

PROJECT MANUAL  
FOR  
GENERAL CONSTRUCTION

**JPS HEALTH NETWORK**  
OWNER PROJECT # - MEDICAL HOME SOUTHEAST TARRANT  
RADIOLOGY ROOM  
1050 WEST ARKANSAS LANE  
ARLINGTON, TEXAS 76013

**VOLUME C.1 - DIVISIONS 00-01**

**COMM. NO. 1241**  
**December 20, 2023**



# **PROJECT MANUAL**

## **Medical Home Southeast Tarrant – Radiology Room Arlington, Texas**

**December 20, 2023**

**Construction Documents**

### **Owner**

JPS Health Network  
1500 South Main Street  
Fort Worth, Texas 76014

### **Architect**

Primera Design Associates, LLC  
2102 Roosevelt Drive, Suite A  
Dalworthington Gardens, Texas 76013  
Telephone: 817-303-5400

### **Structural Engineer**

Primera Design Associates, LLC  
2102 Roosevelt Drive, Suite A  
Dalworthington Gardens, Texas 76013  
Telephone: 817-303-5400

### **Mechanical, Electrical and Plumbing Engineers**

Baird, Hampton, & Brown  
6300 Ridglea Place, Suite 700  
Fort Worth, Texas  
Telephone: 817-338-1277

**Primera Design Associates, LLC Commission Number: 1241**

**END OF DOCUMENT**

**DOCUMENT 000107**

**PROFESSIONAL SEALS PAGE**

The specification sections listed below were prepared by or under the direct supervision of the Architect:

Primera Design Associates, LLC  
2102 Roosevelt Drive, Suite A  
Dalworthington Gardens, Texas 76013

SEAL

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- 011000 Summary
- 012100 Allowances
- 012500 Substitution Procedures
- 012600 Contract Modification Procedures
- 012900 Payment Procedures
- 013100 Project Management and Coordination
- 013200 Construction Progress Documentation
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- 015000 Temporary Facilities and Controls
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- 017823 Operation and Maintenance Data
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**DIVISION 13 – SPECIAL CONSTRUCTION**

134900 Radiation Protection

SEAL



END OF DOCUMENT

**DOCUMENT 000107**

**PROFESSIONAL SEALS PAGE**

The specification sections listed below were prepared by or under the direct supervision of the Mechanical Engineer:

BAIRD, HAMPTON & BROWN  
6300 Ridglea Place, Suite 700  
Fort Worth, Texas 76116

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- 230713 HVAC Duct Insulation
- 233113.19 Ductwork Accessories
- 233113 Metal Ductwork
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SEAL



The specification sections listed below were prepared by or under the direct supervision of the Electrical Engineer:

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- 260511 Work in Existing Building
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**PROCUREMENT SUBSTITUTION PROCEDURES**

1.1 DEFINITIONS

- A. Procurement Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Procurement and Contracting Documents, submitted prior to receipt of bids.
- B. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award. See Section 012500 "Substitution Procedures" for conditions under which Substitution requests will be considered following Contract award.

1.2 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.3 PROCUREMENT SUBSTITUTIONS

- A. Procurement Substitutions, General: By submitting a bid, the Bidder represents that its bid is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Bidders are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.
- B. Procurement Substitution Requests will be received and considered by Owner when the following conditions are satisfied, as determined by Architect; otherwise requests will be returned without action:
  - 1. Extensive revisions to the Contract Documents are not required.
  - 2. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.
  - 3. The request is fully documented and properly submitted.

1.4 SUBMITTALS

- A. Procurement Substitution Request: Submit to Architect. Procurement Substitution Request must be made in writing by prime contract Bidder only in compliance with the following requirements:
  - 1. Requests for substitution of materials and equipment will be considered if received no later than 10 days prior to date of bid opening.
  - 2. Submittal Format: Submit three copies of each written Procurement Substitution Request, using form bound in Project Manual.
- B. Architect's Action:
  - 1. Architect may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. Architect will notify all bidders of acceptance of the proposed substitute by means of an Addendum to the Procurement and Contracting Documents.
- C. Architect's approval of a substitute during bidding does not relieve Contractor of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

**END OF DOCUMENT**

**PROCUREMENT SUBSTITUTION REQUEST FORM**

PROJECT: \_\_\_\_\_ **(Before Contract Award)**  
TO: \_\_\_\_\_  
NO. \_\_\_\_\_ DATE: \_\_\_\_\_

Contractor hereby requests acceptance of the following product or system as a substitution in accordance with provisions of Division 01 Section "Substitution Procedures:"

**1. SPECIFIED PRODUCT OR SYSTEM**

Substitution request for: \_\_\_\_\_  
Specification Section No.: \_\_\_\_\_ Article/ Paragraph: \_\_\_\_\_

**2. REASON FOR SUBSTITUTION REQUEST**

SPECIFIED PRODUCT . . .	PROPOSED PRODUCT . . .
<input type="checkbox"/> Is no longer available.	<input type="checkbox"/> Will reduce construction time
<input type="checkbox"/> Is unable to meet project schedule.	<input type="checkbox"/> Will result in cost savings of \$ _____ to Project
<input type="checkbox"/> Is unsuitable for the designated application.	<input type="checkbox"/> Is for supplier's convenience
<input type="checkbox"/> Cannot interface with adjacent materials.	<input type="checkbox"/> Is for subcontractor's convenience
<input type="checkbox"/> Is not compatible with adjacent materials.	<input type="checkbox"/> Other: _____
<input type="checkbox"/> Cannot provide the specified warranty.	
<input type="checkbox"/> Cannot be constructed as indicated	
<input type="checkbox"/> Cannot be obtained due to one or more of the following:	
<input type="checkbox"/> Strike	<input type="checkbox"/> Bankruptcy of manufacturer or supplier
<input type="checkbox"/> Lockout	<input type="checkbox"/> Similar occurrence (explain below)

**3. SUPPORTING DATA**

Drawings, specifications, product data, performance data, test data, and any other necessary information to facilitate review of the Substitution Request are attached.

Sample is attached.  Sample will be sent if requested.

**4. QUALITY COMPARISON:** Provide all necessary side-by-side comparative data as required to facilitate review of Substitution Request:

	SPECIFIED PRODUCT	PROPOSED PRODUCT
Manufacturer:	_____	_____
Name / Brand:	_____	_____
Catalog No.:	_____	_____
Vendor:	_____	_____
Variations:	_____	_____

(Add Additional Sheets If Necessary)

Local Distributor or Supplier: \_\_\_\_\_  
Maintenance Service Available:  Yes  No  
Spare Parts Source: \_\_\_\_\_  
Warranty:  Yes  No \_\_\_\_\_ Years

**5. PREVIOUS INSTALLATIONS**

Identification of at least three similar projects on which proposed substitution was used:

PROJECT #1: \_\_\_\_\_  
Address: \_\_\_\_\_  
Architect: \_\_\_\_\_  
Owner: \_\_\_\_\_  
Contractor: \_\_\_\_\_  
Date Installed: \_\_\_\_\_

PROJECT #2: \_\_\_\_\_  
Address: \_\_\_\_\_  
Architect: \_\_\_\_\_  
Owner: \_\_\_\_\_  
Contractor: \_\_\_\_\_  
Date Installed: \_\_\_\_\_

PROJECT #3: \_\_\_\_\_  
Address: \_\_\_\_\_  
Architect: \_\_\_\_\_  
Owner: \_\_\_\_\_  
Contractor: \_\_\_\_\_  
Date Installed: \_\_\_\_\_

**6. EFFECT OF SUBSTITUTION**

Proposed substitution affects other work or trades:     No     Yes (if Yes, explain)  
\_\_\_\_\_  
\_\_\_\_\_

Proposed substitution requires dimensional revisions or redesign of architectural, structural, M-E-P, life safety, or other work:     No                     Yes (if Yes, attach data explaining revisions)

**7. STATEMENT OF CONFORMANCE OF REQUEST TO CONTRACT REQUIREMENTS**

Contractor and Subcontractor have investigated the proposed substitution and hereby represent that:

- A. They have personally investigated the proposed substitution and believe that it is equal to or superior in all respects to specified product, except as stated above;
- B. The proposed substitution is in compliance with applicable codes and ordinances;
- C. The proposed substitution will provide same warranty as specified for specified product;
- D. They will coordinate the incorporation of the proposed substitution into the Work, and will include modifications to the Work as required to fully integrate the substitution;
- E. They have included complete cost data and implications of the substitution (attached);
- F. They will pay any redesign fees incurred by the Architect or any of the Architect's consultants, and any special inspection costs incurred by the Owner, caused by the use of this product;
- G. They waive all future claims for added cost or time to the Contract related to the substitution, or that become known after substitution is accepted.
- H. The Architect's approval, if granted, will be based upon reliance upon data submitted and the opinion, knowledge, information, and belief of the Architect at the time decision is rendered and Addendum is issued; and that Architect's approval therefore is interim in nature and subject to reevaluation and reconsideration as additional data, materials, workmanship, and coordination with other work are observed and reviewed.

Contractor: \_\_\_\_\_  
*(Name of Contractor)*

Date: \_\_\_\_\_ By: \_\_\_\_\_

Subcontractor: \_\_\_\_\_

(Name of Subcontractor)

Date: \_\_\_\_\_ By: \_\_\_\_\_

**Note: Unresponsive or incomplete requests will be rejected and returned without review.**

**8. ARCHITECT'S REVIEW AND ACTION**

Substitution is accepted.

Substitution is accepted, with the following comments: \_\_\_\_\_

Resubmit Substitution Request:

Provide more information in the following areas: \_\_\_\_\_

- Provide proposal indicating amount of savings / credit to Owner
- Bidding Contractor shall sign Bidder's Statement of Conformance
- Bidding Subcontractor shall sign Bidder's Statement of Conformance

Substitution is not accepted:

- Substitution Request received too late.
- Substitution Request received directly from subcontractor or supplier.
- Substitution Request not submitted in accordance with requirements.
- Substitution Request Form is not properly executed.
- Substitution Request does not indicate what item is being proposed.
- Insufficient information submitted to facilitate proper evaluation.
- Proposed product does not appear to comply with specified requirements.
- Proposed product will require substantial revisions to Contract Documents.

By: \_\_\_\_\_ Date: \_\_\_\_\_

Architect has relied upon the information provided by the Contractor, and makes no claim as to the accuracy, completeness, or validity of such information. If an accepted substitution is later found to be not in compliance with the Contract Documents, Contractor shall provide the specified product.

**END OF FORM**

## SECTION 011000

### SUMMARY

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Project information.
  - 2. Work covered by Contract Documents.
  - 3. Work performed by Owner.
  - 4. Owner-furnished/Contractor-installed (OFICI) products.
  - 5. Owner-furnished/Owner-installed (OFOI) products.
  - 6. Contractor's use of site and premises.
  - 7. Coordination with occupants.
  - 8. Work restrictions.
  - 9. Specification and Drawing conventions.

##### 1.2 PROJECT INFORMATION

- A. Project Identification: Medical Home Southeast Tarrant – Radiology Room; Comm. No. 1241.
  - 1. Project Location: 1050 West Arkansas Lane; Arlington, Texas 76013.
- B. Owner: JPS Health Network.
- C. Architect: Primera Design Associates, LLC; 2102 Roosevelt Drive, Suite A; Dalworthington Gardens, Texas 76013.
- D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:
  - 1. Refer to Title Page.
- E. Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.
  - 1. See Section 013100 "Project Management and Coordination." for requirements for using web-based Project software.

##### 1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
  - 1. Renovation of existing space for radiology room and other Work indicated in the Contract Documents.
- B. Type of Contract:
  - 1. Project will be constructed under a single prime contract.

##### 1.4 WORK PERFORMED BY OWNER

- A. Cooperate fully with Owner, so work may be carried out smoothly, without interfering with or delaying Work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

##### 1.5 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFICI) PRODUCTS

- A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:
  - 1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
  - 2. Provide for delivery of Owner-furnished products to Project site.
  - 3. Upon delivery, inspect, with Contractor present, delivered items.
    - a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.
  - 4. Obtain manufacturer's inspections, service, and warranties.
  - 5. Inform Contractor of earliest available delivery date for Owner-furnished products.

- B. Contractor's Responsibilities: The Work includes the following, as applicable:
    - 1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
    - 2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
    - 3. Receive, unload, handle, store, protect, and install Owner-furnished products.
    - 4. Make building services connections for Owner-furnished products.
    - 5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
    - 6. Repair or replace Owner-furnished products damaged following receipt.
  - C. Owner-Furnished/Contractor-Installed (OFICI) Products:
    - 1. As scheduled.
- 1.6 OWNER-FURNISHED/OWNER-INSTALLED (OFOI) PRODUCTS
- A. The Owner will furnish and install products indicated.
  - B. Owner-Furnished/Owner-Installed (OFOI) Products:
    - 1. As scheduled.
- 1.7 CONTRACTOR'S USE OF SITE AND PREMISES
- A. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
  - B. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
    - 1. Driveways, Walkways and Entrances: Keep driveways parking garage, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
      - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
      - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
  - C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.
- 1.8 COORDINATION WITH OCCUPANTS
- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
    - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
    - 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- 1.9 WORK RESTRICTIONS
- A. Comply with restrictions on construction operations.
    - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
  - B. On-Site Work Hours: Limit work to between 7:00 a.m. to 6:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
    - 1. Weekend Hours: Coordinate with Owner.
    - 2. Early Morning Hours: Coordinate with Owner.
    - 3. Work in Existing Building: Coordinate with Owner.
    - 4. Hours for Utility Shutdowns: Coordinate with Owner.
    - 5. Hours for Noisy Activities: Coordinate with Owner.

- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
    - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
    - 2. Obtain Owner's written permission before proceeding with utility interruptions.
  - D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
    - 1. Notify Owner not less than two days in advance of proposed disruptive operations.
    - 2. Obtain Owner's written permission before proceeding with disruptive operations.
  - E. Wind-Borne Dust Control
    - 1. Submit narrative that describes measures proposed for the control of wind-borne dust and debris during construction operations, including during periods of work activity and during non-working hours. Comply with the following:
      - a. Federal regulations including those of the Environmental Protection Agency.
      - b. City and county codes and regulations.
      - c. Utilize water trucks on site available throughout the day during site grading and excavation to keep soil damp enough to prevent PM10 levels raised by activities associated with project construction.
      - d. Wet down areas to be graded or that are being graded or excavated during late morning and after work is completed for the day.
  - F. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes.
  - G. Smoking and Controlled Substance Restrictions: Use of tobacco products , alcoholic beverages, and other controlled substances on Project site and on Owner's property is not permitted.
  - H. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
    - 1. Comply with Owner's CRMA safety policies for orientation and badging.
- 1.10 SPECIFICATION AND DRAWING CONVENTIONS
- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
    - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
    - 2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
    - 3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
    - 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
  - B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
  - C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.



- D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.
  3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 012100

### ALLOWANCES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
- B. Types of allowances include the following:
  - 1. Lump-sum allowances.

##### 1.2 DEFINITIONS

- A. Allowance: A quantity of work or dollar amount included in the Contract, established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

##### 1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

##### 1.4 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

##### 1.5 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

##### 1.6 LUMP-SUM ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
  - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

##### 1.7 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, required maintenance materials, and similar margins.
  - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
  - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.

3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
  4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs due to a change in the scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
  2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Include the sum of \$25,000.00 for the radiology room.

**END OF SECTION**

## SECTION 012500

### SUBSTITUTION PROCEDURES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.

##### 1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
  - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

##### 1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation in PDF electronic format identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use form provided in Project Manual.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
    - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - e. Samples, where applicable or requested.
    - f. Certificates and qualification data, where applicable or requested.
    - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
    - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
    - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
    - j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
    - k. Cost information, including a proposal of change, if any, in the Contract Sum.
    - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
    - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
  - 3. Any substitution request made that is not on required form, is not completely filled in, or does not provide required backup documentation will be rejected without review.

4. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven business days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 business days of receipt of request, or seven business days of receipt of additional information or documentation, whichever is later.
  - a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

#### 1.4 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

#### 1.5 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

#### 1.6 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
  1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - b. Substitution request is fully documented and properly submitted.
    - c. Requested substitution will not adversely affect Contractor's construction schedule.
    - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - e. Requested substitution is compatible with other portions of the Work.
    - f. Requested substitution has been coordinated with other portions of the Work.
    - g. Requested substitution provides specified warranty.
    - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.
  1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    - b. Requested substitution does not require extensive revisions to the Contract Documents.
    - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - d. Substitution request is fully documented and properly submitted.
    - e. Requested substitution will not adversely affect Contractor's construction schedule.
    - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - g. Requested substitution is compatible with other portions of the Work.
    - h. Requested substitution has been coordinated with other portions of the Work.
    - i. Requested substitution provides specified warranty.
    - j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

**SUBSTITUTION REQUEST FORM**

PROJECT: \_\_\_\_\_ **(After Contract Award)**  
TO: \_\_\_\_\_  
NO. \_\_\_\_\_ DATE: \_\_\_\_\_

Contractor hereby requests acceptance of the following product or system as a substitution in accordance with provisions of Division 01 Section "Substitution Procedures:"

**1. SPECIFIED PRODUCT OR SYSTEM**

Substitution request for: \_\_\_\_\_

Specification Section No.: \_\_\_\_\_ Article/ Paragraph: \_\_\_\_\_

**2. REASON FOR SUBSTITUTION REQUEST**

SPECIFIED PRODUCT . . .

PROPOSED PRODUCT . . .

- |  |  |
|--|--|
| <input type="checkbox"/> Is no longer available.                                 | <input type="checkbox"/> Will reduce construction time                         |
| <input type="checkbox"/> Is unable to meet project schedule.                     | <input type="checkbox"/> Will result in cost savings of<br>\$ _____ to Project |
| <input type="checkbox"/> Is unsuitable for the designated application.           | <input type="checkbox"/> Is for supplier's convenience                         |
| <input type="checkbox"/> Cannot interface with adjacent materials.               | <input type="checkbox"/> Is for subcontractor's convenience                    |
| <input type="checkbox"/> Is not compatible with adjacent materials.              | <input type="checkbox"/> Other: _____  |
| <input type="checkbox"/> Cannot provide the specified warranty.                  |  |
| <input type="checkbox"/> Cannot be constructed as indicated                      |  |
| <input type="checkbox"/> Cannot be obtained due to one or more of the following: |  |
| <input type="checkbox"/> Strike  | <input type="checkbox"/> Bankruptcy of manufacturer or supplier                |
| <input type="checkbox"/> Lockout   | <input type="checkbox"/> Similar occurrence (explain below)                    |

**3. SUPPORTING DATA**

- Drawings, specifications, product data, performance data, test data, and any other necessary information to facilitate review of the Substitution Request are attached.
- Sample is attached.  Sample will be sent if requested.

