILITY**

- A. To the extent any of the following provisions are not more stringently included in the Contract Document the following Limitations of Liability shall apply:
  1. Architect/Engineer is not responsible for Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, and is not responsible for Contractor's failure to perform or furnish the work in accordance with the Contract Documents.
  2. In the event that Architect/Engineer's employees or sub-consultants make comments or issue warnings about safety issues, such comments and warnings shall be considered to have been offered by a Good Samaritan and shall not impose any obligation or responsibility.
  3. Engineer will not be responsible for the acts or omissions of Owner, Contractor, any subcontractor, any supplier, or of any other person or organization performing or furnishing any of the portions of the work
  4. Contractor understands and acknowledges that Engineer is not authorized to order extra work or issue Change Orders to the work, however in the event and to the degree that Engineer may offer advice,

suggestions, and opinions Contractor shall not rely on such advice, suggestions, and opinions unless directed in writing by Owner or its designated representative, and shall, in no event, make any claim against the Engineer for any such advice, suggestions, and opinions.

5. To the fullest extent permitted by law, Contractor shall indemnify and hold harmless Architect, Engineer, and their joint ventures, officers, directors, partners, employees and agents from and against any and all claims, costs, losses and damages (including but not limited to all fees and charge of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused in whole or in part by the negligent acts or omissions of Contractor, Contractor's officers, directors, partners, employees, agents; or contractor's subcontractors or material men in the performance of Work. Contractor shall direct its insurer to list Architect, Engineer, and their joint ventures, as Additional Insureds on general liability insurance policies covering this project. Prior to commencing work, Contractor shall submit copies of its certificate of insurance to both Architect and Engineer.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.
  2. Manufacturer: Unless otherwise specified, company specializing in manufacturing specified products for at least 3 years.

### **2.2 MATERIALS AND EQUIPMENT**

- A. The device numbers noted in this specification are generally those of a specific manufacturer and represent the minimum quality required as the basis of design for this project. Subject to the Substitutions and other provisions of the Contract Documents, Contractor may submit equivalent devices from the other manufacturers listed in the section.
- B. Materials and equipment used in carrying out these specifications shall be new and have UL listing, or listing by other recognized testing laboratory when such listings are available.
- C. All material shall bear manufacturer's name, model number, electrical characteristics and other identification and shall be the standard product of manufacturer regularly engaged in production of similar material.
- D. Construction of equipment shall be as follows:
  1. All prefabricated equipment shall be designed and constructed in such a manner that all parts of said equipment and the equipment as a whole, including attachments, will resist the forces (including seismic where applicable) to which they may be subjected.
  2. Unless otherwise specified or required, design criteria shall be no less than 1.5g for lateral forces and 0.6g for vertical forces.
  3. Provisions for support and anchorage of equipment shall be an integral part of each item and shall include the fastening means and all necessary internal and external bracing, brackets and connections.
- E. Specifications for many items are or may be described on the drawings, including but not limited to wiring devices, lighting fixtures, control devices, etc. are or may be described on the drawings. Contractor shall promptly advise Architect of any conflicts or discrepancies.
- F. Except for conduit, conduit fittings, outlet boxes, wire and cable (600V and below only), all items of equipment or material shall be the product of one manufacturer throughout.
- G. The documents contain specifications regarding equipment design, including BIL levels, AIC ratings, and series ratings. In all cases provide equipment sufficient for the use intended. Do not provide materials whose ratings fall below those included in the Documents.

**PART 3 - EXECUTION****3.1 UTILITY SERVICE(S)**

- A. Contractor shall be responsible for verifying and coordinating the work with local utility companies providing service to the facility and/or site and coordination with the work of others. This shall include, but not be limited to:
  - 1. Confirmation of schedule and service routing and sequence of the work to be performed by each utility, contractor, subcontractor or others to ensure that the work can be performed without impact to the project schedule and with minimum interruption to services.
  - 2. Verification of utility services point of entry to the facility, including applicable invert elevations, proper placement of sleeves and/or penetrations and sealant thereof.
  - 3. Establishing utility point of contact, documenting the local utility company representatives:
    - a. Company:
    - b. Contact Person:
    - c. Contact Telephone Number:
    - d. Provide required connections for each incoming utility service.

**3.2 ELECTRICAL SYSTEMS**

- A. Visit site and observe conditions under which work must be performed.
- B. Before starting work, carefully examine Architectural, Civil, Landscape, Structural, Plumbing, Heating, Ventilating and Air Conditioning drawings to become thoroughly familiar with conditions governing work on this project. Verify elevations, measurements, rough-in requirements of equipment and its installation location before proceeding with the work. Install equipment with access as required by the NEC.
- C. Circuit "tags" on the Electrical Drawings in the form of arrows are used to indicate home runs of raceways to electrical distribution points. These tags show the circuits in each home run and the panel designation. Do not combine circuits other than those shown or allowed on the Drawings. Show the actual circuit numbers on the finished record drawing, and on the panel directory card. Provide an insulated grounding conductor sized in accordance with NEC in every power circuit.
- D. The general directions and location of homeruns are indicated on Drawings and are to be extended to panels as though routes were completely shown. Items which are installed other than as shown on Drawings and without receiving prior written approval will be ordered removed and installed as shown without additional cost to Owner.
- E. The Drawings do not indicate the exact number of wires in each conduit for the branch circuit wiring. Provide the correct quantity of wires as indicated by: the circuit numbers indicated, wiring diagrams, and by applicable requirements of the NEC.
- F. Electrical Drawings are diagrammatic and shall not be scaled for exact sizes. Adjust location of conduits, panels, equipment, pull boxes and fixtures to accommodate the work and to prevent interferences.
  - 1. Lines which pitch have right-of-way over those that do not. Lines whose elevation cannot be changed have right-of-way over lines whose elevations can.
  - 2. Make offsets, transitions, and changes in direction in raceways as required to maintain proper headroom pitch of sloping lines.
- G. Wire and cable routing shown on the Drawings is approximate. Route wire and cable as required to meet Project Conditions.
- H. When wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.
- I. The Drawings are diagrammatic. They do not show every offset, bend, conduit body, elbow or junction box that may be required to install work in the space provided and avoid conflicts. Follow the Drawings as closely as is practical and install additional bends, offsets and elbows where needed by local job site conditions. Provide necessary junction boxes to meet code regulations for the allowed number of conduit bends.
- J. Establish sizes and locations of the various concrete bases required. Coordinate and provide all necessary anchor bolts together with templates for holding these bolts in position.
- K. Provide supports, blocking, hangers, and auxiliary structural members required for support of work.

- L. Furnish and set all sleeves for passage of raceways through structural, masonry, and concrete walls, floors, and elsewhere for proper protection of the raceways.
- M. Establish size, location, and count of cast-in conduits or conduits to be concealed underneath the foundations. Coordinate with steel reinforcing.
- N. The architectural drawings govern the locations and elevations of all electrical equipment, devices and fixtures. Resolve conflicts with the Architect prior to rough-in.
- O. Verify that the physical dimension of each item of electrical equipment will fit the available space. Coordinate electrical equipment space requirements with the allotted space provisions, and access routes through the construction area.
- P. Coordinate rough-in and wiring requirements for all mechanical, kitchen and other equipment with equipment supplier and installer. Make installation in accordance with rough-in and wiring diagrams provided by equipment supplier and installer.
- Q. Coordinate all aspects of the electrical, telephone and other utility services with the appropriate serving utility company.
- R. Coordinate underground work with other contractors working on the site. Common trenches may be used with other trades. In such areas, maintain clearances as required by codes and ordinances.
- S. Coordinate underground work with foundation plans and work.
- T. The location of utilities indicated on the plans is taken from existing public records. The exact location and elevation of public utilities must be determined by the Contractor. The Contractor shall ascertain whether any additional facilities other than those shown on the Drawings may be present.
- U. Call to the attention of the Architect any error, conflict or discrepancy in Plans and/or Specifications. Do not proceed with any questionable items of work until clarification of same has been made. Supplementary Details and Plans may be supplied as required and they will become a part of the Contract Documents.

### 3.3 EQUIPMENT INSTALLATION

- A. Follow manufacturer's instructions.
- B. Where the product has no manufacturer's instructions, follow these specifications. Where neither the manufacturer nor these specifications contain such instructions, install in accordance with the standards listed above. No allowance of any kind will be made for negligence on part of Contractor to foresee means of bringing in or installing equipment into position.
  - 1. Verify all dimensions by field measurements.
  - 2. Install systems, materials, and equipment to provide the maximum headroom possible.
  - 3. Install systems, materials, and equipment to comply with approved submittal data, including coordination drawings
  - 4. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
  - 5. Fit surface panels, devices and outlets with neat, appropriate trims, plates or covers, without over-hanging edges, protruding corners or raw edges, to leave a finished appearance.
  - 6. Extend maintenance and access components (i.e., grease fittings, service panels, and similar items) to accessible locations.
  - 7. Install equipment to allow right of way for piping installed at required slope.
- C. Locations:
  - 1. Verify all locations with actual field conditions, architectural, structural, electrical, plumbing, heating and ventilating plans to avert possible installation conflicts.
  - 2. Architect reserves the right to make minor changes prior to installation without cost to Owner.
  - 3. Coordinate work with that of other trades to assure symmetrical placing of fixtures, sprinkler heads and other exposed components with respect to ceiling tile, grilles, etc. See Architectural reflected ceiling plan for exact location of light fixtures and other equipment.



4. Any work which is incorrectly installed without prior verification without required coordination will be ordered removed and relocated and any changes or damage resulting to other work shall be repaired and/or replaced at no cost to the Owner.
  5. In general, locate all finished devices or other exposed finished devices as indicated on or by symbols on drawings. Where devices or other exposed finished components occur in face, decks or base millwork, walls, ceilings or other finished surfaces carefully coordinate with details and arrangements of same.
  6. All mounting heights shown on drawings are from finish floor to centerline unless otherwise indicated or required by code. Mounting heights at non-typical locations shown with (+) sign and height required noted adjacent to such device. Devices located in concrete block, brick or tile walls are to be adjusted in height to coordinate with modular joints of the materials. Verify requirements with Architect prior to installation.
  7. Wiring Requirements: Install wiring complete to every outlet with all devices shown and/or required. All wiring to be in raceways and concealed throughout finished areas unless specifically noted otherwise. For the purpose of electrical specifications, all areas, with the exception of boiler rooms, mechanical rooms and mechanical spaces, are to be considered as finished areas.
- D. Equipment Connections
1. Coordinate the work with that of other trades to ensure all required connections are provided to ensure proper installation and operation.
  2. Provide complete electrical connections for all items of equipment requiring such connections, including incidental wiring, materials, devices and labor necessary for a finished working installation.
  3. Verify the location and method for connecting to each item of equipment prior to roughing-in. Check voltage and phase of each item of equipment before connection.
  4. Make motor connections for the proper direction of rotation.

### 3.4 NOISE CONTROL

- A. Provide insulation, isolators and other sound attenuation requirements as specified by Contract Documents.
- B. Back to back or straight through boxes are not permitted unless specifically noted on the drawings.
- C. Contactors, transformers, starters and similar noise producing devices shall not be placed on walls which are common to occupied spaces unless specifically called for on the drawings. Where equipment is mounted on wall common to occupied spaces, provide shock mounting or noise isolators to effectively prevent transmission to occupied spaces.
- D. Contactors, starters, transformers and like equipment found noticeably noisier than similar equipment of same type are to be removed and replaced as directed by Architect at no cost to owner.
- E. Route raceways along corridors or other noncritical noise space to minimize penetrations through sound rated walls. Seal raceway penetrations through sound rated walls.

### 3.5 FIRE WALL PENETRATIONS

- A. Perform necessary fire rated wall sealing for the work in accordance with Division 7 - Fire and Smoke Protection.
- B. Provide necessary wall material to maintain fire wall rating where flush mounted equipment or components installed.
- C. Where systems or components penetrate floors, ceilings, ducts, chases and fire walls, provide fire stopping to maintain integrity of the fire assembly. Fire stopping method shall be approved by the authority having jurisdiction.
- D. Where electrical boxes with total area exceeding 16 square inches are located in fire resistive walls, fire stopping shall be provided to maintain integrity of the fire assembly.
- E. Where electrical boxes are installed on opposite sides of a rated wall, horizontal separation between the boxes shall be a minimum of 24-inches. Horizontal separation of these boxes may be less than 24-inches if a UL approved protective material is utilized.
  1. Electrical boxes shall not be installed back to back in rated walls.
    - a. The aggregate surface area of the boxes shall not exceed 100 sq in per 100 sq ft of wall surface.

### 3.6 EQUIPMENT SUPPORT

- A. General
  1. Provide a system of supporting devices and hangers for support and bracing of piping, conduit and equipment as required by code or as provided under this Division as indicated on plans and as described herein.

2. Do not install supporting devices so as to obstruct access to equipment.
  3. Floor-mounted equipment shall not be held in place solely by its own dead weight. Include floor anchor fastening in all cases.
  4. Do not support ductwork, piping, conduits, conductors, or equipment from other piping, conduits, ceiling grids, equipment, ductwork, or ceiling supports. In all cases, provide independent supports for such components and equipment.
- B. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to code (including seismic codes where applicable).
1. Construct concrete bases and form equipment anchorages as detailed in the structural drawings.
  2. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
  3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
  4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  5. Install anchor bolts to elevations required for proper attachment to supported equipment.
  6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
  7. Use concrete and reinforcement as specified in Division 3 Sections and the Structural Drawings.
- C. Metal Supports & Anchorages
1. Refer to local codes, practices and standards for installation and material requirements and limitations relating to the use of metal supports and anchorages (including applicable seismic requirements).
  2. Refer to Division 5 Section "Metal Fabrications" for structural steel.
  3. Field Welding: Comply with AWS D1.1.
- D. Wood Supports & Anchorages
1. Refer to local codes, practices and standards for installation and material requirements and limitations relating to the use of wood supports and anchorages (i.e. fire retardant materials).
  2. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor materials and equipment.
  3. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
  4. Attach to substrates as required to support applied loads.
- E. Grouting
1. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.
  2. Clean surfaces that will come into contact with grout.
  3. Provide forms as required for placement of grout.
  4. Avoid air entrapment during placement of grout.
  5. Place grout, completely filling equipment bases.
  6. Place grout on concrete bases and provide smooth bearing surface for equipment.
  7. Place grout around anchors.
  8. Cure placed grout.

### 3.7 PAINTING

- A. Painting of systems, equipment, and components is specified in Division 9. Unless and to the extent that painting is not specified elsewhere in the Contract Documents, all exposed materials in finished areas and on exterior walls shall be painted to match surrounding surfaces.
- B. Contractor shall be responsible for and shall coordinate the timing of painting with the work of other trades and to minimize the requirements for damage and touchup to the work.
- C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### **3.8 CUTTING, PATCHING AND CORE DRILLING**

#### **A. General**

1. Refer to Divisions 1, 3 and other related provision of the Contract Documents, including Structural Drawings and Specifications for requirements relating to cutting, patching and core drilling of walls, floors and other surfaces.
2. Do not cut or break any steel or wood framing, concrete, masonry, or partitions, etc., without permission from the Architect or as shown on the Drawings.
3. Subject to the provisions of this Section and other portions of the Contract Documents cut, channel, chase and drill floors, walls, partitions and ceilings as necessary for the proper installation, support and anchorage of piping, ductwork, raceway, boxes, and other equipment.
4. Repair any damage to the building, piping, equipment, or finish.
5. Perform repairs with materials matching the original, and install in accordance with appropriate sections of the Contract Documents.
6. Where trenching is done through existing paving, walks, curbs, etc. Contractor is responsible for patching and repairs to original condition.
7. In new work, patch and refinish all finished surfaces damaged by this contractor to match adjacent surface.
8. Where new work is installed in the existing building, patch and refinish surfaces damaged to match existing. Refinishing to be as directed by the Architect.
9. All related refinishing to be as directed by the Architect.

#### **B. All cutting, patching and/or core drilling of structural systems that are do not appear on or that deviate in any way from the Structural Drawings must be preapproved by the Structural Engineer and Contractor shall provide all data, calculations and/or other requirements as maybe required by the Structural Engineer, prior to commencement of the work, including but not limited to:**

1. X-Ray of structural systems to show the actual location of reinforcement.
2. Size and dimensions of penetrating ductwork, piping or conduit including placement within desired opening and required clearances, means of fastening and/or support including all anchoring systems and fasteners.
3. As a general rule, subject to adjustment by Structural Engineer, penetrating ductwork, piping or conduit shall pass through the center of all structural openings, avoiding structural members by minimums specified on the Structural Drawings.

#### **C. Core Drilling Layouts**

1. Unless otherwise specified in the Contract Documents Contractor shall provide to the Structural Engineer a complete floor by floor core drilling layout for all required floor core penetrations in advance of the work for Structural Engineer's review and approval. Core drilling layouts shall include size, dimension and specific locations of core drilling for all trades. Contractor shall not be permitted to conduct independent coring without providing such layout to Structural Engineer.

### **3.9 EXCAVATION, BACKFILL & WATERPROOFING**

- A. Refer to Divisions 1, 2, and other related provisions of the Contract Documents, including but not limited to Sitework and Structural Drawings and related specifications for requirements relating to excavation, backfill and waterproofing for each trade.
- B. Do necessary trenching and excavating for installation of underground piping, raceways and equipment. Use necessary precautions not to affect the bearing value of soil under and near footings. Excavate trenches with proper pitch six inches deeper than required by line grade and prefill to line grade with pea gravel. Where trenching occurs through existing paving, walks, curbs, etc., patch and repair to original conditions. Compact backfill with vibratory or roller compaction equipment in nine inch layers to 90 percent density. Dispose of excess excavated material as directed. Backfill under floor slabs and under hard surfaced yard areas (i.e. walks, drives, parking areas) to be crushed rock unless otherwise indicated, compacted in nine inch layers. Backfill material and compaction to comply with Site Work Section of these Specifications.

- C. Provide and maintain ample means and devices with which to promptly remove and dispose of water entering the excavation during the time it is being prepared for the piping, raceways or equipment laying, during the laying of materials or equipment and until the backfill has been completed.
- D. Avoid, if possible, penetrations of waterproof membranes. Where such penetration is required, perform it prior to waterproofing and in accordance with Architectural details. Where penetrations are not detailed or must be conducted through waterproof membranes, provide a detail of the penetrations for approval of the Architect.

### **3.10 SAFETY & PROTECTION**

- A. The Contract Documents do not include, or is Architect/Engineer responsible for the design of construction details or instructions relating to Contractor' safety or protective measures or precautions or as it pertains to its means, methods, techniques, sequences or procedures required for to perform the work.
- B. Provide necessary shoring, railing, barricades, protective devices, temporary systems/supports, safety instructions and procedures to perform the work safely and to comply with the Safety Requirements of the governing authorities.
- C. Unless otherwise specifically detailed and included, the Contract Documents represent the finished state of all systems and components related to the work and it is Contractor's sole responsibility to provide the necessary means, methods, equipment and protection of the work and those performing the work during construction. Neither Architect/Engineer nor any of their respective subconsultants shall be responsible or liable for Contractors failure to adequately protect the work or those performing the work during construction.

### **3.11 FUTURE PROVISIONS TO BE INCLUDED IN THE WORK**

- A. The following provisions shall be provided for and included in the work:
  - 1. Provide pull line in each empty conduit provided for future installation of wiring.
  - 2. At all systems such as fire alarm, where future stations are to be fed from adjacent outlets or terminal cabinets, all conductors required for complete installation of additional units are to be provided to nearest outlet or terminal cabinet as required. In general, all wiring installed so it will not be necessary to remove existing conductors and re-pull additional wiring to install additional units. All spare conductors properly labeled and terminated in outlet boxes or at terminals in terminal cabinets.

### **3.12 CLEANING**

- A. General
  - 1. At all times keep the premises free from accumulation of waste materials or rubbish caused by the employees or the work. At the completion of the work, remove all superfluous materials, equipment and debris related to or resulting from the work.
  - 2. All systems, equipment and component including but not limited to all panels, compartments, points of access, surface areas, panels, whether concealed or not shall be free from debris, filings, clippings, dirt, dust and debris and in a new condition. Touch up paint where necessary.
  - 3. Where existing systems are expanded and/or remodeled, clean the new installation prior to making final connection to the existing systems.

### **3.13 COOPERATION WITH OTHER TRADES**

- A. Contractor shall cooperate with and coordinate the work with that of all other trades in the performance of the work, including but not limited to; delivery of equipment and materials, furnishing material and location requirements of sleeves, bucks, chases, supports, mountings, backings, inserts, anchor bolts, cast-in-place box-out or steel embeds, routings, sequencing, locations, finished devices, etc., for proper installation of its work. Contractor shall be responsible for any and all removal, replacement or repairs to its work or the work of others for its failure to fully comply with this provision.

### **3.14 OPERATION AND INSTRUCTION**

- A. Upon completion of the work and prior to final acceptance, Contractor shall operate the equipment for a period as required to fully instruct the Owner and its authorized representatives in all details of operation, adjustment and maintenance. Absent more stringent requirements found elsewhere in the Contract Documents, Contractor shall, at a minimum:
  - 1. Schedule with Owner and its designated representatives a single time and location for a 1-day instruction class and submit 3 copies of certificate, signed by Owner's representatives, attesting to the Owner's

authorized representatives having been so instructed. All arrangements shall be made through Architect and Owner's Representative.

2. Thoroughly review and instruct Owner and its designated representatives on all aspects of systems and facilities operations and maintenance utilizing the Instructions and Manuals submitted under the provisions of this Section. Any required instructions from manufacturer's representatives shall be given during this period.
3. This requirement is in addition to any "Operation Test" specified in the Contract Documents.

**END OF SECTION**

**SECTION 26 0509  
EQUIPMENT WIRING**

**PART 1 – GENERAL****1.1 SUMMARY**

- A. Work Included:
1. Equipment connections, whether furnished by Owner or other Divisions of the Contract.
  2. Equipment grounding.

**1.2 RELATED SECTIONS**

- A. Contents of Division 26, Electrical and Division 01, General Requirements (if available) apply to this Section.

**1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).

**1.4 SUBMITTALS**

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).
- B. In addition:
3. Verify mechanical and utilization equipment electrical characteristics with Drawings and equipment submittals prior to ordering equipment. Submit confirmation of this verification as a part of, or addendum to, the electrical product submittals.

**1.5 QUALITY ASSURANCE**

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available) apply to this Section.

**1.6 WARRANTY**

- A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).

**PART 2 – PRODUCTS****2.1 MATERIALS**

- A. Materials and Equipment for Equipment Wiring: As specified in individual Sections.

**2.2 GENERAL**

- A. Unless otherwise noted, the following voltage and phase characteristics apply to motors:
4. 3/4 HP and Under: 120 volt, 1 phase.
  5. 1 HP and Over: 208 volt, 3 phase.
- B. Safety Switches: Provide as required by NEC and as specified in Section 26 28 16, Enclosed Switches and Circuit Breakers.

**PART 3 – EXECUTION****3.2 EXAMINATION**

- A. Prior to submittal of product data for electrical distribution equipment, obtain and examine product data and shop drawings for equipment furnished by the Owner and by other trades on the project. Update the schedule of equipment electrical connections accordingly, noting proper ratings for overcurrent devices, fuses, safety disconnect switches, conduit and wiring, and the like. As a minimum, this requirement applies to equipment furnished by Owner and equipment furnished under the following divisions of work under this contract:
1. Division 10, Specialties
  2. Division 11, Equipment
  3. Division 21, Fire Suppression
  4. Division 22, Plumbing
  5. Division 23, HVAC, Heating, Ventilating and Air Conditioning
  6. Division 27, Communications
  7. Division 28, Electronic Safety and Security

**3.3 INSTALLATION**

- A. Do not install unrelated electrical equipment or wiring on mechanical equipment without prior approval of Engineer.
- B. Provide moisture tight equipment wiring and switches in ducts or plenums used for environmental air.
- C. Connect motor and appliance/utilization equipment complete from panel to motor/equipment as required by code.
- D. Install motor starters and controllers for equipment furnished by others.
- E. Appliance/Utilization Equipment:
  - 1. Provide appropriate cable and cord cap for final connection unless equipment is provided with same. Provide receptacle configured to receive cord cap.
  - 2. Verify special purpose outlet NEMA configuration and ampere rating with equipment supplier prior to ordering wiring devices and coverplates.
- F. Door Hardware:
  - 1. Provide dedicated circuit from nearest 208/120V emergency panelboard for door hardware power supplies. Provide complete control connections for door hardware locking mechanisms to building security system.
  - 2. Coordinate with Division 08, Openings and Drawing requirements.