**4. QUALITY COMPARISON:** Provide all necessary side-by-side comparative data as required to facilitate review of Substitution Request:

	SPECIFIED PRODUCT	PROPOSED PRODUCT
Manufacturer:	_____	_____
Name / Brand:	_____	_____
Catalog No.:	_____	_____
Vendor:	_____	_____
Variations:	_____	_____

(Add Additional Sheets If Necessary)

Local Distributor or Supplier: \_\_\_\_\_  
Maintenance Service Available:  Yes  No  
Spare Parts Source: \_\_\_\_\_  
Warranty:  Yes  No \_\_\_\_\_ Years

**5. PREVIOUS INSTALLATIONS**

Identification of at least three similar projects on which proposed substitution was used:

PROJECT #1: \_\_\_\_\_

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

Architect: \_\_\_\_\_

Owner: \_\_\_\_\_

Contractor: \_\_\_\_\_

Date Installed: \_\_\_\_\_

PROJECT #2: \_\_\_\_\_

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

Architect: \_\_\_\_\_

Owner: \_\_\_\_\_

Contractor: \_\_\_\_\_

Date Installed: \_\_\_\_\_

PROJECT #3: \_\_\_\_\_

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

Architect: \_\_\_\_\_

Owner: \_\_\_\_\_

Contractor: \_\_\_\_\_

Date Installed: \_\_\_\_\_

**6. EFFECT OF SUBSTITUTION**

Proposed substitution affects other work or trades:     No     Yes (if Yes, explain)

\_\_\_\_\_

Proposed substitution requires dimensional revisions or redesign of architectural, structural, M-E-P, life safety, or other work:

No                       Yes (if Yes, attach data explaining revisions)

**7. STATEMENT OF CONFORMANCE OF REQUEST TO CONTRACT REQUIREMENTS**

Contractor and Subcontractor have investigated the proposed substitution and hereby represent that:

- A. They have personally investigated the proposed substitution and believe that it is equal to or superior in all respects to specified product, except as stated above;
- B. The proposed substitution is in compliance with applicable codes and ordinances;
- C. The proposed substitution will provide same warranty as specified for specified product;
- D. They will coordinate the incorporation of the proposed substitution into the Work, and will include modifications to the Work as required to fully integrate the substitution;
- E. They have included complete cost data and implications of the substitution (attached);
- F. They will pay any redesign fees incurred by the Architect or any of the Architect's consultants, and any special inspection costs incurred by the Owner, caused by the use of this product;
- G. They waive all future claims for added cost or time to the Contract related to the substitution, or that become known after substitution is accepted.
- H. The Architect's approval, if granted, will be based upon reliance upon data submitted and the opinion, knowledge, information, and belief of the Architect at the time decision is rendered and Addendum is issued; and that Architect's approval therefore is interim in nature and subject to reevaluation and reconsideration as additional data, materials, workmanship, and coordination with other work are observed and reviewed.



Contractor: \_\_\_\_\_  
(Name of Contractor)

Date: \_\_\_\_\_ By: \_\_\_\_\_

Subcontractor: \_\_\_\_\_  
(Name of Subcontractor)

Date: \_\_\_\_\_ By: \_\_\_\_\_

**Note: Unresponsive or incomplete requests will be rejected and returned without review.**

**8. ARCHITECT'S REVIEW AND ACTION**

- Substitution is accepted.
- Substitution is accepted, with the following comments: \_\_\_\_\_  
\_\_\_\_\_

- Resubmit Substitution Request:
  - Provide more information in the following areas: \_\_\_\_\_  
\_\_\_\_\_

- Provide proposal indicating amount of savings / credit to Owner
- Bidding Contractor shall sign Bidder's Statement of Conformance
- Bidding Subcontractor shall sign Bidder's Statement of Conformance

- Substitution is not accepted:
  - Substitution Request received too late.
  - Substitution Request received directly from subcontractor or supplier.
  - Substitution Request not submitted in accordance with requirements.
  - Substitution Request Form is not properly executed.
  - Substitution Request does not indicate what item is being proposed.
  - Insufficient information submitted to facilitate proper evaluation.
  - Proposed product does not appear to comply with specified requirements.
  - Proposed product will require substantial revisions to Contract Documents.

By: \_\_\_\_\_ Date: \_\_\_\_\_

Architect has relied upon the information provided by the Contractor, and makes no claim as to the accuracy, completeness, or validity of such information. If an accepted substitution is later found to be not in compliance with the Contract Documents, Contractor shall provide the specified product.

**9. OWNER'S REVIEW AND ACTION**

- Substitution is accepted.
- Substitution is accepted with the following comments: \_\_\_\_\_
- Substitution is not accepted.

By: \_\_\_\_\_ Date: \_\_\_\_\_  
(Owner/Owner's Representative)

**END OF FORM**

## SECTION 012600

### CONTRACT MODIFICATION PROCEDURES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

##### 1.2 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

##### 1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
  - 2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include costs of labor and supervision directly attributable to the change.
    - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    - e. Quotation Form: Use forms acceptable to Architect.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
  - 1. Within 7 days after submittal of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
  - 2. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
  - 3. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  - 4. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  - 5. Include costs of labor and supervision directly attributable to the change.
  - 6. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
  - 7. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
  - 8. Proposal Request Form: Use form acceptable to Architect.
- C. Do not proceed with changes until receipt of written approval by Architect and Owner.

1.4 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on.

1.5 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
  - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 012900

### PAYMENT PROCEDURES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

##### 1.2 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

##### 1.3 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
  - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
  - 2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
  - 1. Identification: Include the following Project identification on the schedule of values:
    - a. Project name and location.
    - b. Owner's name.
    - c. Owner's Project number.
    - d. Name of Architect.
    - e. Architect's Project number.
    - f. Contractor's name and address.
    - g. Date of submittal.
  - 2. Arrange schedule of values consistent with format of AIA Document G703.
  - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
  - 4. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
    - a. Differentiate between items stored on-site and items stored off-site.
  - 5. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
  - 6. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
  - 7. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
  - 8. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

##### 1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
  - 1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
  - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
  - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
  - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
  - 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
  - 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
  - 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
  - 3. Provide summary documentation for stored materials indicating the following:
    - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Transmittal: Submit three signed and notarized PDF copies of each Application for Payment to Architect by email. Include waivers of lien and similar attachments if required in a separate PDF.
  - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
  - 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  - 2. When an application shows completion of an item, submit conditional final or full waivers.
  - 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  - 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  - 5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
  - 1. List of subcontractors.
  - 2. Schedule of values.
  - 3. Contractor's construction schedule (preliminary if not final).
  - 4. Products list (preliminary if not final).
  - 5. Submittal schedule (preliminary if not final).
  - 6. List of Contractor's staff assignments.
  - 7. List of Contractor's principal consultants.
  - 8. Copies of building permits.
  - 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  - 10. Initial progress report.
  - 11. Report of preconstruction conference.
  - 12. Certificates of insurance and insurance policies.
  - 13. Data needed to acquire Owner's insurance.

- I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
  - 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
    - a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 "Closeout Procedures."
  - 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Retainage: In accordance with Owner-Contractor agreement.
- K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
  - 1. Evidence of completion of Project closeout requirements.
  - 2. Certification of completion of final punch list items.
  - 3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  - 4. Updated final statement, accounting for final changes to the Contract Sum.
  - 5. AIA Document G706.
  - 6. AIA Document G706A.
  - 7. Evidence that claims have been settled.
  - 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
  - 9. Final liquidated damages settlement statement.
  - 10. Proof that taxes, fees, and similar obligations are paid.
  - 11. Waivers and releases.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 013100

### PROJECT MANAGEMENT AND COORDINATION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
  - 1. Coordination drawings.
  - 2. RFIs.
  - 3. Digital project management procedures.
  - 4. Web-based Project management software package.
  - 5. Project meetings.

##### 1.2 DEFINITIONS

- A. BIM: Building Information Modeling.
- B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

##### 1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
  - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
  - 2. Number and title of related Specification Section(s) covered by subcontract.
  - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: 15 days prior to starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
  - 1. Post copies of list in Project meeting room, in temporary field office, in web-based Project software directory, and in prominent location in built facility. Keep list current at all times.

##### 1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's construction schedule.
  - 2. Preparation of the schedule of values.
  - 3. Installation and removal of temporary facilities and controls.
  - 4. Delivery and processing of submittals.
  - 5. Progress meetings.
  - 6. Preinstallation conferences.
  - 7. Project closeout activities.

8. Startup and adjustment of systems.

1.5 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
    - b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    - d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
    - e. Indicate required installation sequences.
    - f. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Process: Prepare coordination drawings in the following manner:
1. Schedule submittal and review of Fire Sprinkler, Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
  2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan files denoting approved ductwork. HVAC Installer will locate ductwork and piping on a single layer, using orange color. Forward drawings to Plumbing Installer.
  3. Plumbing Installer will locate plumbing and equipment on a single layer, using blue color.
  4. Fire Sprinkler Installer will locate piping and equipment, using red color. Fire Sprinkler Installer shall forward drawing files to Electrical Installer.
  5. Electrical Installer will indicate service and feeder conduit runs and equipment in green color. Electrical Installer shall forward drawing files to Communications and Electronic Safety and Security Installer.
  6. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment in purple color. Communications and Electronic Safety and Security Installer shall forward completed drawing files to Contractor.
  7. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with Architect to review and resolve conflicts on the coordination drawings.
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format:
    - a. Same digital data software program, version, and operating system as original Drawings.
  2. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format.
  3. BIM File Incorporation: Develop and incorporate coordination drawing files into BIM established for Project.
    - a. Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.
  4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
    - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
    - b. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.



1.6 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
  - 1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
  - 2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
  - 1. Project name.
  - 2. Owner name.
  - 3. Owner's Project number.
  - 4. Name of Architect.
  - 5. Architect's Project number.
  - 6. Date.
  - 7. Name of Contractor.
  - 8. RFI number, numbered sequentially.
  - 9. RFI subject.
  - 10. Specification Section number and title and related paragraphs, as appropriate.
  - 11. Drawing number and detail references, as appropriate.
  - 12. Field dimensions and conditions, as appropriate.
  - 13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  - 14. Contractor's signature.
  - 15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
  - 1. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
  - 1. The following Contractor-generated RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for approval of Contractor's means and methods.
    - d. Requests for coordination information already indicated in the Contract Documents.
    - e. Requests for adjustments in the Contract Time or the Contract Sum.
    - f. Requests for interpretation of Architect's actions on submittals.
    - g. Incomplete RFIs or inaccurately prepared RFIs.
  - 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
  - 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:
  - 1. Project name.
  - 2. Name and address of Contractor.
  - 3. Name and address of Architect.
  - 4. RFI number, including RFIs that were returned without action or withdrawn.
  - 5. RFI description.

6. Date the RFI was submitted.
  7. Date Architect's response was received.
  8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within three days if Contractor disagrees with response.
- 1.7 DIGITAL PROJECT MANAGEMENT PROCEDURES
- A. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect for Contractor's use during construction.
1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
  2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
  3. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
    - a. Subcontractors and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.
  4. The following digital data files will be furnished for each appropriate discipline:
    - a. Architectural floor plans.
    - b. Reflected ceiling plans.
    - c. Structural foundation and framing.
    - d. No plumbing, mechanical, electrical, HVAC, or food service.
- B. Web-Based Project Management Software Package: Provide, administer, and use web-based Project management software package for purposes of hosting and managing Project communication and documentation until Final Completion.
- C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  2. Name file with submittal number or other unique identifier, including revision identifier.
  3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.
- 1.8 PROJECT MEETINGS
- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Responsibilities and personnel assignments.
    - b. Tentative construction schedule.
    - c. Critical work sequencing and long lead items.
    - d. Designation of key personnel and their duties.
    - e. Lines of communications.
    - f. Use of web-based Project software.
    - g. Procedures for processing field decisions and Change Orders.
    - h. Procedures for RFIs.

- i. Procedures for testing and inspecting.
  - j. Procedures for processing Applications for Payment.
  - k. Distribution of the Contract Documents.
  - l. Submittal procedures.
  - m. Preparation of Record Documents.
  - n. Use of the premises.
  - o. Work restrictions.
  - p. Working hours.
  - q. Owner's occupancy requirements.
  - r. Responsibility for temporary facilities and controls.
  - s. Procedures for moisture and mold control.
  - t. Procedures for disruptions and shutdowns.
  - u. Construction waste management and recycling.
  - v. Parking availability.
  - w. Office, work, and storage areas.
  - x. Equipment deliveries and priorities.
  - y. First aid.
  - z. Security.
  - aa. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
  - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. Contract Documents.
    - b. Options.
    - c. Related RFIs.
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Review of mockups.
    - i. Possible conflicts.
    - j. Compatibility requirements.
    - k. Time schedules.
    - l. Weather limitations.
    - m. Manufacturer's written instructions.
    - n. Warranty requirements.
    - o. Compatibility of materials.
    - p. Acceptability of substrates.
    - q. Temporary facilities and controls.
    - r. Space and access limitations.
    - s. Regulations of authorities having jurisdiction.
    - t. Testing and inspecting requirements.
    - u. Installation procedures.
    - v. Coordination with other work.
    - w. Required performance results.
    - x. Protection of adjacent work.
    - y. Protection of construction and personnel.
  - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
  - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
  2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    - a. Preparation of Record Documents.
    - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    - c. Procedures for completing and archiving web-based Project software site data files.
    - d. Submittal of written warranties.
    - e. Requirements for preparing operations and maintenance data.
    - f. Requirements for delivery of material samples, attic stock, and spare parts.
    - g. Requirements for demonstration and training.
    - h. Preparation of Contractor's punch list.
    - i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    - j. Submittal procedures.
    - k. Owner's partial occupancy requirements.
    - l. Installation of Owner's furniture, fixtures, and equipment.
    - m. Responsibility for removing temporary facilities and controls.
  4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at weekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
  2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Status of submittals.
      - 2) Deliveries.
      - 3) Off-site fabrication.
      - 4) Access.
      - 5) Site use.
      - 6) Temporary facilities and controls.
      - 7) Progress cleaning.
      - 8) Quality and work standards.
      - 9) Status of correction of deficient items.
      - 10) Field observations.
      - 11) Status of RFIs.
      - 12) Status of Proposal Requests.
      - 13) Pending changes.
      - 14) Status of Change Orders.
      - 15) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
  - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 013200

### CONSTRUCTION PROGRESS DOCUMENTATION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Contractor's Construction Schedule.
  - 2. Daily construction reports.
  - 3. Material location reports.
  - 4. Site condition reports.
  - 5. Unusual event reports.

##### 1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
  - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
  - 2. Predecessor Activity: An activity that precedes another activity in the network.
  - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine the critical path of Project and when activities can be performed.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
  - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
  - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
  - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

##### 1.3 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
  - 1. Working electronic copy of schedule file.
  - 2. PDF file.
- B. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

- D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
  - 1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
  - 2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
  - 3. Total Float Report: List of activities sorted in ascending order of total float.
  - 4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.
- E. Construction Schedule Updating Reports: Submit with Applications for Payment.
- F. Daily Construction Reports: Submit at weekly intervals.
- G. Weekly Reports: Submit brief description of work achieved that week with four photos. Note weather Conditions.
- H. Material Location Reports: Submit location report of materials stored off-site at monthly intervals.
- I. Site Condition Reports: Submit at time of discovery of differing conditions.
- J. Unusual Event Reports: Submit at time of unusual event.
- K. Qualification Data: For scheduling consultant.

#### 1.4 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:
  - 1. Review software limitations and content and format for reports.
  - 2. Verify availability of qualified personnel needed to develop and update schedule.
  - 3. Discuss constraints, including work stages.
  - 4. Review delivery dates for Owner-furnished products.
  - 5. Review schedule for work of Owner's separate contracts.
  - 6. Review submittal requirements and procedures.
  - 7. Review time required for review of submittals and resubmittals.
  - 8. Review requirements for tests and inspections by independent testing and inspecting agencies.
  - 9. Review time required for Project closeout and Owner startup procedures.
  - 10. Review and finalize list of construction activities to be included in schedule.
  - 11. Review procedures for updating schedule.

#### 1.5 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
  - 1. Secure time commitments for performing critical elements of the Work from entities involved.
  - 2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

#### 1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
- B. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion.
  - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

- C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
  2. Temporary Facilities: Indicate start and completion dates for the following as applicable:
    - a. Securing of approvals and permits required for performance of the Work.
    - b. Temporary facilities.
    - c. Construction of mock-ups, prototypes and samples.
    - d. Owner interfaces and furnishing of items.
    - e. Interfaces with Separate Contracts.
    - f. Regulatory agency approvals.
    - g. Punch list.
  3. Procurement Activities: Include procurement process activities for the following long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
  4. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
  5. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
  6. Commissioning Time: Include no fewer than 15 days for commissioning.
  7. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
  8. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Work Restrictions: Show the effect of the following items on the schedule:
    - a. Coordination with existing construction.
    - b. Limitations of continued occupancies.
    - c. Uninterruptible services.
    - d. Use-of-premises restrictions.
    - e. Seasonal variations.
    - f. Environmental control.
  2. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    - a. Subcontract awards.
    - b. Submittals.
    - c. Purchases.
    - d. Mockups.
    - e. Fabrication.
    - f. Sample testing.
    - g. Deliveries.
    - h. Installation.
    - i. Tests and inspections.
    - j. Adjusting.
    - k. Curing.
    - l. Startup and placement into final use and operation.
    - m. Commissioning.
  3. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
    - a. Structural completion.
    - b. Temporary enclosure and space conditioning.
    - c. Permanent space enclosure.



- d. Completion of mechanical installation.
    - e. Completion of electrical installation.
    - f. Substantial Completion.
  - E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
    - 1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.
  - F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
    - 1. Unresolved issues.
    - 2. Unanswered Requests for Information.
    - 3. Rejected or unreturned submittals.
    - 4. Notations on returned submittals.
    - 5. Pending modifications affecting the Work and the Contract Time.
  - G. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
    - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
    - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
    - 3. As the Work progresses, indicate Final Completion percentage for each activity.
  - H. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.
  - I. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
    - 1. Post copies in Project meeting rooms and temporary field offices.
    - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.
- 1.7 STARTUP CONSTRUCTION SCHEDULE
- A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for commencement of the Work.
  - B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- 1.8 GANTT-CHART SCHEDULE REQUIREMENTS
- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for commencement of the Work.
    - 1. Base schedule on the startup construction schedule and additional information received since the start of Project.
  - B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
    - 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

## 1.9 CPM SCHEDULE REQUIREMENTS

- A. Prepare network diagrams using AON (activity-on-node) format.
- B. Startup Network Diagram: Submit diagram within 14 days of date established for commencement of the Work. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's Construction Schedule using a time-scaled CPM network analysis diagram for the Work.
  - 1. Develop network diagram in sufficient time to submit CPM schedule, so it can be accepted for use no later than 60 days after date established for commencement of the Work.
    - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates.
  - 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
  - 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
  - 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
  - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
    - a. Preparation and processing of submittals.
    - b. Mobilization and demobilization.
    - c. Purchase of materials.
    - d. Delivery.
    - e. Fabrication.
    - f. Utility interruptions.
    - g. Installation.
    - h. Work by Owner that may affect or be affected by Contractor's activities.
    - i. Testing and inspection.
    - j. Commissioning.
    - k. Punch list and Final Completion.
    - l. Activities occurring following Final Completion.
  - 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
  - 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
  - 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
    - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
  - 5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
    - a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
    - b. Total cost assigned to activities shall equal the total Contract Sum.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
  - 1. Contractor or subcontractor and the Work or activity.
  - 2. Description of activity.
  - 3. Main events of activity.
  - 4. Immediate preceding and succeeding activities.