**3.4 FIELD QUALITY CONTROL**

- A. Perform field inspection and testing in accordance with Division 01, General Requirements.

**3.5 SYSTEMS STARTUP**

- A. Provide field representative to prepare and start equipment.
  - 1. Test and correct for proper rotation of polyphase motors.
- B. Adjust for proper operation within manufacturer's published tolerances.
- C. Demonstrate proper operation of equipment to Owner's designated representative.

**END OF SECTION**

**SECTION 26 0519**  
**LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

**1.02 SUMMARY**

- A Section includes:
  - 1. Copper building wire rated 600 V or less.
  - 2. Mineral-insulated cable, Type MI, rated 600 V or less.
  - 3. Connectors, splices, and terminations rated 600 V and less.

**1.03 ACTION SUBMITTALS**

- A Product Data: For each type of product indicated.
- B Product Schedule: Indicate type, use, location, and termination locations.

**1.04 INFORMATIONAL SUBMITTALS**

- A Qualification Data: For testing agency.
- B Field quality-control reports.

**1.05 QUALITY ASSURANCE**

- A Testing Agency Qualifications: Certified by NETA.
  - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

**PART 2 PRODUCTS****2.01 COPPER BUILDING WIRE**

- A Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B Manufacturers:
  - 1. Belden Inc
  - 2. General Cable Tech
  - 3. Southwire Company
  - 4. Or approved equal
- C Standards:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - 2. RoHS compliant.
  - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- E Conductor Insulation:
  - 1. Type NM: Comply with UL 83 and UL 719.
  - 2. Type RHW-2: Comply with UL 44.
  - 3. Type TC-ER: Comply with NEMA WC 70/ICEA S-95-658 and UL 1277.
  - 4. Type THWN-2: Comply with UL 83.
  - 5. Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
  - 6. Type UF: Comply with UL 83 and UL 493.
  - 7. Type XHHW-2: Comply with UL 44.
- F Shield:



1. Type TC-ER: Cable designed for use with VFCs, with oversized crosslinked polyethylene insulation, spiral-wrapped foil plus 85 percent coverage braided shields and insulated full-size ground wire, and sunlight- and oil-resistant outer PVC jacket.

## 2.02 CONNECTORS AND SPLICES

- A Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B Manufacturers:
  1. AFC Cable
  2. Hubbell Power Systems
  3. O-Z/Gedney
  4. Thomas & Betts Corp
  5. Or approved equal.
- C Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
  1. Material: Copper.
  2. Type: One hole with standard barrels.
  3. Termination: Compression.

## PART 3 EXECUTION

### 3.01 CONDUCTOR MATERIAL APPLICATIONS

- A Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B Feeders: Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- C Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- D Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.
- E VFC Output Circuits Cable: Extra-flexible stranded for all sizes.
- F Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

### 3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A Exposed Feeders: Not allowed.
- B Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- C Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- D Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- E Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.
- F Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- G Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- H VFC Output Circuits: Type XHHW-2 in metal conduit.

### 3.03 INSTALLATION OF CONDUCTORS AND CABLES

- A Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

- D Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."
- G Complete cable tray systems installation according to Section 260536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

### **3.04 CONNECTIONS**

- A Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B Make splices, terminations, and taps that are compatible with conductor material.
  - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

### **3.05 IDENTIFICATION**

- A Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

### **3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS**

- A Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

### **3.07 FIRESTOPPING**

- A Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

### **3.08 FIELD QUALITY CONTROL**

- A Perform tests and inspections.
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors.
  - 2. Perform each of the following visual and electrical tests:
    - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
    - b. Test bolted connections for high resistance using one of the following:
      - 1) A low-resistance ohmmeter.
      - 2) Calibrated torque wrench.
      - 3) Thermographic survey.
    - c. Inspect compression-applied connectors for correct cable match and indentation.
    - d. Inspect for correct identification.
    - e. Inspect cable jacket and condition.
    - f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
    - g. Continuity test on each conductor and cable.
    - h. Uniform resistance of parallel conductors.
  - 3. Initial Infrared Scanning: After Substantial Completion, but before Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
    - a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

- b. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- B Cables will be considered defective if they do not pass tests and inspections.
- C Prepare test and inspection reports to record the following:
  - 1. Procedures used.
  - 2. Results that comply with requirements.
  - 3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

**END OF SECTION**

**SECTION 26 0526**  
**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

**1.02 SUMMARY**

- A Section includes grounding and bonding systems and equipment..

**1.03 ACTION SUBMITTALS**

- A Product Data: For each type of product indicated.

**1.04 INFORMATIONAL SUBMITTALS**

- A Coordination Drawings: Plans showing dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
  1. Test wells.
  2. Ground rods.
  3. Ground rings.
  4. Grounding arrangements and connections for separately derived systems
- B Qualification Data: For testing agency and testing agency's field supervisor.
- C Field quality-control reports.

**1.05 CLOSEOUT SUBMITTALS**

- A Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
  1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - a. Plans showing as-built, dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
      - 1) Test wells.
      - 2) Ground rods.
      - 3) Grounding arrangements and connections for separately derived systems.
    - b. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NFPA 70B.
      - 1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
      - 2) Include recommended testing intervals.

**1.06 QUALITY ASSURANCE**

- A Testing Agency Qualifications: Certified by NETA.

**PART 2 PRODUCTS****2.01 SYSTEM DESCRIPTION**

- A Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B Comply with UL 467 for grounding and bonding materials and equipment.

**2.02 MANUFACTURERS**

- A Manufacturers:
  1. ERICO
  2. Hubbell Incorporated
  3. ILSCO
  4. O-Z/Gedney
  5. Or approved equal

**2.03 CONDUCTORS**

- A Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

- B Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Stranded Conductors: ASTM B 8.
  - 3. Tinned Conductors: ASTM B 33.
  - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
  - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
  - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
- C Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

## 2.04 CONNECTORS

- A Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
- D Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.
- E Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- F Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- G Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.
- H Conduit Hubs: Mechanical type, terminal with threaded hub.
- I Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- J Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- K Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.
- L Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.
- M Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.
- N Straps: Solid copper, copper lugs. Rated for 600 A.
- O Tower Ground Clamps: Mechanical type, copper or copper alloy, terminal one-piece clamp.
- P U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
- Q Water Pipe Clamps:
  - 1. Mechanical type, two pieces with zinc-plated bolts.
    - a. Material: Tin-plated aluminum.
    - b. Listed for direct burial.
  - 2. U-bolt type with malleable-iron clamp and copper ground connector.

## 2.05 GROUNDING ELECTRODES

- A Ground Rods: Zinc-coated steel, sectional type; 3/4 inch by 10 feet (19 mm by 3 m).
- B Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.
  - 1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches (1200 mm) long.
  - 2. Backfill Material: Electrode manufacturer's recommended material.
- C Ground Plates: 1/4 inch (6 mm) thick, hot-dip galvanized.

## PART 3 EXECUTION

### 3.01 APPLICATIONS

- A Conductors: Install solid conductor for No. 8AWG and smaller, and stranded conductors for No. 6AWG and larger unless otherwise indicated.

- B Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- C Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
  - 1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
  - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
- D Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
  - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
  - 4. Connections to Structural Steel: Welded connectors.

### 3.02 GROUNDING AT THE SERVICE

- A Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

### 3.03 EQUIPMENT GROUNDING

- A Install insulated equipment grounding conductors with all feeders and branch circuits.
- B Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
  - 1. Feeders and branch circuits.
  - 2. Lighting circuits.
  - 3. Receptacle circuits.
  - 4. Single-phase motor and appliance branch circuits.
  - 5. Three-phase motor and appliance branch circuits.
  - 6. Flexible raceway runs.
  - 7. Armored and metal-clad cable runs.
- C Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

### 3.04 INSTALLATION

- A Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
  - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
  - 2. Use exothermic welds for all below-grade connections.
  - 3. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

- D Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.
1. Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- E Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
  3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- F Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
  2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
  3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- G Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.
- H Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.
- I Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column.
1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
  2. Bury ground ring not less than 24 inches (600 mm) from building's foundation.
- J Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG.
1. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within base of foundation.
  2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.
- K Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 feet (6.0 m) long. If reinforcing is in multiple pieces, connect together by the usual steel tie wires or exothermic welding to create the required length.
- L Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
  2. Make connections with clean, bare metal at points of contact.
  3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
  4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
  5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

**3.05 FIELD QUALITY CONTROL**

- A Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- D Perform tests and inspections.
  - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
  - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal and at individual ground rods. Make tests at ground rods before any conductors are connected.
    - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    - b. Perform tests by fall-of-potential method according to IEEE 81.
  - 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- E Grounding system will be considered defective if it does not pass tests and inspections.
- F Prepare test and inspection reports.
- G Report measured ground resistances that exceed the following values:
  - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
  - 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
  - 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
  - 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
- H Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

**END OF SECTION**



**SECTION 26 0529**  
**HANGARS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

**1.02 SUMMARY**

- A Section includes:
1. Steel slotted support systems.
  2. Aluminum slotted support systems.
  3. Nonmetallic slotted support systems.
  4. Conduit and cable support devices.
  5. Support for conductors in vertical conduit.
  6. Structural steel for fabricated supports and restraints.
  7. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
  8. Fabricated metal equipment support assemblies

**1.03 ACTION SUBMITTALS**

- A Product Data: For each type of product:
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
    - a. Slotted support systems, hardware, and accessories.
    - b. Clamps.
    - c. Hangers.
    - d. Sockets.
    - e. Eye nuts.
    - f. Fasteners.
    - g. Anchors.
    - h. Saddles.
    - i. Brackets.
  2. Include rated capacities and furnished specialties and accessories.
- B Shop Drawings: For fabrication and installation details for electrical hangers and support systems.
1. Hangers. Include product data for components.
  2. Slotted support systems.
  3. Equipment supports.
  4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

**1.04 INFORMATIONAL SUBMITTALS**

- A Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Suspended ceiling components.
  2. Ductwork, piping, fittings, and supports.
  3. Structural members to which hangers and supports will be attached.
  4. Size and location of initial access modules for acoustical tile.
  5. Items penetrating finished ceiling, including the following:
    - a. Luminaires.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Sprinklers.

- e. Access panels.
  - f. Projectors.
- B Seismic Qualification Data: Certificates, for hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.
- 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C Welding Qualifications: Qualify procedures and personnel according to the following:
- 1. AWS D1.1/D1.1M.
  - 2. AWS D1.2/D1.2M.

## **PART 2 PRODUCTS**

### **2.01 PERFORMANCE REQUIREMENTS**

- A Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- 1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified.
  - 2. Component Importance Factor: 1.0.

### **2.02 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS**

- A Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.
- 1. Manufacturers:
    - a. Allied Tube & Conduit
    - b. B-Line
    - c. Haydon Corp.
    - d. Thomas & Betts Corp.
    - e. Or approved Equal
  - 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  - 3. Material for Channel, Fittings, and Accessories: Galvanized steel.
  - 4. Channel Width: Selected for applicable load criteria.
  - 5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  - 6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
  - 7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
- B Aluminum Slotted Support Systems: Extruded-aluminum channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.
- 1. Manufacturers:
    - a. Cooper Industries
    - b. Haydon Corp.
    - c. Thomas & Betts
    - d. Or approved equal
  - 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  - 3. Channel Material: 6063-T5 aluminum alloy.
  - 4. Fittings and Accessories Material: 5052-H32 aluminum alloy.
  - 5. Channel Width: Selected for applicable load criteria.
  - 6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.

7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least one surface.
1. Manufacturers:
    - a. Allied Tube & Conduit
    - b. B-Line
    - c. Haydon Corp
    - d. Or approved equal
  2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  3. Channel Width: Selected for applicable load criteria.
  4. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
  5. Fitting and Accessory Materials: Same as those for channels and angles, except metal items may be stainless steel.
  6. Rated Strength: Selected to suit applicable load criteria.
  7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- D Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- F Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- G Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Manufacturers:
      - 1) Hiliti, Inc.
      - 2) ITW Ramset
      - 3) MKT Fastening
      - 4) Or approved equal
  2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Manufacturers:
      - 1) B-line
      - 2) Hilti, Inc.
      - 3) ITW Ramset
      - 4) Or approved equal
  3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
  4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: Stainless-steel springhead type.
7. Hanger Rods: Threaded steel.

### 2.03 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

## PART 3 EXECUTION

### 3.01 APPLICATIONS

- A Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
  1. NECA 1.
  2. NECA 101
  3. NECA 102.
  4. NECA 105.
  5. NECA 111.
- B Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- D Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- E Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- F Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

### 3.02 SUPPORT INSTALLATION

- A Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, according to NFPA 70.
- C Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  1. To Wood: Fasten with lag screws or through bolts.
  2. To New Concrete: Bolt to concrete inserts.
  3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  4. To Existing Concrete: Expansion anchor fasteners.
  5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
  6. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
  7. To Light Steel: Sheet metal screws.

8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

### **3.03 INSTALLATION OF FABRICATED METAL SUPPORTS**

A Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C Field Welding: Comply with AWS D1.1/D1.1M.

### **3.04 CONCRETE BASES**

A Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."

C Anchor equipment to concrete base as follows:

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

### **3.05 PAINTING**

A Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B Touchup: Comply with requirements in Section 099123 "Interior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

**END OF SECTION**

**SECTION 26 0529  
RACEWAY FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

**1.02 SUMMARY**

- A Section includes:
  1. Metal conduits and fittings.
  2. Nonmetallic conduits and fittings.
  3. Metal wireways and auxiliary gutters.
  4. Nonmetal wireways and auxiliary gutters.
  5. Boxes, enclosures, and cabinets.
  6. Handholes and boxes for exterior underground cabling.

**1.03 DEFINITIONS**

- A ARC: Aluminum rigid conduit.
- B GRC: Galvanized rigid steel conduit.
- C IMC: Intermediate metal conduit.

**1.04 ACTION SUBMITTALS**

- A Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets
- B Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

**PART 2 PRODUCTS****2.01 METAL CONDUITS AND FITTINGS**

- A Metal Conduit:
  1. Manufacturers:
    - a. AFC Cable Systems
    - b. Allied Tube & Conduit
    - c. Western Tube and Conduit
    - d. Or Approved Equal
  2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  3. GRC: Comply with ANSI C80.1 and UL 6.
  4. ARC: Comply with ANSI C80.5 and UL 6A.
  5. IMC: Comply with ANSI C80.6 and UL 1242.
  6. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit, IMC.
    - a. Comply with NEMA RN 1.
    - b. Coating Thickness: 0.040 inch (1 mm), minimum.
  7. EMT: Comply with ANSI C80.3 and UL 797.
  8. FMC: Comply with UL 1; zinc-coated steel or aluminum.
  9. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- B Metal Fittings:
  1. Manufacturers:
    - a. AFC Cable Systems
    - b. Allied Tube & Conduit
    - c. Western Tube and Conduit
    - d. Or Approved Equal
  2. Comply with NEMA FB 1 and UL 514B.
  3. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

4. Fittings, General: Listed and labeled for type of conduit, location, and use.
  5. Fittings for EMT:
    - a. Material: Steel.
    - b. Type: clamp/bolt-on.
  6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
  7. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- C Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

## 2.02 NONMETALLIC CONDUITS AND FITTINGS

- A Nonmetallic Conduit:
1. Manufacturers:
    - a. AFC Cable Systems
    - b. Allied Tube & Conduit
    - c. Western Tube and Conduit
    - d. Or Approved Equal
  2. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  3. Fiberglass:
    - a. Comply with NEMA TC 14.
    - b. Comply with UL 2515 for aboveground raceways.
    - c. Comply with UL 2420 for belowground raceways.
  4. ENT: Comply with NEMA TC 13 and UL 1653.
  5. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
  6. LFNC: Comply with UL 1660.
  7. Rigid HDPE: Comply with UL 651A.
  8. Continuous HDPE: Comply with UL 651A.
  9. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.
  10. RTRC: Comply with UL 2515A and NEMA TC 14.
- B Nonmetallic Fittings:
1. Manufacturers:
    - a. AFC Cable Systems
    - b. CANTEX INC
    - c. Thomas & Betts Corp.
    - d. Or Approved Equal
  2. Fittings, General: Listed and labeled for type of conduit, location, and use.
  3. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
    - a. Fittings for LFNC: Comply with UL 514B.
  4. Solvents and Adhesives: As recommended by conduit manufacturer.

## 2.03 METAL WIREWAYS AND AUXILIARY GUTTERS

- A Manufacturers:
1. B-Line
  2. Hoffman
  3. Square D
  4. Or Approved Equal
- B Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, Type 3R, Type 4X, unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D Wireway Covers: Hinged type unless otherwise indicated.
- E Finish: Manufacturer's standard enamel finish.

## **2.04 NONMETAL WIREWAYS AND AUXILIARY GUTTERS**

- A Manufacturers:
1. Allied Moulded Products
  2. Hoffman
  3. Or Approved Equal
- B Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.
- D Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.
- E Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

## **2.05 BOXES, ENCLOSURES, AND CABINETS**

- A Manufacturers:
1. B-Line
  2. Hoffman
  3. Square D
  4. Or Approved Equal
- B General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.
- G Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- I Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- J Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
- K Gangable boxes are allowed.
- L Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 & Type 3R, Type 4 with continuous-hinge cover with flush latch unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
  2. Nonmetallic Enclosures: Plastic.
  3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- M Cabinets:
1. NEMA 250, Type & Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
  2. Hinged door in front cover with flush latch and concealed hinge.



3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.06 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A General Requirements for Handholes and Boxes:
1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
  2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
1. Manufacturers:
    - a. Armorcast Products Comp.
    - b. Oldcastle Enclosure
    - c. Quazite
    - d. Or Approved Equal
  2. Standard: Comply with SCTE 77.
  3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
  4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
  5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  6. Cover Legend: Molded lettering, "ELECTRIC."
  7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
  8. Handholes 12 Inches Wide by 24 Inches Long (300 mm Wide by 600 mm Long) and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

## PART 3 EXECUTION

### 3.01 RACEWAY APPLICATION

- A Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC.
  2. Concealed Conduit, Aboveground: EMT.
  3. Underground Conduit: RNC, Type EPC-40-PVC.
  4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B Indoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT.
  2. Exposed, Not Subject to Severe Physical Damage: EMT.
  3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
  4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
  5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
  6. Damp or Wet Locations: GRC.
  7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.
- C Minimum Raceway Size: 1/2-inch trade size.

- D Raceway Fittings: Compatible with raceways and suitable for use and location.
  - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
  - 3. EMT: Use clamp/bolt-on, steel fittings. Comply with NEMA FB 2.10.
  - 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- F Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- G Install surface raceways only where indicated on Drawings.
- H Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C) .

### 3.02 INSTALLATION

- A Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- B Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- C Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.
- D Do not fasten conduits onto the bottom side of a metal deck roof.
- E Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- F Complete raceway installation before starting conductor installation.
- G Arrange stub-ups so curved portions of bends are not visible above finished slab.
- H Install no more than the equivalent of four 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.
- I Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- J Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- K Support conduit within 12 inches (300 mm) of enclosures to which attached.
- L Raceways Embedded in Slabs:
  - 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
  - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  - 3. Arrange raceways to keep a minimum of 1 inch (25 mm) of concrete cover in all directions.
  - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
  - 5. Change from ENT to GRC before rising above floor.
- M Stub-Ups to Above Recessed Ceilings:
  - 1. Use EMT, IMC, or RMC for raceways.
  - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- N Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- O Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

- P Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- Q Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- R Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- S Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- T Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- U Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- V Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- W Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  2. Where an underground service raceway enters a building or structure.
  3. Conduit extending from interior to exterior of building.
  4. Conduit extending into pressurized duct and equipment.
  5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
  6. Where otherwise required by NFPA 70.
- X Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- Y Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
  2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
    - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
    - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
  3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.00078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
  4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
  5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

- Z Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 36 inches (915 mm) of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
  - 1. Use LFMC in damp or wet locations subject to severe physical damage.
  - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- AA Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- BB Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- CC Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- DD Locate boxes so that cover or plate will not span different building finishes.
- EE Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- FF Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- GG Set metal floor boxes level and flush with finished floor surface.
- HH Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

### 3.03 INSTALLATION OF UNDERGROUND CONDUIT

- A Direct-Buried Conduit:
  - 1. Excavate trench bottom to provide firm and uniform support for conduit.
  - 2. Install backfill.
  - 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
  - 4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
  - 5. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

### 3.04 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.
- D Install handholes with bottom below frost line.
- E Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.
- F Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

### 3.05 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

### 3.06 FIRESTOPPING

- A Install firestopping at penetrations of fire-rated floor and wall assemblies

**3.07 FIRESTOPPING**

- A Protect coatings, finishes, and cabinets from damage and deterioration.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

**END OF SECTION**

**SECTION 26 0533**  
**IDENTIFICATION OF ELECTRICAL SYSTEMS**

**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

**1.02 SUMMARY**

- A Section Includes:
  - 1. Color and legend requirements for raceways, conductors, and warning labels and signs.
  - 2. Labels.
  - 3. Bands and tubes.
  - 4. Tapes and stencils.
  - 5. Tags.
  - 6. Signs.
  - 7. Cable ties.
  - 8. Paint for identification.
  - 9. Fasteners for labels and signs.

**1.03 ACTION SUBMITTALS**

- A Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.
- B Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.
- D Delegated-Design Submittal: For arc-flash hazard study.

**PART 2 PRODUCTS****2.01 PERFORMANCE REQUIREMENTS**

- A Comply with ASME A13.1.
- B Comply with NFPA 70.
- C Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D Comply with ANSI Z535.4 for safety signs and labels.
- E Comply with NFPA 70E requirements for arc-flash warning labels.
- F Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- G Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient.

**2.02 COLOR AND LEGEND REQUIREMENTS**

- A Raceways and Cables Carrying Circuits at 600 V or Less:
  - 1. Black letters on an orange field.
  - 2. Legend: Indicate voltage and system or service type.
- B Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder conductors.
  - 1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
  - 2. Colors for 208/120-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.

- c. Phase C: Blue.
  3. Colors for 480/277-V Circuits:
    - a. Phase A: Brown.
    - b. Phase B: Orange.
    - c. Phase C: Yellow.
  4. Color for Neutral: White
  5. Color for Equipment Grounds: Green
  6. Colors for Isolated Grounds: Green with white stripe.
- C Raceways and Cables Carrying Circuits at More Than 600 V:
  1. Black letters on an orange field.
  2. Legend: "DANGER - CONCEALED HIGH VOLTAGE WIRING."
- D Warning Label Colors:
  1. Identify system voltage with black letters on an orange background.
- E Warning labels and signs shall include, but are not limited to, the following legends:
  1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
  2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."
- F Equipment Identification Labels:
  1. Black letters on a white field.

### 2.03 LABELS

- A Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
  1. Manufacturers:
    - a. Brady Corp.
    - b. Emedco
    - c. Panduit Corp.
    - d. Or Approved Equal
- B Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.
  1. Manufacturers:
    - a. Brady Corp.
    - b. HellermannTyton
    - c. Panduit Corp
    - d. Or Approved Equal
- C Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, vinyl flexible label with acrylic pressure-sensitive adhesive.
  1. Manufacturers:
    - a. Brady Corp.
    - b. Brother International
    - c. Emedco
    - d. Ideal Industries
    - e. Or approved Equal
  2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
  3. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
  4. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
- D Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Manufacturers:
  - a. Brady Corp.
  - b. Brother International
  - c. Emedco
  - d. Ideal Industries
  - e. Or approved Equal
2. Minimum Nominal Size:
  - a. 1-1/2 by 6 inches (37 by 150 mm) for raceway and conductors.
  - b. 3-1/2 by 5 inches (76 by 127 mm) for equipment.
  - c. As required by authorities having jurisdiction.

#### 2.04 BANDS AND TUBES

- A Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameters sized to suit diameters and that stay in place by gripping action.
1. Manufacturers:
    - a. Brady Corp.
    - b. HellermannTyton
    - c. Panduit Corp
    - d. Or approved Equal
- B Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at a maximum of 200 deg F (93 deg C). Comply with UL 224.
1. Manufacturers:
    - a. Brandy Corp
    - b. Panduit Corp
    - c. Or approved Equal

#### 2.05 TAPES AND STENCILS

- A Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
1. Manufacturers:
    - a. Carlton Industries
    - b. Champion America
    - c. HellmannTyton
    - d. Ideal Industries Inc
    - e. Or approved Equal
- B Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.
1. Manufacturers:
    - a. Brady Corp
    - b. Carlton Industries
    - c. Marking Services
    - d. Or approved Equal
- C Tape and Stencil: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers placed diagonally over orange background and are 12 inches (300 mm) wide. Stop stripes at legends.
1. Manufacturers:
    - a. Brimar Industries
    - b. HellermannTyton
    - c. Marking Services, Inc
    - d. Or approved equal



- D Floor Marking Tape: 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.
1. Manufacturers:
    - a. Carlton Industries
    - b. Seton Identification
    - c. Or approved equal
- E Underground-Line Warning Tape:
1. Manufacturers:
    - a. Brady Corp.
    - b. Brimar Industries
    - c. Ideal Industries
    - d. Or approved equal
  2. Tape:
    - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical utility lines.
    - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
    - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
  3. Color and Printing:
    - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
    - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
    - c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".
- F Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

## 2.06 CABLE TIES

- A Manufacturers:
1. HellermannTyton
  2. Ideal Industries
  3. Panduit Corp
  4. Or approved Equal
- B General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
1. Minimum Width: 3/16 inch (5 mm).
  2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).
  3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
  4. Color: Black, except where used for color-coding.
- C UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
1. Minimum Width: 3/16 inch (5 mm).
  2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).
  3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
  4. Color: Black.
- D Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
1. Minimum Width: 3/16 inch (5 mm).
  2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 7000 psi (48.2 MPa).
  3. UL 94 Flame Rating: 94V-0.
  4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
  5. Color: Black.