5. Early and late start dates.
  6. Early and late finish dates.
  7. Activity duration in workdays.
  8. Total float or slack time.
  9. Average size of workforce.
  10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
  2. Changes in early and late start dates.
  3. Changes in early and late finish dates.
  4. Changes in activity durations in workdays.
  5. Changes in the critical path.
  6. Changes in total float or slack time.
  7. Changes in the Contract Time.
- H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
  2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
  3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
  4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
    - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

#### 1.10 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
  2. List of separate contractors at Project site.
  3. Approximate count of personnel at Project site.
  4. Equipment at Project site.
  5. Material deliveries.
  6. High and low temperatures and general weather conditions, including presence of rain or snow.
  7. Testing and inspection.
  8. Accidents.
  9. Meetings and significant decisions.
  10. Unusual events.
  11. Stoppages, delays, shortages, and losses.
  12. Meter readings and similar recordings.
  13. Emergency procedures.
  14. Orders and requests of authorities having jurisdiction.
  15. Change Orders received and implemented.
  16. Construction Change Directives received and implemented.
  17. Services connected and disconnected.
  18. Equipment or system tests and startups.
  19. Partial completions and occupancies.
  20. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
  2. Material stored prior to previous report and since removed from storage and installed.
  3. Material stored following previous report and remaining in storage.

- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
  - 1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 013233

### PHOTOGRAPHIC DOCUMENTATION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
  1. Preconstruction photographs.
  2. Periodic construction photographs.
  3. Final Completion construction photographs.
  4. Preconstruction video recordings.
  5. Periodic construction video recordings.

##### 1.2 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within three days of taking photographs.
  1. Submit photos by uploading to web-based Project management software site. Include copy of key plan indicating each photograph's location and direction.
  2. Identification: Provide the following information with each image description in file metadata tag:
    - a. Name of Project.
    - b. Name and contact information for photographer.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Date photograph was taken.
    - f. Description of location, vantage point, and direction.
    - g. Unique sequential identifier keyed to accompanying key plan.
- C. Video Recordings: Submit video recordings within seven days of recording.
  1. Submit video recordings by uploading to web-based Project management software site. Include copy of key plan indicating each video's location and direction.
  2. Identification: With each submittal, provide the following information in file metadata tag:
    - a. Name of Project.
    - b. Name and address of photographer.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Date video recording was recorded.
    - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
- D. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.
- E. Construction Webcam Service Provider: A firm specializing in providing photographic equipment, web-based software, and related services for construction projects, with a record of providing satisfactory services similar to those required for Project.

##### 1.3 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels, and with vibration-reduction technology. Use flash in low light levels or backlit conditions.
- B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full high-definition mode with vibration-reduction technology. Provide supplemental lighting in low light levels or backlit conditions.
- C. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

- D. Metadata: Record accurate date and time and GPS location data from camera.
- E. File Names: Name media files with date and sequential numbering suffix.

#### 1.4 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs with maximum depth of field and in focus.
  - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
  - 1. Flag excavation areas before taking construction photographs.
  - 2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
  - 3. Take 20 photographs of existing buildings either on or adjoining property, to accurately record physical conditions at start of construction.
  - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Periodic Construction Photographs: Take 20 photographs monthly coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- E. Time-Lapse Sequence Construction Photographs: Take 20 photographs as indicated, to show status of construction and progress since last photographs were taken.
  - 1. Frequency: Take photographs monthly, on the same date each month.
  - 2. Vantage Points: Following suggestions by Architect and Contractor, photographer shall select vantage points. During each of the following construction phases, take not less than two of the required shots from same vantage point each time, to create a time-lapse sequence as follows:
    - a. Commencement of the Work, through completion of subgrade construction.
    - b. Above-grade structural framing.
    - c. Exterior building enclosure.
    - d. Interior Work, through date of Substantial Completion.
- F. Final Completion Construction Photographs: Take 20 photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

#### 1.5 CONSTRUCTION VIDEO RECORDINGS

- A. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.
  - 1. Confirm date and time at beginning and end of recording.
  - 2. Begin each video recording with name of Project, Contractor's name, videographer's name, and Project location.
- B. Preconstruction Video Recording: Before starting excavation, record video recording of Project site and surrounding properties from different vantage points, as directed by Architect.
  - 1. Flag excavation areas before recording construction video recordings.
  - 2. Show existing conditions adjacent to Project site before starting the Work.
  - 3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of excavation.
  - 4. Show protection efforts by Contractor.
- C. Periodic Construction Video Recordings: Record video recording monthly coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last video recordings were recorded. Minimum recording time shall be 30 minutes(s).

Medical Home Southeast Tarrant – Radiology Room  
Arlington, Texas  
Construction Documents

Primera Design Associates, LLC  
Comm. #1241  
20 December 2023

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 013300

### SUBMITTAL PROCEDURES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Submittal schedule requirements.
  - 2. Administrative and procedural requirements for submittals.

##### 1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

##### 1.3 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
  - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
  - 2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
  - 3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
    - a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
  - 4. Format: Arrange the following information in a tabular format:
    - a. Scheduled date for first submittal.
    - b. Specification Section number and title.
    - c. Submittal Category: Action; informational.
    - d. Name of subcontractor.
    - e. Description of the Work covered.
    - f. Scheduled date for Architect's final release or approval.
    - g. Scheduled dates for purchasing.
    - h. Scheduled date of fabrication.
    - i. Scheduled dates for installation.
    - j. Activity or event number.

##### 1.4 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
  - 1. Project name.
  - 2. Date.
  - 3. Name of Architect.
  - 4. Name of Contractor.
  - 5. Name of firm or entity that prepared submittal.
  - 6. Names of subcontractor, manufacturer, and supplier.



7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
  8. Category and type of submittal.
  9. Submittal purpose and description.
  10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
  11. Drawing number and detail references, as appropriate.
  12. Indication of full or partial submittal.
  13. Location(s) where product is to be installed, as appropriate.
  14. Other necessary identification.
  15. Remarks.
  16. Signature of transmitter.
- B. Options: Identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

#### 1.5 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
  4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 15 days for review of each resubmittal.
  4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
  3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

#### 1.6 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  - 1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
  - 2. Mark each copy of each submittal to show which products and options are applicable.
  - 3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Availability and delivery time information.
  - 4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams that show factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  - 5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.
  - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
  - 2. BIM Incorporation: Develop and incorporate Shop Drawing files into BIM established for Project.
- C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
  - 1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
  - 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
    - a. Project name and submittal number.
    - b. Generic description of Sample.
    - c. Product name and name of manufacturer.
    - d. Sample source.
    - e. Number and title of applicable Specification Section.
    - f. Specification paragraph number and generic name of each item.
  - 3. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
  - 4. Paper Transmittal: Include paper transmittal, including complete submittal information indicated.
  - 5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.

- b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
    - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
  7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
      - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  2. Manufacturer and product name, and model number if applicable.
  3. Number and name of room or space.
  4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
  1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
  2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
  3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
  4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
  5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
  6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - a. Name of evaluation organization.
  - b. Date of evaluation.
  - c. Time period when report is in effect.
  - d. Product and manufacturers' names.
  - e. Description of product.
  - f. Test procedures and results.
  - g. Limitations of use.

1.7 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
- C. BIM Incorporation: Incorporate delegated-design drawing and data files into BIM established for Project.
  1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as original Drawings.

1.8 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with indication in web-based Project management software. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
  1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ARCHITECT'S REVIEW

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.
  - 1. Submittals by Web-Based Project Management Software: Architect will indicate, on Project management software website, the appropriate action.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Architect will return without review submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 013516

### ALTERATION PROJECT PROCEDURES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes special procedures for alteration work.

##### 1.2 DEFINITIONS

- A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.
- B. Consolidate: To strengthen loose or deteriorated materials in place.
- C. Design Reference Sample: A sample that represents the Architect's prebid selection of work to be matched; it may be existing work or work specially produced for the Project.
- D. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.
- F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- G. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- H. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- I. Retain: To keep existing items that are not to be removed or dismantled.
- J. Strip: To remove existing finish down to base material unless otherwise indicated.

##### 1.3 COORDINATION

- A. Alteration Work Subschedule: A construction schedule coordinating the sequencing and scheduling of alteration work for entire Project, including each activity to be performed, and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for alteration work.
  - 1. Schedule construction operations in sequence required to obtain best Work results.
  - 2. Coordinate sequence of alteration work activities to accommodate the following:
    - a. Owner's continuing occupancy of portions of existing building.
    - b. Other known work in progress.
    - c. Tests and inspections.
  - 3. Detail sequence of alteration work, with start and end dates.
  - 4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
  - 5. Use of elevator and stairs.
  - 6. Equipment Data: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use in existing structure. Do not use such equipment without certification from Contractor's professional engineer that the structure can support the imposed loadings without damage.
- B. Pedestrian and Vehicular Circulation: Coordinate alteration work with circulation patterns within Project building(s) and site. Some work is near circulation patterns and adjacent to restricted areas. Circulation patterns cannot be closed off entirely and in places can be only temporarily redirected around small areas of work. Access to restricted areas may not be obstructed. Plan and execute the Work accordingly.

#### 1.4 PROJECT MEETINGS FOR ALTERATION WORK

- A. Preliminary Conference for Alteration Work: Before starting alteration work, conduct conference at Project site.
1. Attendees: In addition to representatives of Owner, Architect, and Contractor, testing service representative, specialists, and chemical-cleaner manufacturer(s) shall be represented at the meeting.
  2. Agenda: Discuss items of significance that could affect progress of alteration work, including review of the following:
    - a. Alteration Work Subschedule: Discuss and finalize; verify availability of materials, specialists' personnel, equipment, and facilities needed to make progress and avoid delays.
    - b. Fire-prevention plan.
    - c. Governing regulations.
    - d. Areas where existing construction is to remain and the required protection.
    - e. Hauling routes.
    - f. Sequence of alteration work operations.
    - g. Storage, protection, and accounting for salvaged and specially fabricated items.
    - h. Existing conditions, staging, and structural loading limitations of areas where materials are stored.
    - i. Qualifications of personnel assigned to alteration work and assigned duties.
    - j. Requirements for extent and quality of work, tolerances, and required clearances.
    - k. Embedded work such as flashings and lintels, special details, collection of waste, protection of occupants and the public, and condition of other construction that affects the Work or will affect the work.
  3. Reporting: Record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.
- B. Coordination Meetings: Conduct coordination meetings specifically for alteration work at weekly intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner, Architect, and Contractor, each specialist, supplier, installer, and other entity concerned with progress or involved in planning, coordination, or performance of alteration work activities shall be represented at these meetings. All participants at conference shall be familiar with Project and authorized to conclude matters relating to alteration work.
  2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of alteration work. Include topics for discussion as appropriate to status of Project.
    - a. Alteration Work Subschedule: Review progress since last coordination meeting. Determine whether each schedule item is on time, ahead of schedule, or behind schedule. Determine how construction behind schedule will be expedited with retention of quality; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities are completed within the Contract Time.
    - b. Schedule Updating: Revise Contractor's Alteration Work Subschedule after each coordination meeting where revisions to schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    - c. Review present and future needs of each entity present, including review items listed in the "Preliminary Conference for Alteration Work" Paragraph in this article and the following:
      - 1) Interface requirements of alteration work with other Project Work.
      - 2) Status of submittals for alteration work.
      - 3) Access to alteration work locations.
      - 4) Effectiveness of fire-prevention plan.
      - 5) Quality and work standards of alteration work.
      - 6) Change Orders for alteration work.
  3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Alteration Work Subschedule:
  - 1. Submit alteration work subschedule within seven days of date established for commencement of alteration work.
- B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements that are to remain, including finish surfaces, that might be misconstrued as damage caused by Contractor's alteration work operations.
- C. Alteration Work Program: Submit 30 days before work begins.
- D. Fire-Prevention Plan: Submit 30 days before work begins.

#### 1.6 QUALITY ASSURANCE

- A. Specialist Qualifications: An experienced firm regularly engaged in specialty work similar in nature, materials, design, and extent to alteration work as specified in each Section and that has completed a minimum of five recent projects with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work.
  - 1. Field Supervisor Qualifications: Full-time supervisors experienced in specialty work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on-site when specialty work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.
- B. Alteration Work Program: Prepare a written plan for alteration work for whole Project, including each phase or process and protection of surrounding materials during operations. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project alteration work program with specific requirements of programs required in other alteration work Sections.
  - 1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
  - 2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.
- C. Fire-Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-control devices during each phase or process. Coordinate plan with Owner's fire-protection equipment and requirements. Include fire-watch personnel's training, duties, and authority to enforce fire safety.
- D. Safety and Health Standard: Comply with ANSI/ASSE A10.6.

#### 1.7 STORAGE AND HANDLING OF SALVAGED MATERIALS

- A. Salvaged Materials:
  - 1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
  - 2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
  - 3. Store items in a secure area until delivery to Owner.
  - 4. Transport items to Owner's storage area on-site.
  - 5. Protect items from damage during transport and storage.
- B. Salvaged Materials for Reinstallation:
  - 1. Repair and clean items for reuse as indicated.
  - 2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
  - 3. Protect items from damage during transport and storage.
  - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.
- C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.



- D. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.
  - 1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
  - 2. Secure stored materials to protect from theft.
  - 3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F (3 deg C) or more above the dew point.
- E. Storage Space:
  - 1. Arrange for off-site locations for storage and protection of salvaged material that cannot be stored and protected on-site.

#### 1.8 FIELD CONDITIONS

- A. Survey of Existing Conditions: Record existing conditions that affect the Work by use of preconstruction photographs.
  - 1. Comply with requirements specified in Section 013233 "Photographic Documentation."
- B. Discrepancies: Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.
- C. Owner's Removals: Before beginning alteration work, verify in correspondence with Owner that the following items have been removed:
  - 1. .
- D. Size Limitations in Existing Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within existing spaces, areas, rooms, and openings, including temporary protection, by 12 inches (300 mm) or more.

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

### **PART 3 - EXECUTION**

#### 3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.
  - 1. Use only proven protection methods, appropriate to each area and surface being protected.
  - 2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
  - 3. Erect temporary barriers to form and maintain fire-egress routes.
  - 4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
  - 5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
  - 6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
  - 7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
  - 8. Provide supplemental sound-control treatment to isolate demolition work from other areas of the building.
- B. Temporary Protection of Materials to Remain:
  - 1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
  - 2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.
- C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

- D. Utility and Communications Services:
    - 1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
    - 2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
    - 3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.
  - E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.
    - 1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
    - 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.
  - F. Existing Roofing: Prior to the start of work in an area, install roofing protection.
- 3.2 PROTECTION FROM FIRE
- A. General: Follow fire-prevention plan and the following:
    - 1. Comply with NFPA 241 requirements unless otherwise indicated. Perform duties titled "Owner's Responsibility for Fire Protection."
    - 2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.
      - a. If combustible material cannot be removed, provide fire blankets to cover such materials.
  - B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:
    - 1. Obtain Owner's approval for operations involving use of open-flame or welding or other high-heat equipment. Notify Owner at least 72 hours before each occurrence, indicating location of such work.
    - 2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
    - 3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
    - 4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
    - 5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
    - 6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:
      - a. Train each fire watch in the proper operation of fire-control equipment and alarms.
      - b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
      - c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
      - d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
      - e. Maintain fire-watch personnel at Project site until two hours after conclusion of daily work.
  - C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.

- D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.
  - 1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.

### 3.3 PROTECTION DURING APPLICATION OF CHEMICALS

- A. Protect motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.
- B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in alteration work program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.
- C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.
- D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.
- E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

### 3.4 GENERAL ALTERATION WORK

- A. Have specialty work performed only by qualified specialists.
- B. Ensure that supervisory personnel are present when work begins and during its progress.
- C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs. Comply with requirements in Section 013233 "Photographic Documentation."
- D. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.
- E. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.
  - 1. Do not proceed with the work in question until directed by Architect.

**END OF SECTION**

## SECTION 014000

### QUALITY REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

##### 1.2 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
  - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.
  - 1. Mockups are used for one or more of the following:
    - a. Verify selections made under Sample submittals.
    - b. Demonstrate aesthetic effects.
    - c. Demonstrate the qualities of products and workmanship.
    - d. Demonstrate successful installation of interfaces between components and systems.
    - e. Perform preconstruction testing to determine system performance.
  - 2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
  - 3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
- E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).

- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."
- I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

### 1.3 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

### 1.4 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

### 1.5 ACTION SUBMITTALS

- A. Mockup Shop Drawings:
  - 1. Include plans, sections, elevations, and details, indicating materials and size of mockup construction.
  - 2. Indicate manufacturer and model number of individual components.
  - 3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

### 1.6 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
  - 1. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Entity responsible for performing tests and inspections.
  - 3. Description of test and inspection.

4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

- F. Reports: Prepare and submit certified written reports and documents as specified.
- G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

#### 1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of commencement of work, and not less than days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
  2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
  3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by Commissioning Authority.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

#### 1.8 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
  2. Project title and number.
  3. Name, address, telephone number, and email address of testing agency.
  4. Dates and locations of samples and tests or inspections.
  5. Names of individuals making tests and inspections.
  6. Description of the Work and test and inspection method.
  7. Identification of product and Specification Section.
  8. Complete test or inspection data.
  9. Test and inspection results and an interpretation of test results.
  10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.

11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  12. Name and signature of laboratory inspector.
  13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of technical representative making report.
  2. Statement on condition of substrates and their acceptability for installation of product.
  3. Statement that products at Project site comply with requirements.
  4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement of whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of factory-authorized service representative making report.
  2. Statement that equipment complies with requirements.
  3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  4. Statement of whether conditions, products, and installation will affect warranty.
  5. Other required items indicated in individual Specification Sections.

#### 1.9 QUALITY ASSURANCE

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.
1. Requirements of authorities having jurisdiction supersede requirements for specialists.
- G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

- I. **Factory-Authorized Service Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. **Preconstruction Testing:** Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following Contractor's responsibilities, including the following:
  - 1. Provide test specimens representative of proposed products and construction.
  - 2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
  - 3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
  - 4. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
  - 5. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.
  - 6. **Testing Agency Responsibilities:** Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
- K. **Mockups:** Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Build mockups of size indicated.
  - 2. Build mockups in location indicated or, if not indicated, as directed by Architect.
  - 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
  - 4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
  - 5. Demonstrate the proposed range of aesthetic effects and workmanship.
  - 6. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.
    - a. Allow seven days for initial review and each re-review of each mockup.
  - 7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
  - 8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - 10. Demolish and remove mockups when directed unless otherwise indicated.

#### 1.10 QUALITY CONTROL

- A. **Owner Responsibilities:** Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
  - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
  - 2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. **Contractor Responsibilities:** Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
  - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.



2. Engage a qualified testing agency to perform quality-control services.
    - a. Contractor will not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
  4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
  3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
  4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
  4. Facilities for storage and field curing of test samples.
  5. Delivery of samples to testing agencies.
  6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  7. Security and protection for samples and for testing and inspection equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.
1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.

2. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

#### 1.11 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
  1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures, and reviewing the completeness and adequacy of those procedures to perform the Work.
  2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
  4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
  5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
  6. Retesting and reinspecting corrected Work.

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

### **PART 3 - EXECUTION**

#### 3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
  1. Date test or inspection was conducted.
  2. Description of the Work tested or inspected.
  3. Date test or inspection results were transmitted to Architect.
  4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and authorities' having jurisdiction reference during normal working hours.
  1. Submit log at Project closeout as part of Project Record Documents.

#### 3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
  1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

**END OF SECTION**

## SECTION 014200

### REFERENCES

#### PART 1 - GENERAL

##### 1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

##### 1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
  - 1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
  - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

##### 1.3 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

#### PART 2 - PRODUCTS (NOT USED)

#### PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 015000

### TEMPORARY FACILITIES AND CONTROLS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

##### 1.2 USE CHARGES

- A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use with metering. Provide connections and extensions of services and metering as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use with metering. Provide connections and extensions of services and metering as required for construction operations.

##### 1.3 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
  - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
  - 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
  - 3. Indicate methods to be used to avoid trapping water in finished work.
- F. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
  - 1. Locations of dust-control partitions at each phase of work.
  - 2. HVAC system isolation schematic drawing.
  - 3. Location of proposed air-filtration system discharge.
  - 4. Waste-handling procedures.
  - 5. Other dust-control measures.
- G. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:
  - 1. Methods used to meet the goals and requirements of the Owner.
  - 2. Concrete cutting method(s) to be used.
  - 3. Location of construction devices on the site.

4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.
6. Indicate locations of sensitive equipment areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

#### 1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and Texas Accessibility Standards (TAS).

#### 1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

### **PART 2 - PRODUCTS**

#### 2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top rails.
- B. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.
- C. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

#### 2.2 TEMPORARY FACILITIES

- A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
  1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.
  2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack and marker boards.
  3. Drinking water and private toilet.
  4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
  5. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
  1. Store combustible materials apart from building.

### 2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
  - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  - 2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

## PART 3 - EXECUTION

### 3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
  - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

### 3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

### 3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
  - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
  - 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
  - 1. Install electric power service overhead unless otherwise indicated.
- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
  - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

- H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one land-based telephone line(s) for each field office.
  - 1. At each telephone, post a list of important telephone numbers.
    - a. Police and fire departments.
    - b. Ambulance service.
    - c. Contractor's home office.
    - d. Contractor's emergency after-hours telephone number.
    - e. Architect's office.
    - f. Engineers' offices.
    - g. Owner's office.
    - h. Principal subcontractors' field and home offices.
- I. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.
  - 1. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these three functions with wireless connectivity.
  - 2. Internet Service: Broadband modem, router, and ISP, equipped with hardware firewall, providing minimum 10.0 -Mbps upload and 15 -Mbps download speeds at each computer.

### 3.4 SUPPORT FACILITIES INSTALLATION

- A. Comply with the following:
  - 1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
  - 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
  - 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
  - 2. Prepare subgrade and install subbase and base for temporary roads and paved areas in accordance with Refer to Civil Engineer's documents.
  - 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
  - 1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
  - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Provide temporary offsite parking areas for construction personnel.
- E. Storage and Staging: Use designated areas of Project site for storage and staging needs.
- F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
  - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
  - 2. Remove snow and ice as required to minimize accumulations.
- G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
  - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
  - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
    - a. Provide temporary, directional signs for construction personnel and visitors.
  - 3. Maintain and touch up signs, so they are legible at all times.
- H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

- I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
  - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- J. Temporary Elevator Use: See Division 14 elevator Section for temporary use of new elevators.
- K. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- L. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

### 3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
  - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.
- E. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
  - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
- F. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock construction entrances at end of each workday shall be locked at all times with punch pad lock.
- G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- H. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.
- I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
  - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
  - 1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
  - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
  - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
  - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.



### 3.6 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
  - 1. Protect porous materials from water damage.
  - 2. Protect stored and installed material from flowing or standing water.
  - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
  - 4. Remove standing water from decks.
  - 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
  - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
  - 2. Keep interior spaces reasonably clean and protected from water damage.
  - 3. Periodically collect and remove waste containing cellulose or other organic matter.
  - 4. Discard or replace water-damaged material.
  - 5. Do not install material that is wet.
  - 6. Discard and replace stored or installed material that begins to grow mold.
  - 7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
  - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
  - 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
  - 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
    - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
    - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
    - c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

### 3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
  - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
  - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.

2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

**END OF SECTION**

## SECTION 016000

### PRODUCT REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; and special warranties.

##### 1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
  - 1. Evaluation of Substitution Requests: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating substitutions of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating substitutions.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a substitution request, if applicable.
- D. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."
- E. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

##### 1.3 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
  - 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
  - a. Name of product and manufacturer.
  - b. Model and serial number.
  - c. Capacity.
  - d. Speed.
  - e. Ratings.
3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

#### 1.4 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved substitutions.

#### 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
  1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
  3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
  4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.
- C. Storage:
  1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
  2. Store products to allow for inspection and measurement of quantity or counting of units.
  3. Store materials in a manner that will not endanger Project structure.
  4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
  5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
  6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
  7. Protect stored products from damage and liquids from freezing.
  8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

#### 1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
  1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
  2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
  1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
  3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

## **PART 2 - PRODUCTS**

### **2.1 PRODUCT SELECTION PROCEDURES**

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
  4. Where products are accompanied by the term "as selected," Architect will make selection.
  5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Substitutions for Contractor's convenience will be considered unless otherwise indicated.
    - a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."
  2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Substitutions for Contractor's convenience will be considered unless otherwise indicated.
    - a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."
  3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide products by the Basis-of-Design manufacturer or a Substitution Request for one of the products listed that complies with requirements. Substitutions for Contractor's convenience will be considered unless otherwise indicated.
    - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
    - b. Where a Basis-of-Design product is not specified, provide one of the listed products.
  4. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide products by the Basis-of-Design manufacturer or a Substitution Request for a product by one of the manufacturers listed that complies with requirements. Substitutions for Contractor's convenience will be considered unless otherwise indicated.
    - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
    - b. Where a Basis-of-Design manufacturer is not specified, provide products from one of the listed manufacturers.
  5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, provide the specified or indicated product. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named.
    - a. For approval of products other than "Basis-of-Design", comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 017300

### EXECUTION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Cutting and patching.
  - 5. Progress cleaning.
  - 6. Starting and adjusting.
  - 7. Protection of installed construction.
  - 8. Correction of the Work.

##### 1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

##### 1.3 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at Project site.
  - 1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
    - a. Contractor's superintendent.
    - b. Trade supervisor responsible for cutting operations.
    - c. Trade supervisor(s) responsible for patching of each type of substrate.
    - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.
  - 2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- B. Layout Conference: Conduct conference at Project site.
  - 1. Prior to establishing layout of new perimeter and structural column grid(s), review building location requirements. Review benchmark, control point, and layout and dimension requirements. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:
    - a. Contractor's superintendent.
    - b. Professional surveyor responsible for performing Project surveying and layout.
    - c. Professional surveyor responsible for performing site survey serving as basis for Project design.
  - 2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
  - 3. Review requirements for including layouts on Shop Drawings and other submittals.
  - 4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

##### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certified Surveys: Submit two copies signed by land surveyor.

- C. Certificates: Submit certificate signed by land surveyor, certifying that location and elevation of improvements comply with requirements.
- D. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
  - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
  - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
  - 3. Products: List products to be used for patching and firms or entities that will perform patching work.
  - 4. Dates: Indicate when cutting and patching will be performed.
- E. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

#### 1.6 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
  - 1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
  - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
  - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
  - 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

### **PART 2 - PRODUCTS**

#### 2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.



### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.
  - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
  - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
  - 1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
  - 2. List of detrimental conditions, including substrates.
  - 3. List of unacceptable installation tolerances.
  - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

#### **3.2 PREPARATION**

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 013100 "Project Management and Coordination."

#### **3.3 CONSTRUCTION LAYOUT**

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect promptly.
- B. Engage a land surveyor experienced in laying out the Work, using the following accepted surveying practices:
  - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - 2. Establish limits on use of Project site.
  - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

4. Inform installers of lines and levels to which they must comply.
  5. Check the location, level and plumb, of every major element as the Work progresses.
  6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
  7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

### 3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
  2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
  2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

### 3.5 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb, and make horizontal work level.
  2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
  4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces, unless otherwise indicated on Drawings.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

### 3.6 CUTTING AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of Work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - 6. Proceed with patching after construction operations requiring cutting are complete.

- F. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
  - 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  - 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- G. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### 3.7 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
  - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
    - a. Use containers intended for holding waste materials of type to be stored.
  - 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.
  - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Restore permanent facilities used during construction to their specified condition.
- D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

**END OF SECTION**

## SECTION 017700

### CLOSEOUT PROCEDURES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final completion procedures.
  - 3. Warranties.
  - 4. Final cleaning.

##### 1.2 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

##### 1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest-control inspection.

##### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

##### 1.6 CLOSEOUT PROCEDURES

- A. Prior to the Substantial Completion process, the Contractor shall prepare several designated rooms for the Architect's inspection. At each stage of completion, the Contractor shall notify the Architect ten (10) days prior to the date of each inspection.
- B. After the rooms are clean and finished to a state of Substantial Completion, the Contractor shall prepare a comprehensive list of items to be completed or corrected for these rooms.
- C. First Inspection: The Architect, upon receipt of the list, shall review the representative rooms. When, in the opinion of the Architect, the areas are Substantially Complete, the Architect will verify and amend the Contractor's list for the representative rooms.
- D. Second Inspection: When listed items have been completed or corrected, the Architect shall, upon request, inspect the representative rooms for a second time. If the Architect approves the level of completion in these rooms, the remaining Work or portion thereof shall be cleaned and finished to the standard established by the second inspection.

##### 1.7 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.

- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
  3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
    - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner's signature for receipt of submittals.
  5. Submit testing, adjusting, and balancing records.
  6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
  2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  3. Complete startup and testing of systems and equipment.
  4. Perform preventive maintenance on equipment used prior to Substantial Completion.
  5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
  6. Advise Owner of changeover in utility services.
  7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  9. Complete final cleaning requirements.
  10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  2. Results of completed inspection will form the basis of requirements for Final Completion.
- 1.8 FINAL COMPLETION PROCEDURES
- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
  2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  4. Submit pest-control final inspection report.
  5. Submit Final Completion photographic documentation.

- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
  - 1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.9 LIST OF INCOMPLETE ITEMS

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
  - 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, listed by room or space number.
  - 2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
  - 3. Include the following information at the top of each page:
    - a. Project name.
    - b. Date.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Page number.
  - 4. Submit list of incomplete items in the following format:
    - a. Web-Based Project Software Upload: Utilize software feature for creating and updating list of incomplete items (punch list).

#### 1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
  - 1. Submit by uploading to web-based project software site.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

### **PART 2 - PRODUCTS**

#### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

### **PART 3 - EXECUTION**

#### 3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.



- c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
  - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
  - e. Remove snow and ice to provide safe access to building.
  - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
  - g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
  - h. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
  - i. Vacuum and mop concrete.
  - j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
  - k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
  - l. Remove labels that are not permanent.
  - m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
  - q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
  - r. Clean strainers.
  - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste-disposal requirements in Section 015000 "Temporary Facilities and Controls."
- 3.2 REPAIR OF THE WORK
- A. Complete repair and restoration operations required by Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

**END OF SECTION**

## SECTION 017823

### OPERATION AND MAINTENANCE DATA

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory manuals.
  - 2. Emergency manuals.
  - 3. Systems and equipment operation manuals.
  - 4. Systems and equipment maintenance manuals.
  - 5. Product maintenance manuals.

##### 1.2 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

##### 1.3 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:
  - 1. Submit by uploading to web-based project software site. Enable reviewer comments on draft submittals.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
  - 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.
- E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

##### 1.4 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
  - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  - 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

#### 1.5 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  - 1. Title page.
  - 2. Table of contents.
  - 3. Manual contents.
- B. Title Page: Include the following information:
  - 1. Subject matter included in manual.
  - 2. Name and address of Project.
  - 3. Name and address of Owner.
  - 4. Date of submittal.
  - 5. Name and contact information for Contractor.
  - 6. Name and contact information for Architect.
  - 7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  - 8. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
  - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

#### 1.6 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
  - 1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
  - 2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
  - 3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

#### 1.7 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
  - 1. Type of emergency.
  - 2. Emergency instructions.
  - 3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
  - 1. Fire.
  - 2. Flood.
  - 3. Gas leak.
  - 4. Water leak.
  - 5. Power failure.
  - 6. Water outage.
  - 7. System, subsystem, or equipment failure.

8. Chemical release or spill.
  - D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
  - E. Emergency Procedures: Include the following, as applicable:
    1. Instructions on stopping.
    2. Shutdown instructions for each type of emergency.
    3. Operating instructions for conditions outside normal operating limits.
    4. Required sequences for electric or electronic systems.
    5. Special operating instructions and procedures.
- 1.8 SYSTEMS AND EQUIPMENT OPERATION MANUALS
- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
    1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
    2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
  - B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
    1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
    2. Performance and design criteria if Contractor has delegated design responsibility.
    3. Operating standards.
    4. Operating procedures.
    5. Operating logs.
    6. Wiring diagrams.
    7. Control diagrams.
    8. Piped system diagrams.
    9. Precautions against improper use.
    10. License requirements including inspection and renewal dates.
  - C. Descriptions: Include the following:
    1. Product name and model number. Use designations for products indicated on Contract Documents.
    2. Manufacturer's name.
    3. Equipment identification with serial number of each component.
    4. Equipment function.
    5. Operating characteristics.
    6. Limiting conditions.
    7. Performance curves.
    8. Engineering data and tests.
    9. Complete nomenclature and number of replacement parts.
  - D. Operating Procedures: Include the following, as applicable:
    1. Startup procedures.
    2. Equipment or system break-in procedures.
    3. Routine and normal operating instructions.
    4. Regulation and control procedures.
    5. Instructions on stopping.
    6. Normal shutdown instructions.
    7. Seasonal and weekend operating instructions.
    8. Required sequences for electric or electronic systems.
    9. Special operating instructions and procedures.
  - E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
  - F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

## 1.9 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
  - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.
- C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
  - 1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
    - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.
- E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  - 1. Test and inspection instructions.
  - 2. Troubleshooting guide.
  - 3. Precautions against improper maintenance.
  - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - 5. Aligning, adjusting, and checking instructions.
  - 6. Demonstration and training video recording, if available.
- F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

- J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
  - 1. Do not use original project record documents as part of maintenance manuals.

1.10 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern, and texture.
  - 4. Material and chemical composition.
  - 5. Reordering information for specially manufactured products.
- E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - 1. Inspection procedures.
  - 2. Types of cleaning agents to be used and methods of cleaning.
  - 3. List of cleaning agents and methods of cleaning detrimental to product.
  - 4. Schedule for routine cleaning and maintenance.
  - 5. Repair instructions.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 017839

### PROJECT RECORD DOCUMENTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings.
  - 2. Record specifications.
  - 3. Record Product Data.
  - 4. Miscellaneous record submittals.

##### 1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one set(s) of marked-up record prints.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
  - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

##### 1.3 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
  - 1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an acceptable drawing technique.
    - c. Record data as soon as possible after obtaining it.
    - d. Record and check the markup before enclosing concealed installations.
    - e. Cross-reference record prints to corresponding photographic documentation.
  - 2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or Construction Change Directive.
    - k. Changes made following Architect's written orders.
    - l. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.

- n. Record information on the Work that is shown only schematically.
  3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as for the original Contract Drawings.
  2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
  3. Refer instances of uncertainty to Architect for resolution.
  4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
    - a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
    - b. Architect will provide data file layer information. Record markups in separate layers.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  2. Format: Annotated PDF electronic file with comment function enabled.
  3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
  4. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Architect.
    - e. Name of Contractor.

#### 1.4 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
  5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
- B. Format: Submit record specifications as annotated PDF electronic file.

#### 1.5 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.



- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  - 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.
- C. Format: Submit Record Product Data as annotated PDF electronic file.
  - 1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

#### 1.6 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file.
  - 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

#### 1.7 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

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

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

**END OF SECTION**

## SECTION 017900

### DEMONSTRATION AND TRAINING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.
  - 2. Demonstration and training video recordings.

##### 1.2 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.
- C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

##### 1.3 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
  - 1. Identification: On each copy, provide an applied label with the following information:
    - a. Name of Project.
    - b. Name and address of videographer.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Date of video recording.
  - 2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
  - 3. At completion of training, submit complete training manual(s) for Owner's use prepared in same PDF file format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data."

##### 1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
  - 1. Inspect and discuss locations and other facilities required for instruction.
  - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  - 3. Review required content of instruction.

4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

#### 1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

#### 1.6 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
  1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  2. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Systems and equipment operation manuals.
    - c. Systems and equipment maintenance manuals.
    - d. Product maintenance manuals.
    - e. Project Record Documents.
    - f. Identification systems.
    - g. Warranties and bonds.
    - h. Maintenance service agreements and similar continuing commitments.
  3. Emergencies: Include the following, as applicable:
    - a. Instructions on meaning of warnings, trouble indications, and error messages.
    - b. Instructions on stopping.
    - c. Shutdown instructions for each type of emergency.
    - d. Operating instructions for conditions outside of normal operating limits.
    - e. Sequences for electric or electronic systems.
    - f. Special operating instructions and procedures.
  4. Operations: Include the following, as applicable:
    - a. Startup procedures.
    - b. Equipment or system break-in procedures.
    - c. Routine and normal operating instructions.
    - d. Regulation and control procedures.
    - e. Control sequences.
    - f. Safety procedures.
    - g. Instructions on stopping.
    - h. Normal shutdown instructions.
    - i. Operating procedures for emergencies.
    - j. Operating procedures for system, subsystem, or equipment failure.
    - k. Seasonal and weekend operating instructions.
    - l. Required sequences for electric or electronic systems.
    - m. Special operating instructions and procedures.