**2.07 MISCELLANEOUS IDENTIFICATION PRODUCTS**

- A Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

**PART 3 EXECUTION****3.01 PREPARATION**

- A Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

**3.02 INSTALLATION**

- A Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B Install identifying devices before installing acoustical ceilings and similar concealment.
- C Verify identity of each item before installing identification products.
- D Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E Apply identification devices to surfaces that require finish after completing finish work.
- F Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
  - 1. Secure tight to surface of conductor, cable, or raceway.
- H Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- I Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- J Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:
  - 1. "EMERGENCY POWER."
  - 2. "POWER."
  - 3. "UPS."
- K Vinyl Wraparound Labels:
  - 1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
  - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
- L Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.
- M Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.
- N Self-Adhesive Labels:
  - 1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
  - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
- O Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.
- P Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.
- Q Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.
- R Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
  - 1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

- S Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
- T Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.
- U Underground Line Warning Tape:
  - 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common exceeds 16 inches (400 mm) overall.
  - 2. Limit use of underground-line warning tape to direct-buried cables.
  - 3. Install underground-line warning tape for direct-buried cables and cables in raceways.
- V Cable Ties: General purpose, for attaching tags, except as listed below:
  - 1. Outdoors: UV-stabilized nylon.
  - 2. In Spaces Handling Environmental Air: Plenum rated.

### 3.03 IDENTIFICATION SCHEDULE

- A Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- C Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30A and 120V to Ground: Identify with self-adhesive raceway labels.
  - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- D Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:
  - 1. "EMERGENCY POWER."
  - 2. "POWER."
- E Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels to identify the phase.
  - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- F Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.
- G Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive labels with the conductor designation.
- H Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- I Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.
  - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
- J Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- K Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- L Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.
- M Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.
  - 1. Apply to exterior of door, cover, or other access.
  - 2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

- a. Power-transfer switches.
  - b. Controls with external control power connections.
- N Arc Flash Warning Labeling: Self-adhesive labels.
- O Operating Instruction Signs: Laminated acrylic or melamine plastic signs.
- P Emergency Operating Instruction Signs: Laminated acrylic or melamine plastic signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer. Coordinate "Equipment Identification Labels" Paragraph below with electrical Sections. Delete items not in Project.
- Q Equipment Identification Labels:
- 1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
  - 2. Outdoor Equipment: Laminated acrylic or melamine sign.
  - 3. Equipment to Be Labeled:
    - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self-adhesive, engraved, laminated acrylic or melamine label.
    - b. Enclosures and electrical cabinets.
    - c. Access doors and panels for concealed electrical items.
    - d. Switchgear.
    - e. Switchboards.
    - f. Transformers: Label that includes tag designation indicated on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    - g. Emergency system boxes and enclosures.
    - h. Enclosed switches.
    - i. Enclosed circuit breakers.
    - j. Enclosed controllers.
    - k. Variable-speed controllers.
    - l. Push-button stations.
    - m. Power-transfer equipment.
    - n. Contactors.
    - o. Remote-controlled switches, dimmer modules, and control devices.
    - p. Power-generating units.
    - q. Monitoring and control equipment.
    - r. UPS equipment.

**END OF SECTION**

**SECTION 26 2726  
WIRING DEVICES****PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

**1.02 SUMMARY**

- A Section Includes:
  1. Standard-grade receptacles, 125 V, 20 A.
  2. USB receptacles.
  3. GFCI receptacles, 125 V, 20 A.
  4. Twist-locking receptacles.
  5. Cord and plug sets.
  6. Toggle switches, 120/277 V, 20 A.
  7. Wall plates.

**1.03 DEFINITIONS**

- A AFCI: Arc-fault circuit interrupter.
- B BAS: Building automation system.
- C EMI: Electromagnetic interference.
- D GFCI: Ground-fault circuit interrupter.
- E Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- F RFI: Radio-frequency interference.
- G SPD: Surge protective device.

**1.04 ACTION SUBMITTALS**

- A Product Data: For each type of product.
- B Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C Samples: One for each type of device and wall plate specified, in each color specified.

**1.05 INFORMATIONAL SUBMITTALS**

- A Field quality-control reports.

**1.06 CLOSEOUT SUBMITTALS**

- A Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

**1.07 MAINTENANCE MATERIAL SUBMITTALS**

- A Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

**PART 2 PRODUCTS****2.01 GENERAL WIRING DEVICE REQUIREMENTS**

- A Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B Comply with NFPA 70.
- C RoHS compliant.
- D Comply with NEMA WD 1.
- E Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
  1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
  2. Devices shall comply with requirements in this Section.
- F Devices for Owner-Furnished Equipment:
  1. Receptacles: Match plug configurations.
  2. Cord and Plug Sets: Match equipment requirements.

- G Device Color:
  - 1. Wiring Devices Connected to Normal Power System: White unless otherwise indicated or required by NFPA 70 or device listing.
- H Wall Plate Color: Stainless steel.
- I Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

## 2.02 STANDARD-GRADE RECEPTACLES, 125 V, 20 A

- A Duplex Receptacles, 125 V, 20 A:
  - 1. Manufacturers:
    - a. Eaton
    - b. Leviton
    - c. Hubbell
    - d. Or approved equal.
  - 2. Description: Two pole, three wire, and self-grounding.
  - 3. Configuration: NEMA WD 6, Configuration 5-20R.
  - 4. Standards: Comply with UL 498 and FS W-C-596.
- B Weather-Resistant Duplex Receptacle, 125 V, 20 A:
  - 1. Manufacturers:
    - a. Eaton
    - b. Leviton
    - c. Hubbell
    - d. Or approved equal.
  - 2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
  - 3. Configuration: NEMA WD 6, Configuration 5-20R.
  - 4. Standards: Comply with UL 498.
  - 5. Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" Article.

## 2.03 USB RECEPTACLES

- A USB Charging Receptacles:
  - 1. Manufacturers:
    - a. Eaton
    - b. Leviton
    - c. Hubbell
    - d. Or approved equal.
  - 2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
  - 3. USB Receptacles: Dual, USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
  - 4. Standards: Comply with UL 1310 and USB 3.0 devices.
- B Tamper-Resistant Duplex and USB Charging Receptacles:
  - 1. Manufacturers:
    - a. Eaton
    - b. Leviton
    - c. Hubbell
    - d. Or approved equal.
  - 2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap. Integral shutters that operate only when a plug is inserted in the line voltage receptacle.
  - 3. Line Voltage Receptacles: Two pole, three wire, and self-grounding; NEMA WD 6, Configuration 5-20R.
  - 4. USB Receptacles: Dual USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
  - 5. Standards: Comply with UL 498, UL 1310, USB 3.0 devices, and FS W-C-596.

6. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

#### **2.04 GFCI RECEPTACLES, 125 V, 20 A**

- A Manufacturers:
  1. Eaton
  2. Leviton
  3. Hubbell
  4. Or approved equal.
- B Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
- C Configuration: NEMA WD 6, Configuration 5-20R.
- D Type: Non-feed through.
- E Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.

#### **2.05 TWIST-LOCKING RECEPTACLES**

- A Twist-Lock, Single Receptacles, 120 V, 20 A:
  1. Manufacturers:
    - a. Eaton
    - b. Leviton
    - c. Hubbell
    - d. Or approved equal.
  2. Configuration: NEMA WD 6, Configuration L5-20R.
  3. Standards: Comply with UL 498.
- B Twist-Lock, Single Receptacles, 250 V, 20 A:
  1. Manufacturers:
    - a. Eaton
    - b. Leviton
    - c. Hubbell
    - d. Or approved equal.
  2. Configuration: NEMA WD 6, Configuration L6-20R.
  3. Standards: Comply with UL 498.
- C Twist-Lock, Single Receptacles, 277 V, 20 A:
  1. Manufacturers:
    - a. Eaton
    - b. Leviton
    - c. Hubbell
    - d. Or approved equal.
  2. Configuration: NEMA WD 6, Configuration L7-20R.
  3. Standards: Comply with UL 498.

#### **2.06 CORD AND PLUG SETS**

- A Match voltage and current ratings and number of conductors to requirements of equipment being connected.
- B Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
- C Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

#### **2.07 TOGGLE SWITCHES, 120/277 V, 20 A**

- A Single-Pole Switches, 120/277 V, 20 A:
  1. Manufacturers:
    - a. Eaton
    - b. Leviton
    - c. Hubbell
    - d. Or approved equal.

2. Standards: Comply with UL 20 and FS W-S-896.
- B Lighted Single-Pole Switches, 120/277 V, 20 A:
  1. Manufacturers:
    - a. Eaton
    - b. Leviton
    - c. Hubbell
    - d. Or approved equal.
  2. Description: Handle illuminated when switch is on.
  3. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.
- C Key-Operated, Single-Pole Switches, 120/277 V, 20 A:
  1. Manufacturers:
    - a. Eaton
    - b. Leviton
    - c. Hubbell
    - d. Or approved equal.
  2. Description: Factory-supplied key in lieu of switch handle.
  3. Standards: Comply with UL 20 and FS W-S-896.
- D Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches, 120/277 V, 20 A.
  1. Manufacturers:
    - a. Eaton
    - b. Leviton
    - c. Hubbell
    - d. Or approved equal.
  2. Description: For use with mechanically held lighting contactors.
  3. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.
- E Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches, 120/277 V, 20 A:
  1. Manufacturers:
    - a. Eaton
    - b. Leviton
    - c. Hubbell
    - d. Or approved equal.
  2. Description: For use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.
  3. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.

## 2.08 WALL PLATES

- A Single Source: Obtain wall plates from same manufacturer of wiring devices.
- B Single and combination types shall match corresponding wiring devices.
  1. Plate-Securing Screws: Metal with head color to match plate finish.
  2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished, Type 302 stainless steel.
  3. Material for Unfinished Spaces: Galvanized steel.
  4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- C Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.
- D Antimicrobial Cover Plates:
  1. Contact surfaces treated with a coating that kills 99.9 percent of certain common bacteria within two hours when regularly and properly cleaned.
  2. Tarnish resistant.



**PART 3 EXECUTION****3.01 INSTALLATION**

- A Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B Coordination with Other Trades:
  - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes, and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
  - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C Conductors:
  - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
  - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
  - 3. The length of free conductors at outlets for devices shall comply with NFPA 70, Article 300, without pigtails.
  - 4. Existing Conductors:
    - a. Cut back and pigtail, or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.
- D Device Installation:
  - 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
  - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
  - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
  - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
  - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
  - 6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
  - 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
  - 8. Tighten unused terminal screws on the device.
  - 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- E Receptacle Orientation:
  - 1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
  - 2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.
- F Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G Dimmers:
  - 1. Install dimmers within terms of their listing.
  - 2. Verify that dimmers used for fan-speed control are listed for that application.
  - 3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device, listing conditions in the written instructions.
- H Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- I Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

**3.02 GFCI RECEPTACLES**

- 1. Install non-feed-through GFCI receptacles where protection of downstream receptacles is not required.

**3.03 IDENTIFICATION**

- A Comply with Section 260553 "Identification for Electrical Systems."

**3.04 FIELD QUALITY CONTROL**

- A Test Instruments: Use instruments that comply with UL 1436.
- B Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- C Perform the following tests and inspections:
1. Test Instruments: Use instruments that comply with UL 1436.
  2. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- D Tests for Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
  2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
  3. Ground Impedance: Values of up to 2 ohms are acceptable.
  4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
  5. Using the test plug, verify that the device and its outlet box are securely mounted.
  6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault-current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- E Wiring device will be considered defective if it does not pass tests and inspections.
- F Prepare test and inspection reports.