5. Adjustments: Include the following:
  - a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
  - a. Diagnostic instructions.
  - b. Test and inspection procedures.
7. Maintenance: Include the following:
  - a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning.
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
8. Repairs: Include the following:
  - a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

#### 1.7 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

#### 1.8 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  1. Owner will furnish an instructor to describe Owner's operational philosophy.
  2. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  1. Schedule training with Owner, through Architect, with at least seven days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral performance-based test.
- F. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

#### 1.9 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
  1. At beginning of each training module, record each chart containing learning objective and lesson outline.

- B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode.
  - 1. Submit video recordings on CD-ROM or thumb drive.
  - 2. File Hierarchy: Organize folder structure and file locations according to Project Manual table of contents. Provide complete screen-based menu.
  - 3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.
  - 4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the equipment demonstration and training recording that describes the following for each Contractor involved on the Project, arranged according to Project Manual table of contents:
    - a. Name of Contractor/Installer.
    - b. Business address.
    - c. Business phone number.
    - d. Point of contact.
    - e. Email address.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
  - 1. Film training session(s) in segments not to exceed 15 minutes.
    - a. Produce segments to present a single significant piece of equipment per segment.
    - b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    - c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.
- D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
  - 1. Furnish additional portable lighting as required.
- E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.
- F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.
- G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

**PART 2 - PRODUCTS**

**PART 3 - EXECUTION**

**END OF SECTION**

VOLUME C.2

BOOKMARK

PROJECT MANUAL  
FOR  
GENERAL CONSTRUCTION

**JPS HEALTH NETWORK**  
OWNER PROJECT # - MEDICAL HOME SOUTHEAST TARRANT  
RADIOLOGY ROOM  
1050 WEST ARKANSAS LANE  
ARLINGTON, TEXAS 76013

**VOLUME C.2 - DIVISIONS 02-27**

**COMM. NO. 1241**  
**December 20, 2023**



# **PROJECT MANUAL**

## **Medical Home Southeast Tarrant – Radiology Room Arlington, Texas**

**December 20, 2023**

**Construction Documents**

### **Owner**

JPS Health Network  
1500 South Main Street  
Fort Worth, Texas 76014

### **Architect**

Primera Design Associates, LLC  
2102 Roosevelt Drive, Suite A  
Dalworthington Gardens, Texas 76013  
Telephone: 817-303-5400

### **Structural Engineer**

Primera Design Associates, LLC  
2102 Roosevelt Drive, Suite A  
Dalworthington Gardens, Texas 76013  
Telephone: 817-303-5400

### **Mechanical, Electrical and Plumbing Engineers**

Baird, Hampton, & Brown  
6300 Ridglea Place, Suite 700  
Fort Worth, Texas  
Telephone: 817-338-1277

**Primera Design Associates, LLC Commission Number: 1241**

**END OF DOCUMENT**



**DOCUMENT 000107**

**PROFESSIONAL SEALS PAGE**

The specification sections listed below were prepared by or under the direct supervision of the Architect:

Primera Design Associates, LLC  
2102 Roosevelt Drive, Suite A  
Dalworthington Gardens, Texas 76013

SEAL

**DIVISION 01 – GENERAL REQUIREMENTS**

- 011000 Summary
- 012100 Allowances
- 012500 Substitution Procedures
- 012600 Contract Modification Procedures
- 012900 Payment Procedures
- 013100 Project Management and Coordination
- 013200 Construction Progress Documentation
- 013233 Photographic Documentation
- 013300 Submittal Procedures
- 013516 Alteration Project Procedures
- 014000 Quality Requirements
- 014200 References
- 015000 Temporary Facilities and Controls
- 016000 Product Requirements
- 017300 Execution
- 017700 Closeout Procedures
- 017823 Operation and Maintenance Data
- 017839 Project Record Documents
- 017900 Demonstration and Training



**DIVISION 02 – EXISTING CONDITIONS**

- 024121 Work at Existing Facility

**DIVISION 03 – CONCRETE**

- 035416 Hydraulic Cement Underlayment

**DIVISION 05 – METALS**

- 054523 Healthcare Metal Supports

**DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES**

- 061053 Miscellaneous Rough Carpentry
- 064116 Plastic-Laminate-Clad Architectural Cabinets

**DIVISION 07 – THERMAL AND MOISTURE PROTECTION**

- 078413 Penetration Firestopping
- 078443 Joint Firestopping
- 079200 Joint Sealants
- 079219 Acoustical Joint Sealants

**DIVISION 08 – OPENINGS**

- 081115 Interior Hollow Metal Door Frames
- 083113 Access Doors and Frames
- 088000 Glazing

**DIVISION 09 – FINISHES**

092216 Non-Structural Metal Framing  
092900 Gypsum Board  
095113 Acoustical Panel Ceilings  
096513 Resilient Base and Accessories  
096519 Resilient Tile Flooring  
098116 Acoustical Blanket Insulation  
099123 Interior Painting

**DIVISION 10 – SPECIALTIES**

101400 Signage  
102600 Wall and Door Protection  
102800 Toilet, Bath, and Laundry Accessories

**DIVISION 12 – FURNISHINGS**

123661.16 Solid Surfacing Countertops

**DIVISION 13 – SPECIAL CONSTRUCTION**

134900 Radiation Protection

SEAL



END OF DOCUMENT

**DOCUMENT 000107**

**PROFESSIONAL SEALS PAGE**

The specification sections listed below were prepared by or under the direct supervision of the Mechanical Engineer:

BAIRD, HAMPTON & BROWN  
6300 Ridglea Place, Suite 700  
Fort Worth, Texas 76116

**DIVISION 21 – FIRE SUPPRESSION**

- 210010 Basic Fire Protection Requirements
- 210512 Fire Protection and Electrical Coordination
- 211100 Fire Protection Piping
- 211300 Automatic Sprinkler Systems

**DIVISION 22 – PLUMBING**

- 220010 Basic Plumbing Requirements
- 220529 Plumbing Supports
- 220716 Plumbing Piping Insulation
- 221000 Plumbing Piping
- 221001 Plumbing Specialties
- 221119 Piping Specialties
- 224001 Plumbing Fixtures

**DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING**

- 230010 Basic Mechanical Requirements
- 230512 Mechanical and Electrical Coordination
- 230593 Mechanical Test, Adjusting, and Balancing
- 230713 HVAC Duct Insulation
- 233113.19 Ductwork Accessories
- 233113 Metal Ductwork
- 233713 Air Outlets and Inlets
- 238965 Motor Controllers

SEAL



The specification sections listed below were prepared by or under the direct supervision of the Electrical Engineer:

**DIVISION 26 – ELECTRICAL**

- 260510 General Requirements for Electrical Work
- 260511 Work in Existing Building
- 260512 Mechanical and Electrical Coordination
- 260519 Wires and Cables
- 260520 Wire Connection and Devices
- 260526 Grounding
- 260527 Sealing of Penetrations
- 260529 Supporting Devices
- 260532 Pull and Junction Boxes
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- 260535 Wireway
- 262716 Cabinets
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- 262817 Disconnect Switches
- 262913 Motors, Motor Starters and Controls
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**DIVISION 27 – COMMUNICATIONS**

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## SECTION 024121

### WORK AT EXISTING FACILITY

#### PART 1 – GENERAL

##### 1.1 SUMMARY

- A. Furnish all labor, materials, services, equipment, and appliances required in connection with the work at existing facility as indicated on the Drawings and as described herein.
  - 1. Scheduling of Construction
  - 2. Control of Dust, Odor, Vibration and Other Contaminants/Irritants
  - 4. Existing Conditions
  - 5. Use of Existing Facility

##### 1.2 GENERAL

- A. The intent is to minimize the impact of the construction activities on the occupied areas of the building or impact on Owner's operations.
- B. The Contractor shall meet with the Owner as needed to assure compliance with these standards. The Contractor shall provide labor, materials, equipment, etc. as required to assure compliance.
- C. The Contractor will respond to the Owner immediately, and in any case within sixty (60) minutes, if the Owner determines that the Construction activity is impacting or potentially could impact patient care in occupied areas of the building. If the Contractor does not respond immediately, the Owner will perform corrective measures and the cost, as determined by the Owner, will be deducted from the Contract amount by Change Order.
- D. The Owner's designated representative for matters related to this Section will be determined at the Pre-Construction conference.

#### PART 2 – PRODUCTS (NOT USED)

#### PART 3 – EXECUTION

##### 3.1 SCHEDULING OF CONSTRUCTION

- A. Existing facilities must function at all times during construction activities and the Contractor shall do whatever is necessary to assure continuous operation.
- B. Work Plan and Outage Request: All work that could impact the Owner's facilities and operation, including mechanical, plumbing, and electrical systems, must be scheduled with the Owner in order to minimize the impact on the facility and operations.
  - 1. The Contractor shall submit a "Work Plan Approval Request" form for all work to be performed outside the designated construction area at least two (2) weeks in advance of the proposed portion of work.
  - 2. The Contractor shall submit an "Outage Request" form at least two (2) weeks in advance of the proposed outage.
  - 3. The Contractor shall research in detail each piece of work or system to be affected and present the proposed plan of accomplishing the "work" without impacting the facilities and operations to the Owner for review and approval along with the work plan or outage request.
  - 4. The Contractor shall provide and install temporary wiring, lighting, ductwork, spot coolers, etc. as necessary to facilitate the continued operation of the facility and remove such temporary measures at the conclusion of the work.
  - 5. The Contractor shall perform the work so that only a small area will be out of use at any one time and all work completed within any given small area before commencing with the next small area. The intent is to minimize the impact to the facility.
  - 6. The Contractor will perform work at night or on weekends if necessary to allow the facility to continue to operate.



3.2 CONTROL OF DUST, ODOR, VIBRATION AND OTHER CONTAMINANTS / IRRITANTS

- A. Whenever work occurs adjacent to the occupied areas, the work shall be separated from the occupied areas by means of dustproof partitions.
- B. All penetrations into the construction area must be sealed and windows closed.
- C. Debris removal from the construction area must be completed by a predetermined route at times approved by the Owner.
- D. Any dust tracked into occupied areas must be removed immediately. Cleaning in occupied areas shall be done with HEPA-filtered vacuum cleaners.
- E. The Contractor shall take all precautions necessary to ensure that no dust, odors, fumes or other contaminants generated as a result of any construction activities are drawn into any air intakes into occupied areas.
- F. The Contractor shall take all precautions necessary to minimize the noise and vibration that is generated on the jobsite and could potentially be transferred to the building structure or to other spaces within the facility. All work hours must be pre-approved by the Owner so that he can confirm that activities in surrounding adjacent areas will not be adversely affected by the anticipated noise and/or vibration that may be generated by the planned construction activities.
- G. If the Contractor releases or allows water, sewage, objectionable substances, contaminants or other such materials into the facility, the Contractor shall respond immediately to clean up and restore the area to its previous condition.

3.4 EXISTING CONDITIONS

- A. It is the intent of the contract documents that the Contractor inspects the job site prior to bidding and be familiar with all existing conditions. Cost of the work required to accommodate the existing conditions shall be included in the bid proposal.
- B. Protect existing building as required from damage, moisture and dust. Provide materials as required to protect existing building finishes and equipment. At completion of Contract, existing building items shall be restored, by means of repair or replacement, to previous condition or better.
- C. Any item whether shown on the drawings or not, that must remain in order for the facility to operate properly, but whose location is in conflict with the new construction, shall be removed, relocated and reconnected as necessary to accommodate the new work at no additional cost. Furthermore, the Contractor shall be responsible to research and determine the appropriate way and method to relocate and reconnect the item. The Contractor shall submit his solution to the Architect for approval. The Contractor alone will be responsible for the cost of the work shown, indicated or reasonably inferred as being necessary to produce the indicated results.
- D. Coordinate the work with the Mechanical and Electrical Divisions of the specifications. Determine which items and equipment are to remain, which are to be relocated and/or removed, and perform all work consistent with the indicated final result.
- E. Prior to construction, inspect all areas adjacent to the proposed "work" including route to construction area; prepare a photographic record of existing damaged conditions and their locations, including, but not limited to: walls, ceilings, floors, doors, etc. As part of the work, all items shall be restored to its previous condition or damaged items not represented by photographic record that are within the areas effected by construction, shall be repaired to "like new" condition.
- F. Existing floors shall be leveled in accordance with Section 035416 "Hydraulic Cement Underlayment.
- G. In existing rooms and spaces where work is being done, the existing finishes adjacent to the new or remodeled work shall be cleaned or refinished to "like new" condition to the nearest inside corner or as indicated on Drawings.
- H. In locations where demolition and or remodel work is being done, unfinished surfaces resulting from such work shall be refinished to match existing adjacent finishes.

### 3.5 USE OF EXISTING FACILITY

- A. All material shall be stored within the building in the area under construction or in a designated storage area on site.
- B. All construction traffic, deliveries, etc. shall be limited to routes and times allowed by the Owner in order to reduce the effect of the construction on the operation of the facility.
- C. Contractors will be required to wear an Owner-approved badge when working at the facility in areas outside of the designated construction area.
- D. Toilets: The Contractor shall NOT use the existing toilets in the facility.

### 3.6 PROTECTION FROM FIRE

- A. General: follow fire-prevention plan and the following:
  - 1. Comply with NFPA 241 requirements unless otherwise indicated. Perform duties titled "Owner's Responsibility for Fire Protection."
  - 2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.
    - a. If combustible material cannot be removed, provide fire blankets to cover such materials.
- B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:
  - 1. Obtain Owner's approval for operations involving use of open-flame or welding or other high-heat equipment. Notify Owner at least 72 hours before each occurrence, indicating location of such work.
  - 2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
  - 3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
  - 4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
  - 5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
  - 6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:
    - a. Train each fire watch in the proper operation of fire-control equipment and alarms.
    - b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
    - c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
    - d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
    - e. Maintain fire-watch personnel at Project site until two hours after conclusion of daily work.
- C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.
- D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.
  - 1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.

**WORK PLAN APPROVAL REQUEST**

REQUEST NO. \_\_\_\_\_

Date submitted to Owner: \_\_\_\_\_ Approval needed by date: \_\_\_\_\_

Proposed date and time to start work Date: \_\_\_\_\_ Time: \_\_\_\_\_ A.M. / P.M.

Duration of work: \_\_\_\_\_

Location of work (room names, numbers, wing no., etc. or attach drawing if necessary):

\_\_\_\_\_  
\_\_\_\_\_

Area affected (room names, numbers, wing no., etc. or attach drawing if necessary):

\_\_\_\_\_  
\_\_\_\_\_

Utility system affected (attach "Outage Request" form):

\_\_\_\_\_  
\_\_\_\_\_

Description of work: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Potential impact to facilities and operation: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Proposed plan to accomplishing the work and not impact facilities and operations:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

General Contractor Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Owner Comments:  Approved  Approved as Noted  Correct and Resubmit

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Owner's signature: \_\_\_\_\_ Date: \_\_\_\_\_

**OUTAGE REQUEST**

REQUEST NO. \_\_\_\_\_

Date submitted to Owner: \_\_\_\_\_ Approval needed by date: \_\_\_\_\_

Proposed date and time to start work Date: \_\_\_\_\_ Time: \_\_\_\_\_ A.M. / P.M.

Duration of work: \_\_\_\_\_

Utility system affected: \_\_\_\_\_

\_\_\_\_\_

Location of work (room names, numbers, wing no., etc. or attach drawing if necessary):

\_\_\_\_\_

Area affected (room names, numbers, wing no., etc. or attach drawing if necessary):

\_\_\_\_\_

\_\_\_\_\_

Description of work: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Potential impact to facilities and operation: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Proposed plan to accomplishing the work and not impact facilities and operations:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

General Contractor signature: \_\_\_\_\_ Date: \_\_\_\_\_

Owner Comments:     Approved             Approved as Noted             Correct and Resubmit

\_\_\_\_\_

\_\_\_\_\_

Owner's signature: \_\_\_\_\_ Date: \_\_\_\_\_

**END OF SECTION**

## SECTION 035416

### HYDRAULIC CEMENT UNDERLAYMENT

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Polymer-modified, self-leveling, hydraulic cement underlayment for application below interior floor coverings.

##### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.

##### 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

##### 1.4 FIELD CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.
  - 1. Place hydraulic cement underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F (10 and 27 deg C).

#### PART 2 - PRODUCTS

##### 2.1 HYDRAULIC CEMENT UNDERLAYMENTS

- A. Hydraulic Cement Underlayment: Polymer-modified, self-leveling, hydraulic cement product that can be applied in minimum uniform thickness of 1/4 inch (6 mm) and that can be feathered at edges to match adjacent floor elevations.
  - 1. Products Subject to compliance with requirements, provide by the following:
    - a. ARDEX; K-15 Self-Leveling Underlayment Concrete.
- B. Cement Binder: ASTM C 150/C 150M, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
- C. Compressive Strength: Not less than 4000 psi (27.6 MPa) at 28 days when tested according to ASTM C 109/C 109M.
- D. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm); or coarse sand as recommended by underlayment manufacturer.
  - 1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.
- E. Water: Potable and at a temperature of not more than 70 deg F (21 deg C).
- F. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.
- G. Surface Sealer: Designed to reduce porosity as recommended by manufacturer for type of floor covering to be applied to underlayment.

#### PART 3 - EXECUTION

##### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for conditions affecting performance of the Work.
- B. Proceed with application only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. General: Prepare and clean substrate according to manufacturer's written instructions.
  - 1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
  - 2. Fill substrate voids to prevent underlayment from leaking.
- B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.
  - 1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    - a. Anhydrous Calcium Chloride Test, ASTM F1869: Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/100 sq. m) in 24 hours.
    - b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 85 percent relative humidity level measurement, or as recommended by hydraulic cement underlayment manufacturer.
- C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

### 3.3 APPLICATION

- A. General: Mix and apply underlayment components according to manufacturer's written instructions.
  - 1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
  - 2. Coordinate application of components to provide optimum adhesion to substrate and between coats.
  - 3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
- B. Apply underlayment to produce uniform, level surface.
  - 1. Apply a final layer without aggregate to product surface.
  - 2. Feather edges to match adjacent floor elevations.
- C. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.
- D. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.
- E. Apply surface sealer at rate recommended by manufacturer.
- F. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

### 3.4 PROTECTION

- A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

**END OF SECTION**

## SECTION 054523

### HEALTHCARE METAL SUPPORTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Metal support systems for surgical lights, x-ray equipment and other medical equipment as required.