**END OF SECTION**

**SECTION 26 2813  
FUSES****PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

**1.02 SUMMARY**

- A Section Includes:
1. Cartridge fuses rated 600 V ac and less for use in the following:
    - a. Control circuits.
    - b. Enclosed controllers.
    - c. Enclosed switches.

**1.03 ACTION SUBMITTALS**

- A Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
    - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
    - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
  2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and
  3. Current-limitation curves for fuses with current-limiting characteristics.
  4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit in PDF format.
  5. Coordination charts and tables and related data.
  6. Fuse sizes for elevator feeders and elevator disconnect switches.

**1.04 CLOSEOUT SUBMITTALS**

- A Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017700 "Closeout Procedures," Section 017823 "Operation and Maintenance Data," include the following:
1. Ambient temperature adjustment information.
  2. Current-limitation curves for fuses with current-limiting characteristics.
  3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse used on the Project. Submit in PDF format.
  4. Coordination charts and tables and related data.

**1.05 MAINTENANCE MATERIAL SUBMITTALS**

- A Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than 3 of each size and type.

**1.06 FIELD CONDITIONS**

- A Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C) apply manufacturer's ambient temperature adjustment factors to fuse ratings.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A Manufacturers:
1. Bussmann
  2. Littelfuse
  3. Or approved equal.

- B Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

## 2.02 CARTRIDGE FUSES

- A Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
  1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC.
  2. Type RK-5: 600-V, zero- to 600-A rating, 200 kAIC
  3. Type CC: 600-V, zero- to 30-A rating, 200 kAIC
  4. Type CD: 600-V, 31- to 60-A rating, 200 kAIC
  5. Type J: 600-V, zero- to 600-A rating, 200 kAIC
  6. Type L: 600-V, 601- to 6000-A rating, 200 kAIC
  7. Type T: 600-V, zero- to 800-A rating, 200 kAIC
- B Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C Comply with NEMA FU 1 for cartridge fuses.
- D Comply with NFPA 70.
- E Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 FUSE APPLICATIONS

- A Cartridge Fuses:
  1. Feeders: Class L, fast acting.
  2. Motor Branch Circuits: Class RK1, time delay.
  3. Large Motor Branch (601-4000 A): Class L, time delay.
  4. Power Electronics Circuits: Class J, high speed.
  5. Other Branch Circuits: Class RK1, time delay.
  6. Control Transformer Circuits: Class CC, time delay, control transformer duty.
  7. Provide open-fuse indicator fuses or fuse covers with open fuse indication.

### 3.03 INSTALLATION

- A Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B Install spare-fuse cabinet(s) in location shown on the Drawings or as indicated in the field by Architect.

### 3.04 IDENTIFICATION

- A Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

**END OF SECTION**

**SECTION 26 2816**  
**ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

**1.02 SUMMARY**

- A Section Includes:
  1. Fusible switches.
  2. Nonfusible switches.
  3. Receptacle switches.
  4. Molded-case circuit breakers (MCCBs).
  5. Molded-case switches.
  6. Enclosures.

**1.03 DEFINITIONS**

- A NC: Normally closed.
- B NO: Normally open.
- C SPDT: Single pole, double throw.

**1.04 ACTION SUBMITTALS**

- A Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
  1. Enclosure types and details for types other than NEMA 250, Type 1.
  2. Current and voltage ratings.
  3. Short-circuit current ratings (interrupting and withstand, as appropriate).
  4. Include evidence of a nationally recognized testing laboratory (NRTL) listing for series rating of installed devices.
  5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
  6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in [PDF] [and] <Insert calculation program format> electronic format.
- B Shop Drawings: For enclosed switches and circuit breakers.
  1. Include plans, elevations, sections, details, and attachments to other work.
  2. Include wiring diagrams for power, signal, and control wiring.

**1.05 INFORMATIONAL SUBMITTALS**

- A Qualification Data: For qualified testing agency.
- B Seismic Qualification Data: Certificates, for enclosed switches and circuit breakers, accessories, and components, from manufacturer.
  1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C Field quality-control reports.

**1.06 CLOSEOUT SUBMITTALS**

- A Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
  - a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
  - b. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

#### **1.07 MAINTENANCE MATERIAL SUBMITTALS**

- A Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

#### **1.08 FIELD CONDITIONS**

- A Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
  2. Altitude: Not exceeding 6600 feet (2010 m).

#### **1.09 WARRANTY**

- A Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
1. Warranty Period: One year(s) from date of Substantial Completion.

### **PART 2 PRODUCTS**

#### **2.01 PERFORMANCE REQUIREMENTS**

- A Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

#### **2.02 GENERAL REQUIREMENTS**

- A Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- B Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D Comply with NFPA 70.

#### **2.03 FUSIBLE SWITCHES**

- A Manufacturers:
1. ABB
  2. Eaton
  3. Siemens
  4. Or approved equal.
- B Type HD, Heavy Duty:
1. Single throw.
  2. Three pole.
  3. 600-V ac.
  4. 1200 A and smaller.
  5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.
  6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Lugs: Mechanical type, suitable for number, size, and conductor material.

## 2.04 NONFUSIBLE SWITCHES

- A Manufacturers:
1. ABB
  2. Eaton
  3. Siemens
  4. Or approved equal.
- B Type GD, General Duty, Three Pole, Single Throw, 240-V ac, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- C Type HD, Heavy Duty, Three Pole, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- D Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- E Type HD, Heavy Duty, Three Pole, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- F Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  3. led for copper and aluminum neutral conductors.
  4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  5. Lugs: Mechanical type, suitable for number, size, and conductor material.

## 2.05 RECEPTACLE SWITCHES

- A Manufacturers:
1. ABB
  2. Eaton
  3. Siemens
  4. Or approved equal.
- B Type HD, Heavy-Duty, Three Pole, Single-Throw Fusible Switch: 240-V ac, 30 amperage A; UL 98 and NEMA KS 1; horsepower rated, with clips or bolt pads to accommodate specified fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- C Type HD, Heavy-Duty, Three Pole, Single-Throw Nonfusible Switch: 600-V ac, 30 amperage A; UL 98 and NEMA KS 1; horsepower rated, lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- D Interlocking Linkage: Provided between the receptacle and switch mechanism to prevent inserting or removing plug while switch is in the on position, inserting any plug other than specified, and turning switch on if an incorrect plug is inserted or correct plug has not been fully inserted into the receptacle.
- E Receptacle: Polarized, three-phase, four-wire receptacle (fourth wire connected to enclosure ground lug).
- F Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.

2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Lugs: Mechanical type, suitable for number, size, and conductor material.
6. Service-Rated Switches: Labeled for use as service equipment.

## 2.06 MOLDED-CASE CIRCUIT BREAKERS

- A Manufacturers:
1. ABB
  2. Eaton
  3. Siemens
  4. Or approved equal.
- B Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.
- C Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.
- D MCCBs shall be equipped with a device for locking in the isolated position.
- E Lugs shall be suitable sized according to the 167 deg F (75 deg C) temperature rating in NFPA 70.
- F Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.
- G Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- H Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- I Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
1. Instantaneous trip.
  2. Long- and short-time pickup levels.
  3. Long- and short-time time adjustments.
  4. Ground-fault pickup level, time delay, and I-squared t response.
- J Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- K Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
- L Ground-Fault Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- M Ground-Fault Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- N Features and Accessories:
1. Standard frame sizes, trip ratings, and number of poles.
  2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
  3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
  4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.



5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.

## 2.07 MOLDED-CASE SWITCHES

- A Manufacturers:
1. ABB
  2. Eaton
  3. Siemens
  4. Or approved equal.
- B Description: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.
- C Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.
- D Features and Accessories:
1. Standard frame sizes and number of poles.
  2. Lugs:
    - a. Mechanical type, suitable for number, size, trip ratings, and conductor material.
    - b. Lugs shall be suitable sized according to the 167 deg F (75 deg C) temperature rating in NFPA 70.
  3. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
  4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
  5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.

## 2.08 ENCLOSURES

- A Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
- B Enclosure Finish: The enclosure shall be gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1).
- C Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.
- D Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.
- E Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.
- F NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B Proceed with installation only after unsatisfactory conditions have been corrected.
1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

### 3.02 PREPARATION

- A Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
1. Notify Architect no fewer than seven days in advance of proposed interruption of electric service.

2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Architect's written permission.
4. Comply with NFPA 70E.

### 3.03 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

- A Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
  2. Outdoor Locations: NEMA 250, Type 3R.
  3. Other Wet or Damp, Indoor Locations: NEMA 250, [Type 4] <Insert type>.
  4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

### 3.04 INSTALLATION

- A Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- C Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- D Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- E Install fuses in fusible devices.
- F Comply with NFPA 70 and NECA 1.

### 3.05 IDENTIFICATION

- A Comply with requirements in Section 260553 "Identification for Electrical Systems."
1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  2. Label each enclosure with engraved metal or laminated-plastic nameplate.

### 3.06 FIELD QUALITY CONTROL

- A Tests and Inspections for Switches:
1. Visual and Mechanical Inspection:
    - a. Inspect physical and mechanical condition.
    - b. Inspect anchorage, alignment, grounding, and clearances.
    - c. Verify that the unit is clean.
    - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
    - e. Verify that fuse sizes and types match the Specifications and Drawings.
    - f. Verify that each fuse has adequate mechanical support and contact integrity.
    - g. Inspect bolted electrical connections for high resistance using one of the two following methods:
      - 1) Use a low-resistance ohmmeter.
        - (a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
      - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
        - (a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
    - h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
    - i. Verify correct phase barrier installation.
    - j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.
  2. Electrical Tests:

- a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
  - b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
  - c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
  - d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
  - e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."
- B Tests and Inspections for Molded Case Circuit Breakers:
1. Visual and Mechanical Inspection:
    - a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
    - b. Inspect physical and mechanical condition.
    - c. Inspect anchorage, alignment, grounding, and clearances.
    - d. Verify that the unit is clean.
    - e. Operate the circuit breaker to ensure smooth operation.
    - f. Inspect bolted electrical connections for high resistance using one of the two following methods:
      - 1) Use a low-resistance ohmmeter.
        - (a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
      - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
        - (a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
    - g. Inspect operating mechanism, contacts, and chutes in unsealed units.
    - h. Perform adjustments for final protective device settings in accordance with the coordination study.
  2. Electrical Tests:
    - a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
    - b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
  3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  4. Perform the following infrared scan tests and inspections and prepare reports:
    - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.

- b. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- 5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- C Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- D Prepare test and inspection reports.
  - 1. Test procedures used.
  - 2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
  - 3. List deficiencies detected, remedial action taken, and observations after remedial action.

**3.07 ADJUSTING**

- A Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

**END OF SECTION**

**SECTION 26 0529**  
**CENTRAL BATTERY EQUIPMENT FOR EMERGENCY LIGHTING**

**PART 1 GENERAL****1.01 RELATED DOCUMENTS**

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

**1.02 SUMMARY**

- A Section includes the following central battery and power conversion equipment rated 600 V and less for emergency lighting:
  - 1. Uninterruptible (UPS-type) central battery equipment.

**1.03 DEFINITIONS**

- A DDC: Direct digital control.
- B IBC: International Building Code.
- C Interruptible: As used in the Section Text, an off-line, passive-standby or line-interactive, inverter-only unit, with an intentional interruption of power to the load until an internal transfer switch picks up and transfers the load to the unit's inverter and internal battery source on loss of the "normal" source, and then retransfers to the "normal" source when it is restored. Transfer time can be "slow" (up to approximately 1 second) or "fast" (2-4 ms or 40-50 ms, depending on manufacturer).
- D LED: Light-emitting diode.
- E Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.
- F NiCd: Nickel cadmium.
- G OCPD: Overcurrent protective device.
- H PC: Personal computer.
- I PWM: Pulse-width modulated.
- J TDD: Total demand (harmonic current) distortion (also listed as "THD" in catalog data by manufacturers).
- K THD(V): Total harmonic voltage demand.
- L Uninterruptible: As used in the Section Text, an on-line, double-conversion (rectifier/inverter) unit, with no interruption of power to the load on interruption and restoration of the "normal" source.
- M UPS: Uninterruptible power supply.
- N VRLA: Valve-regulated lead acid.

**1.04 ACTION SUBMITTALS**

- A Product Data: For each type and rating of central battery equipment unit.
  - 1. Include features, performance, electrical ratings, operating characteristics, shipping and operating weights, shipping splits, and furnished options, specialties, and accessories.