##### 1.2 SYSTEM DESCRIPTION

- A. Requirements: Drawings are diagrammatic and are intended to establish basic dimension of units, sight lines, and profiles of units.
- B. Interface with Adjacent Systems: Integrate design and connections with adjacent construction.
  - 1. Accommodate allowable tolerances and deflections for structural members in installation.
  - 2. Coordinate with reflected ceiling plan and other items indicated to be placed in or above ceiling to ensure medical support system does not interfere with or dislocate other items.

##### 1.3 PERFORMANCE REQUIREMENTS

- A. Manufacturer: Responsible for designing system, including anchorage to structural system and necessary modifications to meet specified requirements and maintain visual design concepts.
- B. Employ registered professional engineer, licensed to practice structural engineering in jurisdiction where Project is located, to engineer each component of medical support system.
- C. Attachment Considerations: Account for site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening and fracturing connection between units and building structure or between components themselves.
- D. Make modifications only to meet field conditioned and ensure fitting of system components.
  - 1. Obtain Architect's approval of modifications and for connections to building elements at locations other than indicated on Drawings.
- E. Support Structure: Locate support members at ceiling plane as indicated on Drawings. Make possible attachment of equipment support rails at any point along support system without drilling or welding into system.
- F. Ceiling Anchorage: Attach to ceiling by means of embedded concrete inserts, through-bolts, or direct attachment to structural framing.
- G. Rigidly fix and brace support structure against sway.
- H. Loading: Design support structure to support vertical load, maximum eccentricity of vertical load from support point, transverse force acting on longitudinal rail, longitudinal force acting on longitudinal rail, and deflection criteria established for each piece of supported equipment.
  - 1. If loads are not defined for piece of supported equipment assume concentrated load of 1500 pounds at any point along equipment rails. Concentrated load is maximum encountered by positioning of equipment at extremities of its travel (maximum load configuration).
- I. Safety Factor: Design support structure for minimum safety factor of three based on ultimate strength under static loading conditions. Structure shall not deflect more than 1/720 span vertically or horizontally when maximum loading conditions of equipment operation are applied on either rail.

##### 1.4 ACTION SUBMITTALS

- A. General: Submit following items in accordance with Section 013300.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings: Indicate plan layout, typical elevations, details and anchoring methods.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Delegated Design Data: For installed dimension support systems indicated to comply with certain design loads and deflection limits, include structural analysis data signed and sealed by the qualified professional structural engineer responsible for their preparation.
- B. Certificates verifying AWS qualifications within previous 12 months for each welder employed for Work.
- C. Certifications specified in Quality Assurance article.
- D. Qualification Data: For professional Engineer.

#### 1.6 QUALITY ASSURANCE

- A. Engineer Qualifications: Registered professional engineer licensed to practice structural engineering in jurisdiction where Project is located, with minimum of five years experience in design of medical support systems.
- B. Manufacturer Qualifications: Company specializing in manufacturing, fabricating, and installing Products specified in this Section with minimum five years experience.
- C. Welder Qualifications: AWS certified within past 12 months for each type of weld required.
- D. Certifications: Submit following:
  - 1. Manufacturer's certification that products furnished for Project meet or exceed specified requirements.
  - 2. Engineering certifications.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Section 016000.
- B. Deliver components of system required to be installed by other trades in sufficient time not to delay work of project.

### **PART 2 - PRODUCTS**

#### 2.1 MANUFACTURER

- A. Medical Support Systems:
  - 1. Cooper B-Line Strut Systems, Inc., Highland, IL.
  - 2. Flex-Strut, Inc. Metal Framing Products, Warren, OH.
  - 3. GS Metals Corporation, "Globe Strut."
  - 4. Hilti, Inc., "Hilti Strut MQ."
  - 5. Tyco "Unistrut" Metal Framing, Wayne MI.

#### 2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

#### 2.3 MEDICAL SUPPORT SYSTEMS

- A. Slotted Channel Framing: Cold-formed metal channels with flange edges returned toward web with 9/16 inch wide slotted holes in webs at 2 inches on center.
  - 1. Width, Depth, Thickness: As required by design to meet structural performance.
- B. Materials:
  - 1. Steel Sheet Structural Quality: ASTM A 570, Grade 33.
  - 2. Zinc-Coated Steel Sheet: ASTM A 653, Quality SQ, Grade 33, G90.
  - 3. Hot-Rolled Steel Bar: ASTM A 575.
  - 4. Hot-Rolled Steel Sheet and Strip: ASTM A 569.
  - 5. Fasteners and Anchors: Concrete inserts, bolts or direct attachment to structural framing.
- C. Finish: System components; corrosion resistant. Hardware; electro-galvanized.



**PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Examine conditions and proceed with Work in accordance with Section 017300.

3.2 INSTALLATION

- A. Medical Support Systems: Install in accordance with approved Shop Drawings and manufacturer's installation instructions.
- B. Structural Assembly: Install supporting framework plumb and true.
- C. Installation Tolerances:
  - 1. Mount surfaces of support structure horizontal within tolerance of 1/32 inch in 24 inches and within 1/16 inch in 18 foot length.
  - 2. Elevation of one rail mounting surface to other shall be within 1/16 inch in any 24 inches length of rails.

3.3 PROTECTION

- A. Protect finished installation under provisions of Division 01 Section "Common Execution Requirements."

**END OF SECTION**

## SECTION 061053

### MISCELLANEOUS ROUGH CARPENTRY

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Wood blocking and nailers.
  - 2. Wood furring.
  - 3. Plywood backing panels.

##### 1.2 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
  - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
  - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
  - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

##### 1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
  - 1. Preservative-treated wood.
  - 2. Fire-retardant-treated wood.

##### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

#### PART 2 - PRODUCTS

##### 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory-mark each piece of lumber with grade stamp of grading agency.
  - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
  - 3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

## 2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWWA U1; Use Category UC2.
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
  - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- D. Application: Treat items indicated on Drawings, and the following:
  - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  - 2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
  - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
  - 4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
  - 5. Wood floor plates that are installed over concrete slabs-on-grade.

## 2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
  - 1. Treatment shall not promote corrosion of metal fasteners.
  - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
  - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
  - 4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664, and design value adjustment factors shall be calculated according to ASTM D6841.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
  - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.
- F. Application: Treat all miscellaneous carpentry unless otherwise indicated.

## 2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  - 1. Blocking.
  - 2. Nailers.
  - 3. Furring.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.
  - 1. Mixed southern pine or southern pine; SPIB.
  - 2. Spruce-pine-fir; NLGA.
  - 3. Western woods; WCLIB or WWPA.
  - 4. Northern species; NLGA.
  - 5. Eastern softwoods; NeLMA.

- C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- D. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

#### 2.5 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

#### 2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  - 1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Screws for Fastening to Metal Framing: ASTM C1002 or ASTM C954, length as recommended by screw manufacturer for material being fastened.
- D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or ICC-ES AC193 as appropriate for the substrate.
  - 1. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2 (ASTM F738M and ASTM F836M, Grade A1 or A4).

#### 2.7 MISCELLANEOUS MATERIALS

- A. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.
- B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
  - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.
- F. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- G. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
  - 1. Use inorganic boron for items that are continuously protected from liquid water.
  - 2. Use copper naphthenate for items not continuously protected from liquid water.

- H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- I. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
  - 2. ICC-ES evaluation report for fastener.
- J. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

### 3.2 INSTALLATION OF WOOD BLOCKING AND NAILER

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

### 3.3 INSTALLATION OF WOOD FURRING

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- (19-by-63-mm actual-) size furring horizontally and vertically at 24 inches (610 mm) o.c.
- C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- (19-by-38-mm actual-) size furring vertically at 16 inches (406 mm) o.c.

### 3.4 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

**END OF SECTION**

## SECTION 064116

### PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Plastic-laminate-clad architectural cabinets.
  - 2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

##### 1.2 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

##### 1.3 PREINSTALLATION MEETINGS

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

##### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings:
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Show large-scale details.
  - 3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
  - 4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.
- C. Samples: For each exposed product and for each color and texture specified, in manufacturer's or manufacturer's standard size.
- D. Samples for Initial Selection: For each type of exposed finish.
- E. Samples for Verification: For the following:
  - 1. Plastic Laminates: 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish required.
    - a. Provide one sample applied to core material with specified edge material applied to one edge.
  - 2. Thermoset Decorative Panels: 8 by 10 inches (200 by 250 mm), for each color, pattern, and surface finish.
    - a. Provide edge banding on one edge.
  - 3. Corner Pieces:
    - a. Cabinet-front frame joints between stiles and rails and at exposed end pieces, 18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.
    - b. Miter joints for standing trim.
  - 4. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

##### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For each type of product.
  - 1. Composite wood and agrifiber products.
  - 2. Thermoset decorative panels.
  - 3. High-pressure decorative laminate.
  - 4. Adhesives.
- C. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

- D. Field quality-control reports.

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
  - 1. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.
- B. Installer Qualifications: Manufacturer of products.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

#### 1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 43 and 70 percent during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

### **PART 2 - PRODUCTS**

#### 2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.
  - 1. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.
- B. Architectural Woodwork Standards Grade: Custom.
- C. Type of Construction: Frameless.
- D. Door and Drawer-Front Style: Flush overlay.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Abet Laminati Inc.
    - b. Formica Corporation.
    - c. Lamin-Art, Inc.
    - d. Pionite; a Panolam Industries International, Inc. brand.
    - e. Wilsonart.
  - 2. Basis-of-Design Product: As scheduled.
- F. Laminate Cladding for Exposed Surfaces:
  - 1. Horizontal Surfaces: Grade HGS.
  - 2. Postformed Surfaces: Grade HGP.
  - 3. Vertical Surfaces: Grade VGS.
  - 4. Edges: Grade HGS.
  - 5. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.

- G. Materials for Semiexposed Surfaces:
    - 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
      - a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
      - b. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
      - c. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.
    - 2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
    - 3. Drawer Bottoms: Thermoset decorative panels.
  - H. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless located directly under tops.
  - I. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
  - J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
    - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners.
  - K. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
    - 1. As scheduled.
- 2.2 WOOD MATERIALS
- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
    - 1. Wood Moisture Content: 5 to 10 percent.
  - B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
    - 1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
    - 2. Particleboard: ANSI A208.1, Grade M-2.
    - 3. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.
- 2.3 CABINET HARDWARE AND ACCESSORIES
- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.
  - B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100 degrees of opening, self-closing.
  - C. Back-Mounted Pulls: BHMA A156.9, B02011.
  - D. Wire Pulls: Back mounted, solid metal, 5 inches (127 mm) long, 2-1/2 inches (63.5 mm) deep, and 5/16 inch (8 mm) in diameter.
  - E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
  - F. Shelf Rests: BHMA A156.9, B04013; metal.
  - G. Drawer Slides: BHMA A156.9.
    - 1. Grade 1 and Grade 2: Side mounted.
      - a. Type: Full extension.
      - b. Material: Epoxy-coated steel with polymer rollers.
    - 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full -extension type; zinc-plated-steel ball-bearing slides.
    - 3. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 2.



4. For drawers more than 3 inches (75 mm) high, but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
  5. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-100.
  6. For computer keyboard shelves, provide Grade 1.
  7. For trash bins not more than 20 inches (500 mm) high and 16 inches (400 mm) wide, provide Grade 1HD-100.
- H. Door Locks: BHMA A156.11, E07121.
- I. Drawer Locks: BHMA A156.11, E07041.
- J. Door and Drawer Silencers: BHMA A156.16, L03011.
- K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Stainless Steel: BHMA 630.
- L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.
- 2.4 MISCELLANEOUS MATERIALS
- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
  - B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
  - C. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
    1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.
- 2.5 FABRICATION
- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.
  - B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
  - C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

#### **3.2 INSTALLATION**

- A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.
- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.
- D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) using concealed shims.
  1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
  2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c..

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces.

**END OF SECTION**

## SECTION 078413

### PENETRATION FIRESTOPPING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Penetrations in fire-resistance-rated walls.
  - 2. Penetrations in horizontal assemblies.
  - 3. Penetrations in smoke barriers.

##### 1.2 PREINSTALLATION MEETINGS

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

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
  - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

##### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

##### 1.5 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

##### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by firestopping manufacturer.

##### 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

##### 1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
  2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
    - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
      - 1) UL in its "Fire Resistance Directory."
      - 2) Intertek Group in its "Directory of Listed Building Products."
      - 3) FM Global in its "Building Materials Approval Guide."

### 2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any. Provide firestopping, including products specified in Section 078443 "Joint Firestopping," by same manufacturer as products of this section regardless of installer. All firestopping products within this section shall be of one manufacturer.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Specified Technologies Inc.
    - b. 3M Fire Protection Products.
    - c. A/D Fire Protection Systems Inc.
    - d. GCP Applied Technologies Inc.
    - e. Hilti, Inc.
    - f. Johns Manville.
    - g. Nelson Firestop Products.
    - h. RectorSeal Corporation.
    - i. Tremco, Inc.; Tremco Fire Protection Systems Group.
    - j. USG Corporation.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
  2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
  3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
- D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).
1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at and no more than 50-cfm (0.024-cu. m/s) cumulative total for any 100 sq. ft. (9.3 sq. m) at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.

- F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
  - 1. Permanent forming/damming/backing materials.
  - 2. Substrate primers.
  - 3. Collars.
  - 4. Steel sleeves.

## 2.3 FILL MATERIALS

- A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- C. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- D. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- E. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- F. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- G. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- H. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- I. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

## 2.4 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Ensure penetration firestopping products are coordinated and compatible with one another, with the substrates forming openings, and with penetrating items.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
  - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
  - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.

- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

### 3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
  2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes.
1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet (4.57 m) from end of wall and at intervals not exceeding 30 feet (9.14 m).
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
  2. Contractor's name, address, and phone number.
  3. Designation of applicable testing and inspecting agency.
  4. Date of installation.
  5. Manufacturer's name.
  6. Installer's name.

### 3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

### 3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Where Intertek ETL SEMKO-listed systems are indicated, they refer to design numbers in Intertek ETL SEMKO's "Directory of Listed Building Products" under "Firestop Systems."
- C. Where FM Global-approved systems are indicated, they refer to design numbers listed in FM Global's "Building Materials Approval Guide" under "Wall and Floor Penetration Fire Stops."
- D. Refer to Drawings.

**END OF SECTION**

## SECTION 078443

### JOINT FIRESTOPPING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Joints in or between fire-resistance-rated constructions.

##### 1.2 PREINSTALLATION MEETINGS

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

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.
  - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

##### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

##### 1.5 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

##### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by firestopping manufacturer.

##### 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

##### 1.8 COORDINATION

- A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of joints to accommodate joint firestopping systems.

#### PART 2 - PRODUCTS

##### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
  - 1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
    - a. Joint firestopping systems shall bear classification marking of a qualified testing agency.
      - 1) UL in its "Fire Resistance Directory."
      - 2) Intertek Group in its "Directory of Listed Building Products."



## 2.2 JOINT FIRESTOPPING SYSTEMS

- A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases. Provide firestopping, including products specified in Section 078413 "Penetration Firestopping," by same manufacturer as products of this section regardless of installer. All firestopping products within this section shall be of one manufacturer.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Specified Technologies Inc.
    - b. Hilti, Inc.
    - c. RectorSeal Corporation.
    - d. Tremco, Inc.; Tremco Fire Protection Systems Group
    - e. USG Corporation.
  - 2. Basis-of-Design Product: Specified Technologies, Inc.; SpecSeal SIL300.
- C. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- D. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
  - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
  - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

### 3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
  - 1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- C. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:
  - 1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.

2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.4 IDENTIFICATION

- A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
  1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
  2. Contractor's name, address, and phone number.
  3. Designation of applicable testing agency.
  4. Date of installation.
  5. Manufacturer's name.
  6. Installer's name.

### 3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

### 3.6 CLEANING AND PROTECTION

- A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

### 3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.

### 3.8 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.
- A. Where Intertek ETL SEMKO-listed systems are indicated, they refer to design numbers in Intertek ETL SEMKO's "Directory of Listed Building Products" under product category Firestop Systems.

### 3.9 FIRE-RESISTIVE JOINT SYSTEMS

- A. Refer to Drawings.

**END OF SECTION**

## SECTION 079200

### JOINT SEALANTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Urethane joint sealants.
  - 2. Mildew-resistant joint sealants.
  - 3. Butyl joint sealants.
  - 4. Latex joint sealants.

##### 1.2 PREINSTALLATION MEETINGS

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

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.

##### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.
- B. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:
  - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
  - 2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.
- C. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- D. Field-Adhesion-Test Reports: For each sealant application tested.
- E. Sample Warranties: For special warranties.

##### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.
  - 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

##### 1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
  - 1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
  3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with masonry substrates.
  4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
  5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
  7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.
- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
  2. Conduct field tests for each kind of sealant and joint substrate.
  3. Notify Architect seven days in advance of dates and times when test joints will be erected.
  4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
    - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
      - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
  5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
  6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

#### 1.7 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
  2. When joint substrates are wet.
  3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

#### 1.8 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: From date of Substantial Completion.
    - a. Urethane Sealants: 10 years.
    - b. Silicone Sealants: 20 years.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
  2. Disintegration of joint substrates from causes exceeding design specifications.
  3. Mechanical damage caused by individuals, tools, or other outside agents.
  4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 - PRODUCTS

### 2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

### 2.2 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
  - 1. Products: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. BASF Aktiengesellschaft; MasterSeal TX1 (VOC: 36 g/L).
    - b. C.R. Laurence Co, Inc.; CRL M64 (VOC: 9 g/L).
    - c. Pecora Corporation; DynaTrol I-XL (VOC: <100 g/L).
    - d. Sika Corporation Industry Products; Sikaflex Textured Sealant.
    - e. Tremco Inc., Tremco CS&W Group; Vulkem 116 (49 g/L).
- B. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. BASF Aktiengesellschaft; MasterSeal SL 1 (VOC: 104 g/L).
    - b. Pecora Corporation; Urexpan NR-201 (VOC: <50 g/L).
    - c. Sika Corporation Industry Products; Sikaflex 1c SL (VOC: 40 g/L).

### 2.3 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. C.R. Laurence Co, Inc.; CRL 33S Silicone (VOC: 30 g/L).
    - b. Dow Corning Corporation; 786 Silicone Sealant (VOC: 33 g/L).
    - c. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary (VOC: 20 g/L).
    - d. Pecora Corporation; Pecora 898NST (VOC: 50 g/L).
    - e. Sika Corporation Industry Products; Sikasil GP (VOC: 29 g/L).
    - f. Soudal Accumetric; Silirub RTV1 (VOC: 30 g/L).
    - g. Tremco Inc., Tremco CS&W Group; Tremsil 200 (VOC: 1 g/L).