**1.05 CLOSEOUT SUBMITTALS**

- A Operation and Maintenance Data: For central battery equipment to include in emergency, operation, and maintenance manuals.
  - 1. In addition include the following:
    - 2. Manufacturer's written instructions for testing central battery equipment.
    - 3. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.
    - 4. Manufacturer's written instructions for selecting and setting field-adjustable controls and status and alarm points

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A Deliver equipment in fully enclosed vehicles.
- B Store equipment in spaces having environments controlled within manufacturers' written instructions for ambient temperature and humidity conditions for non-operating equipment.

**1.07 FIELD CONDITIONS**

- A Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
1. Ambient Storage Temperature: Not less than minus 4 deg F (minus 20 deg C) and not exceeding 140 deg F (60 deg C).
  2. Altitude: Exceeding 400 feet.
- B Interruption of Existing Electrical Distribution Systems: Do not interrupt electrical distribution systems within facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
1. Notify Architect no fewer than two days in advance of proposed interruption of electrical systems.
  2. Indicate method of providing temporary electrical service.
  3. Do not proceed with interruption of electrical systems without Architect's written permission.
  4. Comply with NFPA 70E.
- C Product Selection for Restricted Space: Drawings indicate maximum dimensions for central battery equipment, including clearances between central battery equipment and adjacent surfaces and other items.

**1.08 COORDINATION**

- A Coordinate sizes and locations of concrete bases. Cast anchor-bolt inserts into bases.

**1.09 WARRANTY**

- A Special Warranty: Manufacturer agrees to repair or replace central battery equipment that fails in materials or workmanship within specified warranty period. Special warranty, applying to batteries only, applies to materials only, on a prorated basis, for period specified.
1. Warranty Period: Include the following warranty periods, from date of Substantial Completion:
    - a. Central Battery Equipment (excluding Batteries): One year.
    - b. Batteries:
      - 1) Full Warranty: One year.
      - 2) Pro Rata: 5 years minimum.

**PART 2 PRODUCTS****2.01 PERFORMANCE REQUIREMENTS**

- A Seismic Performance: Central battery equipment shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. The designated central battery equipment shall be tested and certified by an NRTL as meeting ICC-ES AC 156 test procedure requirements.

**2.02 UNINTERRUPTIBLE (UPS-TYPE) CENTRAL BATTERY EQUIPMENT**

- A Manufacturers:
1. Meyers Power Products
  2. Dual-Lite
  3. Or approved equal.
- B General Requirements for Central Battery Equipment:
1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  2. NRTL Compliance: Fabricate and label central battery equipment to comply with UL 924.
  3. Comply with the IBC, NFPA 70, and NFPA 101.
  4. Comply with NEMA PE 1.
- C Performance Requirements for UPS-Type Central Battery Equipment:
1. Type: On-line, double conversion.
  2. Continuously provide uninterrupted ac power to connected emergency electrical lighting system.
  3. Automatic Operation:
    - a. Normal Conditions: Supply the load with ac power flowing from normal ac power input terminals, through rectifier and inverter, with battery connected in parallel with rectifier output.

- b. Abnormal Supply Conditions: If normal ac supply deviates from specified and adjustable voltage, voltage waveform, or frequency limits, battery supplies constant, regulated, inverter ac power output to the load without switching or disturbance.
  - c. If normal power fails, battery continues to supply regulated ac power through the inverter to the load without switching or disturbance.
  - d. When power is restored at normal supply terminals of system, controls automatically synchronize inverter with the external source before transferring the load. Rectifier then supplies power to the load through the inverter and simultaneously recharges battery.
  - e. If battery becomes discharged and normal supply is available, rectifier charges battery. When battery is fully charged, rectifier automatically shifts to float-charge mode.
  - f. If any element in the rectifier/inverter string fails and power is available at normal supply terminals of system, static transfer switch transfers the load to normal ac supply circuit without disturbance or interruption of supply.
  - g. If a fault occurs in system supplied by the inverter output, and current flows in excess of the overload rating of the inverter, static transfer switch operates to bypass fault current to normal ac supply circuit for fault clearing.
  - h. When fault has cleared, static transfer switch returns the load to inverter output.
  - i. If battery is disconnected, inverter continues to supply power to the load with no degradation of its regulation of voltage and frequency of output bus.
4. Manual Operation:
- a. Turning inverter off causes static transfer switch to transfer the load directly to normal ac supply circuit without disturbance or interruption.
  - b. Turning inverter on causes static transfer switch to transfer the load to inverter.
- D Unit Operating Requirements:
- 1. Input AC Voltage Tolerance: Plus 10 and minus 15 percent of central battery equipment input voltage rating.
  - 2. Input Frequency Tolerance: Plus or minus 5 percent of central battery equipment frequency rating.
  - 3. Synchronizing Slew Rate: 1 Hz per second, maximum.
  - 4. Minimum Off-Line Efficiency: 97 percent at 60 Hz, full load.
  - 5. Minimum Displacement Primary-Side Power Factor: 97 percent under any load or operating condition.
  - 6. Ambient Temperature Rating (Other Than Batteries): Not less than 68 deg F (20 deg C) and not exceeding 86 deg F (30 deg C).
  - 7. Ambient Storage Temperature Rating (Other Than Batteries): Not less than minus 4 deg F (minus 20 deg C) and not exceeding 158 deg F ((70 deg C).)
  - 8. Ambient Temperature Rating (Batteries): Not less than 32 deg F (0 deg C) and not exceeding 104 deg F (40 deg C).
  - 9. Ambient Storage Temperature Rating (Batteries): Not less than 0 deg F (minus 18 deg C) and not exceeding 104 deg F ((40 deg C).)
  - 10. Humidity Rating: Less than 95 percent (noncondensing).
  - 11. Altitude Rating: Not exceeding 400 feet.
- E Inverter and Controls Logic: Microprocessor based, isolated from all power circuits; provides complete self-diagnostics, periodic automatic testing and reporting; with alarms.
- F Controls and Indication:
- 1. Status Indication: Door-mounted, labeled LED indicators or digital screen displaying the following conditions:
    - a. Normal power available.
    - b. Status of system.
    - c. Battery charging status.
    - d. On battery power.
    - e. System fault.

- f. External fault.
- 2. Panel-Mounted Operator Station: Manufacturer's standard front-accessible, sealed keypad and plain-English language display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.
  - a. Keypad: In addition to required programming and control keys, include the following:
    - 1) Control Authority: Supports at least three conditions: Off, local manual control at unit and local automatic control at unit.
- G Self-Protection and Reliability Features:
  - 1. Integral, programmable, self-diagnostic and self-test circuitry; with alarms and logging.
  - 2. Battery deep-discharge and self-discharge protection; with alarms.
  - 3. Battery self-test circuitry; with alarms and logging.
- H Integral Input Disconnecting Means and OCPD: Thermal-magnetic circuit breaker, complying with UL 489.
  - 1. Integrated Equipment Minimum Short-Circuit Current (Withstand) Rating: 10kA.
- I Rectifier:
  - 1. Description: Solid state, with the following operational features:
    - a. Automatically convert incoming ac voltage to regulated dc bus voltage, with less than 2 percent rms ripple voltage with inverter fully loaded and batteries disconnected.
    - b. Rectified Efficiency: Not less than 97 percent.
    - c. Generator compatible.
- J Inverter:
  - 1. Description: Solid-state, high-frequency, PWM type, with the following operational features:
    - a. Automatically regulate output voltage to within plus or minus 5 percent, for all load ranges and for maximum 25 percent step-load changes; regulation may increase to 8 percent for 100 percent step-load changes, with recovery within 3 cycles.
    - b. Automatically regulate output frequency to within plus or minus 0.05 Hz, from no load to full load, at unity power factor, over the operating range of battery voltage.
    - c. Inverter Overload Capability: 115 percent for 10 minutes; 150 percent surge for 10 seconds.
    - d. Brownout Protection: Produces rated power without draining batteries when input voltage is down to 75 percent of normal.
    - e. Load Power Factor: 0.5 lead to 0.5 lag.
- K Battery Charger:
  - 1. Description: Solid state, variable rate, temperature compensated; automatically maintains batteries in fully charged condition when normal power is available.
  - 2. Maximum Battery Recharge Time from Fully Discharged State: 24 hours.
  - 3. Low-voltage disconnect circuit reduces battery discharge during extended power outages, monitors battery voltage, and disconnects inverter when battery voltage drops to no less than 85.7 percent of nominal voltage.
- L Batteries:
  - 1. Description: Standard VRLA batteries.
    - a. Capable of sustaining full-capacity output of inverter unit for minimum of 90 minutes.
  - 2. Battery Disconnect and OCPD: Manufacturer's standard.
- M Integral Output Disconnecting Means and OCPD:
  - 1. Single-Output OCPD: Thermal-magnetic circuit breaker, complying with UL 489; voltage rating matching unit output voltage rating; 20 A, single pole.
    - a. Normally Closed: 1

### 2.03 ENCLOSURES

- A Central Battery Equipment Enclosures: NEMA 250, to comply with environmental conditions at installed location.
  - 1. Dry and Clean Indoor Locations: Type 1 steel cabinets with access to components through hinged doors with flush tumbler lock and latch.



2. Finish: Manufacturer's standard baked-enamel finish over corrosion-resistant prime treatment.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A Receive, inspect, handle, and store central battery equipment according to NECA 411.
- B Examine areas, surfaces, and substrates to receive central battery equipment, with Installer present, for compliance with requirements for installation tolerances, structural support, ventilation, temperature, humidity, and other conditions affecting performance of the Work. Remove existing shelves in installation area.
  1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment will be installed, before installation begins.
- C Examine equipment before installation. Reject equipment that is wet, moisture damaged, or mold damaged.
- D Examine roughing-in for electrical connections to verify actual locations of connections before installation.
- E Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.02 INSTALLATION**

- A Coordinate layout and installation of central battery equipment with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B Install central battery equipment and accessories according to NECA 411.
- C Wall-Mounted Central Battery Equipment: Install central battery equipment on walls with tops at uniform height and with disconnect operating handles not higher than 79 inches (2000 mm) above finished floor unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For units not on walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."
- D Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- E Comply with NECA 1.
- F Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used for low-voltage control and alarm wiring. Conceal raceway and cables except in unfinished spaces.
  1. Install plenum cable in environmental air spaces, including plenum ceilings.
  2. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- G Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- H Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

#### **3.03 CONNECTIONS**

- A Connections: Interconnect system components. Make connections to supply and load circuits according to manufacturer's wiring diagrams unless otherwise indicated.
- B Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
  1. Separately Derived Systems: Make grounding connections to grounding electrodes and bonding connections to metallic piping systems as indicated; comply with NFPA 70.
- C Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

#### **3.04 CONTROL WIRING INSTALLATION**

- A Install wiring between central battery equipment and remote devices and facility's central-control system.
- B Bundle, train, and support wiring in enclosures.

#### **3.05 IDENTIFICATION**

- A Identify central battery equipment, components, and control wiring. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
  1. Label central battery equipment with engraved nameplates.
  2. Label each separate cabinet, for multicabinet units.

**3.06 FIELD QUALITY CONTROL**

- A Perform tests and inspections.
- B Tests and Inspections:
  - 1. Inspect central battery equipment, wiring, components, connections, and equipment installation. Test and adjust components and equipment.
  - 2. Perform each visual and mechanical inspection and electrical test stated in manufacturer's written instructions.
  - 3. Perform a load-duration test at rated voltage and rated output current to verify the correct functional operation of the unit under full-load stable operating conditions for the minimum time limits required by UL 924. Monitor and record ambient temperature and temperatures within the unit.
  - 4. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  - 5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- C Central battery equipment will be considered defective if it does not pass tests and inspections.
- D Prepare test and inspection reports, including a certified report that identifies central battery equipment and describes all test results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

**3.07 STARTUP SERVICE**

- A Perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.

**3.08 ADJUSTING**

- A Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.
- B Set field-adjustable switches, auxiliary relays, and other adjustable parts.
- C Adjust the trip settings of thermal-magnetic circuit breakers with adjustable, instantaneous-trip elements; install fuses if not factory installed.
- D Set the automatic system test parameters.

**3.09 PROTECTION**

- A Replace central battery equipment whose interiors have been exposed to water or other liquids prior to Substantial Completion.

**3.10 DEMONSTRATION**

- A Train Owner's maintenance personnel to adjust, operate, and maintain central battery equipment, and to use and reprogram microprocessor-based control, monitoring, and display functions.