### 2.4 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. C.R. Laurence Co, Inc.; CRL 777 Butyl Rubber (VOC: 240 g/L)..
    - b. Pecora Corporation; BC-158 (VOC: <250 g/L).
    - c. Tremco Inc., Tremco CS&W Group; Butyl Sealant (VOC: 232 g/L)

## 2.5 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. C.R. Laurence Co, Inc.; CRL 321 (VOC: 22 g/L).
    - b. Pecora Corporation; AC-20 (VOC: 20 g/L).
    - c. Tremco Incorporated; Tremflex 834 (VOC: 31 g/L).

## 2.6 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Alcot Plastics Ltd.; Alcot Plastics Backer Rod.
    - b. BASF Aktiengesellschaft; MasterSeal 920.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

## 2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.

3. Remove laitance and form-release agents from concrete.
  4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal.
    - b. Glass.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  1. Do not leave gaps between ends of sealant backings.
  2. Do not stretch, twist, puncture, or tear sealant backings.
  3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  1. Place sealants so they directly contact and fully wet joint substrates.
  2. Completely fill recesses in each joint configuration.
  3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  1. Remove excess sealant from surfaces adjacent to joints.
  2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
  4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.
  5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C 1193.
    - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

### 3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
  1. Extent of Testing: Test completed and cured sealant joints as follows:
    - a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
    - b. Perform one test for each 1000 feet (300 m) of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
    - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
  3. Inspect tested joints and report on the following:
    - a. Whether sealants filled joint cavities and are free of voids.
    - b. Whether sealant dimensions and configurations comply with specified requirements.
    - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
  4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
  5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

### 3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### 3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

### 3.7 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
1. Joint Locations:
    - a. Isolation joints in cast-in-place concrete slabs.
    - b. Other joints as indicated on Drawings.
  2. Joint Sealant: Urethane, S, P, 25, T, NT.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
    - a. Control and expansion joints on exposed interior surfaces of exterior walls.
    - b. Vertical joints on exposed surfaces of walls and partitions.
    - c. Other joints as indicated on Drawings.
  2. Joint Sealant: Urethane, S, NS, 25, NT.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
1. Joint Locations:
    - a. Control joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
    - c. Other joints as indicated on Drawings.
  2. Joint Sealant: Acrylic latex.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.



- D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 1. Joint Locations:
    - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - b. Other joints as indicated on Drawings.
  - 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Concealed mastics.
  - 1. Joint Locations:
    - a. Aluminum thresholds.
    - b. Sill plates.
    - c. Other joints as indicated on Drawings.
  - 2. Joint Sealant: Butyl-rubber based.
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

**END OF SECTION**

## SECTION 079219

### ACOUSTICAL JOINT SEALANTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes acoustical joint sealants.

##### 1.2 ACTION SUBMITTALS

- A. Product Data: For each acoustical joint sealant.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Acoustical-Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.

##### 1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each kind of acoustical joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.
- B. Sample Warranties: For special warranties.

##### 1.4 COORDINATION

- A. Ensure joint sealant products are coordinated and compatible with the non-metallic plumbing piping system and the fire sprinkler piping system.

##### 1.5 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish acoustical joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.

#### PART 2 - PRODUCTS

##### 2.1 PERFORMANCE REQUIREMENTS

- A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.

##### 2.2 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C 834.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Franklin International; Titebond GREENchoice Professional Acoustical Smoke & Sound Sealant.
    - b. GE Construction Sealants; Momentive Performance Materials Inc.
    - c. Grabber Construction Products.

- d. Hilti, Inc.
  - e. OSI Sealants; Henkel Corporation.
  - f. Pecora Corporation; Pecora AIS-919 Acoustical and Insulation Latex Sealant.
  - g. United States Gypsum Company; SHEETROCK Acoustical Sealant
2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.

### 2.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by acoustical-joint-sealant manufacturer where required for adhesion of sealant to joint substrates.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

- A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.
- B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.
- C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

### 3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect acoustical joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

**END OF SECTION**

## SECTION 081115

### INTERIOR HOLLOW METAL DOOR FRAMES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes standard hollow metal frames for interior applications.

##### 1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.
- B. Shop Drawings: Include the following:
  - 1. Elevations of each door design.
  - 2. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  - 3. Locations of reinforcement and preparations for hardware.
  - 4. Details of each different wall opening condition.
  - 5. Details of anchorages, joints, field splices, and connections.
  - 6. Details of accessories.
  - 7. Details of moldings, removable stops, and glazing.
  - 8. Details of conduit and preparations for power, signal, and control systems.
- C. Other Action Submittals:
  - 1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

##### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- B. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.
- C. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

##### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
  - 1. Provide additional protection to prevent damage to finish of factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Do not store in a manner that traps excess humidity.
  - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

##### 1.6 PROJECT CONDITIONS

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

## 1.7 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

## PART 2 - GENERAL

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Amweld Building Products, LLC.
  - 2. Benchmark; a division of Therma-Tru Corporation.
  - 3. Ceco Door Products; an Assa Abloy Group company.
  - 4. Curries Company; an Assa Abloy Group company.
  - 5. Steelcraft; an Allegion company.

### 2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Frame Anchors: ASTM A 591, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
  - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008 or ASTM A 1011, hot-dip galvanized according to ASTM A 153, Class B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153.
- E. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- G. Glazing: Comply with requirements in Division 08 Section "Glazing."

### 2.3 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.
  - 1. Fabricate frames with mitered or coped corners.
  - 2. Fabricate frames as full profile welded unless otherwise indicated.
  - 3. Frames for Level 2 Steel Doors: 0.053-inch (16 gage) thick steel sheet.
  - 4. Frames for Wood Doors: 0.053-inch (16 gage) thick steel sheet.
  - 5. Frames for Borrowed Lights: 0.053-inch (16 gage) thick steel sheet.
- C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

### 2.4 FRAME ANCHORS

- A. Jamb Anchors:
  - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
  - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
  - 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
  - 4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

## 2.5 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

## 2.6 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- C. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
  1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
  2. Sidelight Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
  3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
  5. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - 1) Two anchors per jamb up to 60 inches high.
      - 2) Three anchors per jamb from 60 to 90 inches high.
      - 3) Four anchors per jamb from 90 to 120 inches high.
      - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
    - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - 1) Three anchors per jamb up to 60 inches high.
      - 2) Four anchors per jamb from 60 to 90 inches high.
      - 3) Five anchors per jamb from 90 to 96 inches high.
      - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
      - 5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
    - c. Compression Type: Not less than two anchors in each jamb.
    - d. Post-installed Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
- D. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
  1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
  2. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.
  3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.
- F. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
  2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
  4. Provide loose stops and moldings on inside of hollow metal work.
  5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.
- 2.7 STEEL FINISHES
- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
- B. Color and Gloss: As indicated by manufacturer's designations.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 PREPARATION**

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
  1. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
  2. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  3. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap frames to receive non-templated, mortised, and surface-mounted door hardware.

#### **3.3 INSTALLATION**

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 HMMA 840.
  1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    - b. Install frames with removable glazing stops located on secure side of opening.
    - c. Remove temporary braces necessary for installation only after frames have been properly set and secured.



- d. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
      - e. Field-apply bituminous coating to backs of frames that are filled with grout containing anti-freezing agents.
    2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
      - a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.
    3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
    4. In-Place Gypsum Board Partitions: Secure frames in place with post-installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
    5. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
      - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
      - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
      - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
      - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
  - C. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
    1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.
- 3.4 ADJUSTING AND CLEANING
- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
  - B. Remove grout and other bonding material from hollow metal work immediately after installation.
  - C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
  - D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

**END OF SECTION**

## SECTION 083113

### ACCESS DOORS AND FRAMES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes access doors and frames for walls and ceilings.

##### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For access doors and frames.

##### 1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing and inspecting agency.
  - 1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, section 5.2.3.1.

##### 1.4 CLOSEOUT SUBMITTALS

- A. Record Documents: For fire-rated doors, list of applicable room name and number in which access door is located.

##### 1.5 QUALITY ASSURANCE

- A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:
  - 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

#### PART 2 - PRODUCTS

##### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, according to NFPA 252 or UL 10B.

##### 2.2 ACCESS DOORS AND FRAMES

- A. Flush Access Doors with Concealed Flanges:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Acudor Products, Inc.
    - b. Babcock-Davis.
    - c. J. L. Industries; a division of Activar Construction Products Group.
    - d. Karp Associates, Inc.
    - e. Larsen's Manufacturing Company.
    - f. Milcor Inc.
    - g. Nystrom, Inc.
  - 2. Description: Face of door flush with frame; with concealed flange for gypsum board installation and concealed hinge.
  - 3. Locations: Wall and ceiling.
  - 4. Door Size: As indicated.
  - 5. Uncoated Steel Sheet for Door: Nominal 0.060 inch (1.52 mm), 16 gage, factory primed.
  - 6. Stainless Steel Sheet for Door: Nominal 0.062 inch (1.59 mm), 16 gage, ASTM A480/A480M No. 4 finish.
  - 7. Frame Material: Same material and thickness as door.
  - 8. Latch and Lock: Cam latch, screwdriver operated.

- B. Recessed Access Doors with Concealed Flanges :
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Acudor Products, Inc.
    - b. Babcock-Davis.
    - c. Bauco Access Panel Solutions Inc.
    - d. J. L. Industries; a division of Activar Construction Products Group.
    - e. Karp Associates, Inc.
    - f. Larsen's Manufacturing Company.
    - g. Milcor Inc.
    - h. Nystrom, Inc.
  2. Description: Door face recessed 5/8 inch (16 mm) for gypsum board infill; with concealed flange for gypsum board installation and concealed hinge.
  3. Locations: Ceiling.
  4. Door Size: As indicated.
  5. Uncoated Steel Sheet for Door: Nominal 0.060 inch (1.52 mm), 16 gage, factory primed.
  6. Stainless Steel Sheet for Door: Nominal 0.062 inch (1.59 mm), 16 gage, ASTM A480/A480M No. 4 finish.
  7. Latch and Lock: Cam latch, screwdriver operated.

## 2.3 FIRE-RATED ACCESS DOORS AND FRAMES

- A. Fire-Rated, Flush Access Doors with Concealed Flanges:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Acudor Products, Inc.
    - b. Babcock-Davis.
    - c. J. L. Industries; a division of Activar Construction Products Group.
    - d. Karp Associates, Inc.
    - e. Larsen's Manufacturing Company.
    - f. Milcor Inc.
    - g. Nystrom, Inc.
  2. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal; with concealed flange for gypsum board installation, self-closing door, and concealed hinge.
  3. Locations: Wall.
  4. Door Size: As indicated.
  5. Fire-Resistance Rating: Not less than that of adjacent construction.
  6. Temperature-Rise Rating: 450 deg F (250 deg C) at the end of 30 minutes.
  7. Uncoated Steel Sheet for Door: Nominal 0.036 inch (0.91 mm), 20 gage, factory primed.
  8. Frame Material: Same material, thickness, and finish as door.
  9. Latch and Lock: Self-closing, self-latching door hardware, operated by knurled-knob.

## 2.4 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879/A879M, with cold-rolled steel sheet substrate complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.
- C. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666, Type 304. Remove tool and die marks and stretch lines, or blend into finish.
- D. Frame Anchors: Same material as door face.
- E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

## 2.5 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
  - 1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.
- D. Latch and Lock Hardware:
  - 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.

## 2.6 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
  - 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
- E. Stainless Steel Finishes:
  - 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
  - 2. Polished Finish: ASTM A480/A480M No. 4 finish. Grind and polish surfaces to produce uniform finish, free of cross scratches.
  - 3. Run grain of directional finishes with long dimension of each piece.
    - a. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.

### 3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Owner will engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
  - 1. Fire-Rated Door Inspections: Inspect each fire-rated access door in accordance with NFPA 80, section 5.2.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated access door indicating compliance with each item listed in NFPA 80.

### 3.4 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

3.5 SCHEDULE

- A. Provide access doors where indicated and in the following locations:
  - 1. Access required by code.
  - 2. Access required for servicing operable, adjustable, or resettable fire suppression, plumbing, mechanical, electrical, life safety, security, and communication systems.
- B. Sizes: Provide the following unless noted otherwise:
  - 1. Ceilings and Soffits: 24 inches by 24 inches minimum.
  - 2. Toilet Rooms: 12 inches by 12 inches minimum at each fixture chase wall.
- C. Materials:
  - 1. Uncoated steel sheet unless noted otherwise.
  - 2. Stainless Steel:
    - a. Toilet rooms, locker rooms, operating rooms, sterile rooms.
    - b. Walls scheduled to receive tile finish, epoxy paint, or FRP panels.

**END OF SECTION**

## SECTION 088000

### GLAZING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes:
  - 1. Glass for windows.
  - 2. Glazing sealants and accessories.
- B. Related Requirements:
  - 1. Section 134900 "Radiation Protection" for lead-lined glazing.

##### 1.2 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

##### 1.3 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

##### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Review temporary protection requirements for glazing during and after installation.

##### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.
- C. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch (300-mm) lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Delegated Design: Provide shop drawings signed and sealed by a structural engineer licensed to practice in the location of the project, indicating ability of system and attachment to supporting construction to resist indicated or code required loads.

##### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For glass.
- C. Preconstruction adhesion and compatibility test report.
- D. Sample Warranties: For special warranties.

##### 1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- E. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
  - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
  - 1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
  - 2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
  - 3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
  - 4. Schedule enough time for testing and analyzing results to prevent delaying the Work.
  - 5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

#### 1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
  - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C).

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Cardinal Glass Industries.
  - 2. Guardian Industries Corp.; SunGuard.
  - 3. Oldcastle BuildingEnvelope™.
  - 4. Pilkington North America.
  - 5. Vitro (Formerly PPG).
- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
  - 1. Obtain tinted glass from single source from single manufacturer.
  - 2. Obtain reflective-coated glass from single source from single manufacturer.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

## 2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.
- C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
  - 1. Design Wind Pressures: As indicated on Drawings.
  - 2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
  - 3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
  - 1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
  - 2. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
  - 3. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
  - 4. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

## 2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. GANA Publications: "Glazing Manual."
  - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
  - 1. Minimum Glass Thickness for Exterior Lites: 6 mm.
  - 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

## 2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
  - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.



- C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
  - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

## 2.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
  - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
  - 2. Perimeter Spacer: Manufacturer's standard spacer material and construction.
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) Technoform Glass Insulation NA, Inc.
      - 2) Thermix; a brand of Ensinger USA.
  - 3. Desiccant: Molecular sieve or silica gel, or a blend of both.

## 2.6 GLAZING SEALANTS

- A. General:
  - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Dow Corning Corporation; 790.
    - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
    - c. Bondaflex Sil 290.
    - d. Pecora Corporation; 890NST.
    - e. Sikasil WS-290.
    - f. Tremco Incorporated; Spectrem 1

## 2.7 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
  - 1. AAMA 804.3 tape, where indicated.
  - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

## 2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

## 2.9 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
  - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
    - a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  - 2. Presence and functioning of weep systems.
  - 3. Minimum required face and edge clearances.
  - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

### 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

#### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

#### 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

#### 3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.7 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
  - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

### 3.8 MONOLITHIC GLASS SCHEDULE

- A. Glass Type : Clear annealed float glass.
  - 1. Minimum Thickness: 6 mm.
- B. Glass Type : Clear fully tempered float glass.
  - 1. Minimum Thickness: 6 mm.
  - 2. Safety glazing required.

**END OF SECTION**

## SECTION 092216

### NON-STRUCTURAL METAL FRAMING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Non-load-bearing steel framing systems for interior partitions.
  - 2. Suspension systems for interior ceilings and soffits.
  - 3. Grid suspension systems for gypsum board ceilings.

##### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Span and Deflection Design Criteria: Provide height to load deflection charts showing studs supplied conform to deflection limit scheduled and allowed per ASTM C 754.
  - 1. Mark on chart(s) showing all major partitions scheduled conformance with criteria.
  - 2. Submit manufacturer's certification of stud size, thickness, and spacing complying with performance requirements and selections made by architect are correct for application shown.

##### 1.3 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of code-compliance certification for studs and tracks.
- B. Evaluation Reports: For firestop tracks post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

##### 1.4 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association or the Steel Stud Manufacturers Association.

##### 1.5 SEQUENCING

- A. Coordinate placement of concealed internal wall reinforcement, such as backing plates, for items to be attached to metal support systems.
- B. Coordinate installation of ceiling and soffit suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorage to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.
- C. Furnish concrete inserts, and other devices indicated, to other trades for installation well in advance of time needed for coordination with other construction.

##### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI S202 "Code of Standard Practice."

#### PART 2 - PRODUCTS

##### 2.1 PERFORMANCE REQUIREMENTS

- A. Design framing systems in accordance with AISI S220, "North American Specification for the Design of Cold-Formed Steel Framing - Nonstructural Members" and ASTM C645, Section 10, unless otherwise indicated.
- B. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

- C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- D. Horizontal Deflection:
  - 1. Minimum Base-Metal Thickness: 25 gage unless indicated otherwise on Drawings or below.
  - 2. Interior Metal Stud/Gypsum Board Assemblies, Typical Locations: Withstand lateral loading (air pressure) of 5 psf with deflection limit not more than L/240 of partition height.
  - 3. Interior Metal Stud/Gypsum Board Assemblies at Atriums, Lobbies, Service Corridors, Exit Corridors, Elevator Lobbies, Vertical Shafts, and walls receiving plaster veneer: Withstand lateral loading (air pressure) of 7.5 psf with deflection limit not more than L/360 of partition height.
  - 4. Interior Metal Stud/Gypsum Board Assemblies at Locations with Ceramic Tile or Other Hard Surface Finishes: Withstand typical lateral loading (air pressure) with deflection limit not more than L/360 of partition height, minimum 22 gage studs at 16 inches on center.
  - 5. Where wall mounted equipment, woodwork, and casework items are indicated or elsewhere as shown on Drawings, provide minimum 16 gage studs.
  - 6. Where bumper or guard rails are indicated, provide minimum 0.033 inches (22-gage) thick studs.
  - 7. At jambs of openings provide two minimum 20 gage studs.
  - 8. Ceilings: At ceilings using mold-mildew resistant gypsum framing to be 16 inches o.c. for 5/8 inch gypsum.
  - 9. Refer to Division 05 for stud framing which is exposed to wind loads and for studs carrying heavy vertical loads, such as, cement plaster, manufactured stone masonry, stone tile thicker than 3/4 inch, etc.