**END OF SECTION**

**SECTION 26 50 00**  
**GENERAL LIGHTING PROVISIONS**

**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 general information related to providing and installing all interior and exterior lighting systems throughout the project.

**1.3 DEFINITIONS**

- A. Fixture: See "Luminaire."
- B. IP: International Protection or Ingress Protection Rating.
- C. LED: Light-emitting diode.
- D. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

**1.4 WARRANTIES**

- A. Submit a copy of manufacturers' written guarantees for each manufacturer for transmittal to the Owner, agreeing to repair or replace any and all defects in workmanship and/or materials for a period of two (2) years, or as otherwise specified, from the date of final acceptance of the installation, without cost to the Owner.
- B. Submit the Contractor's written guarantee for a period of one (1) year after the date of final acceptance, all apparatus installed by the Contractor to be free of mechanical and electrical defects in workmanship, and to replace the same if, in the opinion of the Architect, the responsibility lies with the Contractor.

**1.5 REQUIREMENTS OF REGULATORY AGENCIES**

- A. All equipment covered in this section shall comply with all applicable standards of IESNA, National Electrical Code and all laws, codes and regulations of Federal, State, County and City authorities having jurisdiction over this work.
- B. All equipment shall be U.L. Listed. Equipment shall be listed for Wet or Damp locations, as stated in the luminaire schedule, or as specified by the luminaire catalog number.
- C. Luminaires shall be located so as not to provide any conflicts with barrier free spaces: Public Law 90-480 and American National Standards Institute A1117.1-1961
- D. NEMA WD 6 – Wiring Devices-Dimensional Requirements
- E. All work shall be inspected and approved by the appropriate authorities.

**1.6 MATERIALS AND WORKMANSHIP**

- A. All materials and apparatus required for the work, except as specified otherwise, shall be new, of first class quality, and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit properly into the spaces. Where no specific kind or quality of material is given, an article acceptable to the Architect shall be furnished.
- B. All component parts of each item of equipment or device shall bear the Manufacturer's Nameplate, giving at least the name of the manufacturer, description, size, type, serial number, and electrical characteristics in order to facilitate maintenance or replacement. This nameplate shall not be visible during normal operation of the equipment.
- C. Blemished, damaged, or unsatisfactory luminaires shall be replaced at the direction of the Architect in a satisfactory manner at no cost to the Owner. This includes manufacturer defects as well as damage or blemishes to luminaires during handling and installation. Special attention should be paid to the blades and baffles of luminaires.
- D. Luminaires that are installed and or used during construction must be protected from the construction activities, dirt and debris. Any luminaires showing dirt or debris must be cleaned prior to turnover of the area to the Owner.
- E. Whenever possible luminaires should not be used during construction. Whenever luminaires are used for work lights during construction, light sources shall be replaced according to the project specifications and/or luminaire schedule prior to turnover of area to Owner. All luminaires installed during construction must be sealed, bagged, and covered in plastic to prevent dirt and construction debris from entering the luminaire and accumulating on the reflector.

**1.7 SUBMITTALS**

- A. Cost Estimate

1. Contractor to provide line item pricing for each luminaire type listed in the luminaire schedule. Contractor to specify if labor is included.
  2. Contractor to provide line item pricing for each control type listed in the luminaire schedule. Contractor to specify if labor is included.
- B. Substitute Products Approval during Bidding
1. Substitutions for lighting equipment other than that specified will be considered if equal (or better and/or higher) in quality, performance, ratings and function; and similar in type, size and appearance.
  2. Substitutions are to be provided to the Architect, Electrical Engineer and Lighting Consultant at least (14) days prior to proposals being presented to the Owner. Said substitution package shall include data on both the proposed substitution and the specified product is such detail as to permit the two products to be adequately compared. Said substitution package shall include samples of each substitution being proposed. Substitutions are solely at the proposer's risk and should not be considered as being acceptable until a written approval from the Architect, Electrical Engineer, or Lighting Consultant is issued to that effect. In the absence of approval not occurring prior to bid, the substitution should be considered as not being approved.
  3. Submit Electronic Submittals or (4) hard copies on request, of the substitution requests to the Architect. The Architect will distribute to the Owner, Electrical Engineer and Lighting Consultant. Contractor shall submit bid alternates for approval prior to bidding. Proposed alternates shall include specification sheets with adequate information for comparison. The Architect, Electrical Engineer or Lighting Consultant will issue a statement of approval or rejection within (14) days of receiving the substitution documents.
- C. Shop Drawings & Product Submittals
1. Before releasing any materials, the Contractor shall submit manufacturers catalog cut sheets, diagrams, and a complete list of all of the equipment and materials which the Contractor intends to install. This list shall include, but is not limited to, the following:
    - a. Light standards and anchor bolts;
    - b. Bases including elevations showing depth in to soil, depth above finished surface, interface with adjacent surface elements, reinforcing steel, and concrete mix and strength.
    - c. Details on backing to be provided for wall mounted fixtures over ten pounds to be wall mounted.
    - d. Luminaire mountings, luminaires, finishes, light sources, fixture hickey's, fixture studs, visible chains, visible cables, seismic supports, and ballasts;
    - e. Bolt plate covers;
    - f. Performance and Photometric data, and UL listing;
    - g. Wiring and connection diagrams of all luminaires, etc.
    - h. Lighting dimming control components specifications, if applicable.
  2. The list shall include the brand name, any identifying numbers, relevant technical data, and any other information necessary for the agency responsible for maintenance of the system to procure exact replacements of any and all equipment and material used on the project. All equipment shall be new, first quality and approved by Underwriter's Laboratories, Inc.
  3. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
  4. All luminaires of the same type classification shall be provided by the same manufacturer.
  5. Before releasing any non-standard, modification of standard specification product, semi-custom, or custom luminaires, the Contractor shall submit shop drawings which detail methods of assembly and fastening. Shop drawings shall also indicate colors and their locations on each lighting element for review and approval prior to releasing. Contractor shall also supply manufacturer descriptions on luminaires, light standard materials, fabrication performance, and installation.
  6. The Contractor shall submit all Certificates of Compliance supplied by the manufacturer of the equipment. This equipment shall include, but is not limited to, the following:
    - a. Luminaire mountings.
    - b. Luminaire standards and accessories.
    - c. Pole base and accessories.
    - d. Luminaires, light sources, drivers and ballasts.
    - e. Photometric data (if requested).

- D. Samples (when requested by the Architect, Electrical Engineer or Lighting Consultant)
1. Submit samples of finishes and also submit photometric data in electronic format from an independent testing laboratory to completely describe luminaire performance. Unless otherwise indicated, samples shall be as follows:
    - a. For standard catalog types: complete, production line samples, with all installation hardware, proper lamp(s), and equipped with a cord and plug.
    - b. Sample of a specially designed or developed luminaire shall be submitted for the purpose of ascertaining its photometric performance, quality of visible parts and details, maintenance features (including relamping process), method of installation, and safety features.
    - c. Luminaire samples shall be submitted for final review within 30 days after review of shop drawings. If, after a period of 30 days from rejection of samples, the luminaire cannot be made acceptable, then a luminaire (shop drawing and sample) by an alternative manufacturer shall be submitted at no cost to the Owner.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL MATERIALS REQUIREMENTS**

- A. Provide accessories as required for compatibility with installation requirements. Luminaire catalog numbers do not necessarily denote specific mounting accessories for where/how luminaire is to be installed.
- B. All materials used in fabrication and mounting luminaires shall be of a non-corrosive nature.
- C. Luminaires shall be free of light leaks. Luminaires shall be designed to provide adequate ventilation for both light sources and drivers or transformers.
- D. Luminaires shall be designed to hide mounting hardware from view when luminaire is completely installed. Exposed fasteners shall not be acceptable, except as noted on details.
- E. Wiring channels and lamp holder mountings shall be rigid and accurately manufactured.
- F. In adjustable luminaires, aiming and positive locking devices shall be provided.
- G. All luminaires when installed shall be set true and free of warps, dents, or other irregularities. The finish of exposed parts or trims shall be as specified or as directed by the Architect/Engineer.
- H. All lamp holders shall be of high quality and shall securely hold light sources preventing vibration.
- I. Rivets, springs, and other hardware shall not be visible after installation.

### **2.2 PRODUCT DELIVERY AND STORAGE**

- A. All components shall be packed in a manner consistent with ICC regulations to minimize damage during shipping.
- B. Store all luminaires, light sources, drivers and hardware flat, in a clean, dry area off the ground under watertight cover.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Report all defects. Contractor shall be held responsible for any existing defects that adversely affect the luminaire or its performance.
- B. Upon Architect's request, Contractor shall provide one sample of selected luminaires.

### **3.2 INSTALLATION**

- A. The installation shall be in accordance with all governing local ordinances and regulations, the Drawings, these special provisions and those sections of the Standard Specifications which apply. All workmanship shall be first class and finished work shall present a neat, uncluttered appearance. The Contractor shall coordinate his work with other construction phases so as to provide a minimum of interference to the combined operations. Contractor shall also coordinate their work with the work on adjacent projects where required.
- B. Provide seismic calculations as necessary to validate the installation of all fixtures as appropriate for the seismic zone in to which they are being installed. Furnish and install seismic components as necessary to complete the installation.
- C. Clean the housing, trim, reflector surfaces, lens of all luminaires after construction is complete, so as to render them free of any material.
- D. Any luminaire or lamp or lighting device damaged during construction shall be replaced without cost to the Owner.
- E. Replace all inoperative light sources, ballasts, drivers and transformers just prior to acceptance of Project by Owner. Verify that all light sources are installed are exactly as specified for each luminaire type.

- F. Notify Owner and/or Architect about field conditions at variance with contract documents before commencing installation. This includes but is not inclusive of changes in landscape type and location, and field verification of walls, boundary markers, signs, walkways, and other changes that affect location of equipment.
- G. It shall be the Contractor's responsibility to replace and restore all surface materials in kind, equal to, or exceeding those disturbed by trenching, excavation or backfilling operations. This includes but is not limited to: seeding, sodding, replacement of sub base, pavement, trees, and shrubs. All excess materials shall be disposed of as directed by the Architect.
- H. It is the contractor's responsibility to review and coordinate with the Architectural drawings for placement of luminaires and lighting control devices. The contractor shall also coordinate with Landscape drawings for location of luminaires at the exterior of the project.
- I. It is the Contractor's responsibility to coordinate with other trades and with the local utility locator service.

### **3.3 LIGHTING AIM AND FOCUS**

- A. It is the Contractor's responsibility to provide all necessary labor and materials for final focusing of all adjustable luminaires under the Architect's and/or Lighting Consultant's observation. The focusing of all adjustable luminaires will take place in a night test of system.
- B. Focusing shall take place immediately before the Project is turned over to the Owner. Focusing shall be complete after approval by the Architect and/or Lighting Consultant.
- C. All track mounted luminaires and accessories shall be stored by the contractor during construction and only installed during the focusing period. Track mounted luminaires should not be installed prior to the focusing period unless directed by the Architect and/or Lighting Consultant.
- D. Prior to the focusing, the Contractor shall verify in writing to the Architect and/or Lighting Consultant that all materials stored on site, including track luminaires, accessories and light sources are accounted for and ready for the focusing procedure.

### **3.4 TESTS**

- A. Prior to final acceptance, the Contractor shall demonstrate by test to the Architect's and/or Lighting Consultant's satisfaction that all the electrical and lighting equipment installations are in proper condition per drawings and specifications. The Contractor shall furnish all equipment and appliances to make the test.
- B. All lighting circuits and equipment shall be given an initial operational test, consisting of having the entire system energized for 72 consecutive hours without any failures of any type occurring anywhere in the system. All circuits shall test clear of faults, grounds and open circuits to the satisfaction of the Architect.
  - 1. Submit information of witness participation for all testing including but not limited to:
    - a. Witness(s) name, title, employer, address of the associated business, e-mail, and telephone information.
- C. After satisfactory completion of all tests, the illumination system shall be placed in operation. Final acceptance will not be made until the system has operated satisfactory for a period of not less than (14) days.
- D. The Contractor shall be fully responsible for the system during this period of operation and he shall make any adjustment or repairs which may be required, and remedy any defects or damages which may occur, at Contractor's expense.
- E. Operation of the system shall not in any way be construed as an acceptance of the system or any part of it or as a waiver of any of the provision of the contract. Acceptance of the system is to occur when the Owner accepts the building.
- F. The Contractor shall not be required to pay for electrical energy consumed by the system during the period of trial operation.

**END OF SECTION 26 50 00**