## 2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with AISI S220 and ASTM C645 for conditions indicated.
  - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
  - 2. Protective Coating: Comply with AISI S220 and ASTM A 653/A 653M, G40 (Z120) or coating with equivalent corrosion resistance of ASTM A653/A653M, G40 (Z120), hot-dip galvanized unless otherwise indicated. ,
    - a. Coating roll-formed from steel complying with mechanical and chemical requirements of ASTM A1003 with a zinc-based coating.
    - b. Coatings shall demonstrate equivalent corrosion resistance with an evaluation report acceptable to authorities having jurisdiction
- B. Studs and Tracks: AISI S220 and ASTM C 645, Section 10
  - 1. Steel Studs and Tracks:
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) CEMCO.
      - 2) ClarkDietrich
      - 3) Custom Stud.
      - 4) MarinoWARE.
      - 5) MBA Building Supplies.
      - 6) MRI Steel Framing, LLC.
      - 7) Phillips Manufacturing Co.
      - 8) SCAFCO Steel Stud Company.
      - 9) Steel Network, Inc. (The).
      - 10) Telling Industries
    - b. Minimum Base-Metal Thickness: As required by performance requirements for horizontal deflection .
    - c. Depth: As indicated on Drawings .

- C. Slip-Type Head Joints: Where studs are continuous from floor to structure above, provide one of the following:
1. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) BlazeFrame Industries.
      - 2) CEMCO; California Expanded Metal Products Co.
      - 3) ClarkDietrich Building Systems.
      - 4) MarinoWARE.
      - 5) MBA Building Supplies.
      - 6) Metal-Lite.
      - 7) Perfect Wall, Inc.
      - 8) SCAFCO Steel Stud Company.
      - 9) Steel Network, Inc. (The).
      - 10) Telling Industries.
- D. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. BlazeFrame Industries.
    - b. CEMCO; California Expanded Metal Products Co.
    - c. ClarkDietrich Building Systems.
    - d. Fire Trak Corp.
    - e. MarinoWARE.
    - f. Metal-Lite.
    - g. Perfect Wall, Inc.
    - h. SCAFCO Steel Stud Company.
    - i. Steel Network, Inc. (The).
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. ClarkDietrich Building Systems.
    - b. MarinoWARE.
    - c. MRI Steel Framing, LLC.
    - d. SCAFCO Steel Stud Company.
  2. Minimum Base-Metal Thickness: 0.0179 inch (0.455 mm).
- F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch (1.367-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. ClarkDietrich Building Systems.
    - b. MarinoWARE.
    - c. MRI Steel Framing, LLC.
    - d. SCAFCO Steel Stud Company.
  2. Depth: As indicated on Drawings.
  3. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.
- G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. ClarkDietrich Building Systems.
    - b. MarinoWARE.
    - c. MRI Steel Framing, LLC.
    - d. SCAFCO Steel Stud Company.

2. Minimum Base-Metal Thickness: 0.0179 inch (0.455 mm).
  3. Depth: 7/8 inch (22.2 mm).
- H. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. ClarkDietrich Building Systems.
    - b. MarinoWARE.
    - c. MRI Steel Framing, LLC.
    - d. SCAFCO Steel Stud Company
  2. Configuration: Asymmetrical.
- I. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: 3/4 inch (19 mm).
  2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch (0.8 mm).
  3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire
- J. Partial Wall Framing Connection: Connector designed to support out-of-plane loading of cantilevered partial wall systems that are unsupported at the top track.
1. ClarkDietrich Pony Wall or comparable product.
  2. Minimum Base-Steel Thickness: 0.0966 inch (2.45 mm).

### 2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
- B. Hanger Attachments to Concrete:
1. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 as appropriate for the substrate.
    - a. Uses: Securing hangers to structure.
    - b. Type: Torque-controlled, expansion anchor.
    - c. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
    - d. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).
  2. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.
- D. Flat Hangers: Steel sheet, 1 by 3/16 inch (25 by 5 mm) by length indicated.
- E. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch (1.367 mm) and minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: As indicated on Drawings.
- F. Furring Channels (Furring Members):
1. Cold-Rolled Channels: 0.0538-inch (1.367-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.
  2. Steel Studs and Tracks: AISI S220 and ASTM C 645.
    - a. Minimum Base-Metal Thickness: 0.0179 inch (0.455 mm).
    - b. Depth: 1-5/8 inches (41 mm).
  3. Embossed Steel Studs and Tracks: ASTM C 645.
    - a. Minimum Base-Metal Thickness: As indicated on Drawings.
    - b. Depth: As indicated on Drawings.



4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.
    - a. Minimum Base-Metal Thickness: 0.0179 inch (0.455 mm).
  5. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.
    - a. Configuration: Asymmetrical.
  - G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
    1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      - a. Armstrong World Industries, Inc.
      - b. ROCKWOOL International (formerly Chicago Metallic Corporation).
      - c. United States Gypsum Company.
- 2.4 AUXILIARY MATERIALS
- A. General: Provide auxiliary materials that comply with referenced installation standards.
    1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
  - B. Isolation Strip at Exterior Walls: Provide one of the following:
    1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 PREPARATION**

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
  1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
  1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (610 mm) o.c.
  2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

#### **3.3 INSTALLATION, GENERAL**

- A. Installation Standard: ASTM C 754.
  1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.

- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Single-Layer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
  - 2. Multilayer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
  - 3. Tile Backing Panels: As required by horizontal deflection performance requirements unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
  - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs at each jamb unless otherwise indicated.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
    - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
  - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
  - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
    - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
  - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
  - 6. Curved Partitions:
    - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
    - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches (150 mm) o.c.
- E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

### 3.5 INSTALLING CEILING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Hangers: 48 inches (1219 mm) o.c.
  - 2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
  - 3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
    - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
  3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  5. Do not attach hangers to steel roof deck.
  6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
  7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
  8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

**END OF SECTION**

## SECTION 092900

### GYPSUM BOARD

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Interior gypsum board.
- B. Related Requirements:
  - 1. Section 134900 "Radiation Protection" for lead-lined gypsum board.

##### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

##### 1.3 QUALITY ASSURANCE

- A. Mockups: Build mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
  - 1. Build mockups for the following:
    - a. Each level of gypsum board finish indicated for use in exposed locations.
  - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
  - 3. Simulate finished lighting conditions for review of mockups.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

##### 1.4 DELIVERY, STORAGE AND HANDLING

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

##### 1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

#### PART 2 - PRODUCTS

##### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

##### 2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

## 2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. American Gypsum; 5/8 inch FireBloc Type X Gypsum Wallboard.
    - b. CertainTeed Corporation; Type X Gypsum Board.
    - c. Continental Building Products, LLC; Firecheck Type X.
    - d. Georgia-Pacific Building Products; ToughRock Fireguard X Gypsum Board.
    - e. National Gypsum Company; Gold Bond Brand Fire-Shield Gypsum Board.
    - f. PABCO Gypsum; Flame Curb Type X.
    - g. United States Gypsum Company; USG Sheetrock Brand Firecode X Gypsum Panels.
  - 2. Thickness: 5/8 inch (15.9 mm).
  - 3. Long Edges: Tapered.
- B. Abuse-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. American Gypsum; 5/8" M-Bloc AR Type X with Mold & Moisture Resistance.
    - b. CertainTeed Corporation; AirRenew Extreme Abuse.
    - c. Continental Building Products, Protecta AR 100 Type X with Mold Defense.
    - d. Georgia-Pacific Building Products; ToughRock Fireguard X Abuse-Resistant Gypsum Board.
    - e. National Gypsum Company; eXP Interior Extreme AR.
    - f. PABCO Gypsum; Abuse Curb.
    - g. United States Gypsum Company;USG Sheetrock Brand Mold Tough Abuse-Resistant Firecode X.
  - 2. Core:5/8 inch (15.9 mm), Type X.
  - 3. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
  - 4. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
  - 5. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
  - 6. Long Edges: Tapered.
  - 7. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

## 2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
  - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
  - 2. Shapes:
    - a. Cornerbead.
    - b. Bullnose bead.
    - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
    - d. L-Bead: L-shaped; exposed long flange receives joint compound.
    - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
    - f. Expansion (control) joint.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Fry Reglet Corp.
    - b. Gordon, Inc.
    - c. Pittcon Industries.
  - 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
  - 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

## 2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  - 1. Interior Gypsum Board: Paper.

- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
  - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
  - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
    - a. Use setting-type compound for installing paper-faced metal trim accessories.
  - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
  - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.

## 2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
  - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
- C. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
  - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- D. Electrical Box Pads: Putty Pads: Moldable non-curing one component, intumescent, fire-rated material for through-penetration fire stop systems and sound attenuation systems; self-adhering; 1/8-inch thick minimum.
- E. Acoustical Sealant: Refer to Section 079219 "Acoustical Joint Sealants."
- F. Thermal Insulation: As specified in Section 098116 "Acoustical Blanket Insulation."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 ELECTRICAL BOX PADS FOR SMOKE / FIRE-RATED AND STC-RATED WALLS

- A. Prior to installing wallboards, install electrical box pads in accordance with manufacturer's written instructions.
- B. Overlap front edge of box so that pad will be compressed around edges of box as gypsum panels are installed.

### 3.3 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- C. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- D. Form control and expansion joints with space between edges of adjoining gypsum panels.
- E. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- F. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- G. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- H. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- I. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

### 3.4 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  1. Type X: Vertical surfaces unless otherwise indicated.
- B. Single-Layer Application:
  1. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
  2. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
  1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
  2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

### 3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
  1. Cornerbead: Use at outside corners unless otherwise indicated.
  2. Bullnose Bead: Use where indicated.
  3. LC-Bead: Use at exposed panel edges.
  4. L-Bead: Use where indicated.
  5. U-Bead: Use where indicated.
- D. Aluminum Trim: Install in locations indicated on Drawings.

### 3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  - 2. Level 2: Where indicated on Drawings.
  - 3. Level 3: Where indicated on Drawings.
  - 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

### 3.7 RATED PARTITION IDENTIFICATION

- A. At fire-rated wall and smoke partition assemblies, provide an identification of wall rating in 4-inch high stenciled block letters in red paint. Space identifications 12 feet on center maximum, 4 feet from corners maximum, above ceiling. Provide identification on both sides of wall.
- B. Partition Identification Text: Apply the following, as applicable:
  - 1. WARNING: SMOKE PARTITION – PROPERLY SEAL ALL OPENINGS.
  - 2. WARNING: 1-HOUR SMOKE BARRIER – PROPERLY SEAL ALL OPENINGS.
  - 3. WARNING: 1-HOUR FIRE PARTITION – PROPERLY SEAL ALL OPENINGS.
  - 4. WARNING: 1-HOUR FIRE BARRIER – PROPERLY SEAL ALL OPENINGS.
  - 5. WARNING: 2-HOUR FIRE WALL – PROPERLY SEAL ALL OPENINGS.
  - 6. WARNING: 2-HOUR FIRE BARRIER – PROPERLY SEAL ALL OPENINGS.
- C. Refer to Section 099123 "Interior Painting" for painting requirements.
  - 1. Use interior semi-gloss, latex, low VOC paint.

### 3.8 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

**END OF SECTION**



## SECTION 095113

### ACOUSTICAL PANEL CEILINGS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

##### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
  - 1. Acoustical Panels: Samples of each type, color, pattern, and texture in manufacturer's standard sample size, minimum 6 inches square.

##### 1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Ceiling suspension-system members.
  - 2. Structural members to which suspension systems will be attached.
  - 3. Method of attaching hangers to building structure.
    - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
  - 4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
  - 5. Size and location of initial access modules for acoustical panels.
  - 6. Items penetrating finished ceiling and ceiling-mounted items including the following:
    - a. Lighting fixtures.
    - b. Diffusers.
    - c. Grilles.
    - d. Speakers.
    - e. Sprinklers.
    - f. Access panels.
    - g. Perimeter moldings.
  - 7. Minimum Drawing Scale: 1/4 inch = 1 foot (1:48).
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

##### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

##### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Acoustical Ceiling Units: Full-size panels equal to 2percent of quantity installed.
  - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
  - 3. Hold-Down Clips: Equal to 2percent of quantity installed.

#### 1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  - 1. Build mockup of typical ceiling area as directed by Architect.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

#### 1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: Class A according to ASTM E 1264.
  - 2. Smoke-Developed Index: 450 or less.

#### 2.3 ACOUSTICAL PANELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Armstrong World Industries, Inc.
  - 2. CertainTeed Corp.
  - 3. Rockfon (Roxul, Inc.)
  - 4. USG Interiors, Inc.; Subsidiary of USG Corporation.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Panels: As scheduled.
- D. Color: As scheduled.

#### 2.4 METAL SUSPENSION SYSTEM

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Armstrong World Industries, Inc.
  - 2. CertainTeed Corp.
  - 3. Chicago Metallic Corporation.
  - 4. USG Interiors, Inc.; Subsidiary of USG Corporation.
- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.

- C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 (Z90) coating designation; with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.
  - 1. Structural Classification: Intermediate -duty system.
  - 2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
  - 3. Face Design: Flat, flush.
  - 4. Cap Material: Cold-rolled steel or aluminum.
  - 5. Cap Finish: Painted white.

## 2.5 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
  - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
  - 2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- (2.69-mm-) diameter wire.
- C. Hold-Down Clips: Manufacturer's standard hold-down.
- D. Clean-Room Gasket System: Where indicated, provide manufacturer's standard system, including manufacturer's standard gasket and related adhesives, tapes, seals, and retention clips, designed to seal out foreign material from and maintain positive pressure in clean room.

## 2.6 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Armstrong World Industries, Inc.
  - 2. CertainTeed Corporation.
  - 3. Chicago Metallic Corporation.
  - 4. Fry Reglet Corporation.
  - 5. Gordon, Inc.
  - 6. United States Gypsum Company.
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
  - 1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
  - 2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
  - 3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements.
  - 1. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils (0.04 mm). Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

### 3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.
- B. Suspend ceiling hangers from building's structural members and as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
  - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  - 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
  - 6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
  - 7. Do not attach hangers to steel deck tabs.
  - 8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  - 9. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
  - 10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
  - 1. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends. Miter corners accurately and connect securely.
  - 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
  - 1. Arrange directionally patterned acoustical panels as follows:
    - a. As indicated on reflected ceiling plans.
  - 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
  - 3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
6. Install hold-down clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.
  - a. Hold-Down Clips: Space 24 inches (610 mm) o.c. on all cross runners.

#### 3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m), non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m), non-cumulative.

#### 3.5 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

**END OF SECTION**

## SECTION 096513

### RESILIENT BASE AND ACCESSORIES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Thermoplastic-rubber base.

##### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches (300 mm) long.
- C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

##### 1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

##### 1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  - 1. Coordinate mockups in this Section with mockups specified in other Sections.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

##### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

##### 1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Install resilient products after other finishing operations, including painting, have been completed.

## **PART 2 - PRODUCTS**

### **2.1 THERMOPLASTIC-RUBBER BASE**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Armstrong World Industries, Inc.
  - 2. Johnsonite; a Tarkett company.
  - 3. Nora Systems, Inc.
  - 4. Roppe Corporation, USA.
- B. Basis-of-Design Product: As scheduled.
- C. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
  - 1. Group: I (solid, homogeneous).
  - 2. Style and Location: As scheduled
- D. Thickness: 0.125 inch (3.2 mm).
- E. Height: As indicated on Drawings.
- F. Lengths: Coils in manufacturer's standard length.
- G. Outside Corners: Job formed.
- H. Inside Corners: Job formed.
- I. Colors: As scheduled.

### **2.2 INSTALLATION MATERIALS**

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

### **3.2 PREPARATION**

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until materials are the same temperature as space where they are to be installed.
  - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

### **3.3 RESILIENT BASE INSTALLATION**

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Job-Formed Corners:
  - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.
    - a. Form without producing discoloration (whitening) at bends.
  - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.
    - a. Miter corners to minimize open joints.

### 3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

### 3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
  - 1. Remove adhesive and other blemishes from surfaces.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

**END OF SECTION**



## SECTION 096519

### RESILIENT TILE FLOORING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Rubber floor tile.

##### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of resilient floor tile.
  - 1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
  - 2. Show details of special patterns.
- C. Samples for Verification: Full-size units of each color and pattern of floor tile required.
- D. Product Schedule: For floor tile. Use same designations indicated on Drawings.

##### 1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

##### 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

##### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
  - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  - 1. Coordinate mockups in this Section with mockups specified in other Sections.
    - a. Size: Minimum 100 sq. ft. (9.3 sq. m) for each type, color, and pattern in locations directed by Architect.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

##### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

##### 1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.

- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

## **PART 2 - PRODUCTS**

### **2.1 RUBBER FLOOR TILE**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Johnsonite; a Tarkett company.
  - 2. Mannington Mills, Inc.
  - 3. Nora Systems, Inc.
- B. Basis-of-Design Product: As scheduled.
- C. Tile Standard: ASTM F 1344, Class I-A, Homogeneous Rubber Tile, solid color.
- D. Thickness: 0.125 inch (3.2 mm).
- E. Size: As scheduled.
- F. Seamless-Installation Method: Heat welded.
- G. Colors and Patterns: As scheduled.

### **2.2 INSTALLATION MATERIALS**

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Seamless-Installation Accessories:
  - 1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
    - a. Colors: As scheduled.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.

4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
  - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
  - b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
  1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

### 3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  1. Lay tiles in pattern indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
  1. Lay tiles in pattern of colors and sizes indicated.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- H. Seamless Installation:
  1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and heat weld with welding bead to fuse sections permanently into a seamless flooring installation. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.

### 3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
  1. Remove adhesive and other blemishes from surfaces.
  2. Sweep and vacuum surfaces thoroughly.
  3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover floor tile until Substantial Completion.

**END OF SECTION**

## SECTION 098116

### ACOUSTICAL BLANKET INSULATION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Concealed building insulation.

##### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

##### 1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 1. Surface-Burning Characteristics: ASTM E 84.
  - 2. Fire-Resistance Ratings: ASTM E 119.
  - 3. Combustion Characteristics: ASTM E 136.

##### 1.4 DELIVERY, STORAGE, AND HANDLING

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

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Glass-Fiber Insulation:
    - a. CertainTeed Corporation.
    - b. Johns Manville Corporation.
    - c. Owens Corning.
  - 2. Slag-Wool-/Rock-Wool-Fiber Insulation:
    - a. Fibrex Insulations Inc.
    - b. Owens Corning.
    - c. Thermafiber.

##### 2.2 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
  - 1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.
- B. Unfaced Mineral-Fiber Blanket Insulation (in walls): ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- C. Unfaced, Flexible Glass-Fiber Blanket Insulation (above ceilings): ASTM C 612, Type IA; ASTM C 553, Types I, II, and III; or ASTM C 665, Type I; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; and of the following properties:
  - 1. Nominal density of 1.0 lb/cu. ft., thermal resistivity of 3.7 deg F x h x sq. ft./Btu x in. at 75 deg F.
  - 2. Nominal density of not less than 1.5 lb/cu. ft. nor more than 1.7 lb/cu. ft., thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F.
  - 3. Combustion Characteristics: Passes ASTM E 136.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 PREPARATION**

- A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

#### **3.3 INSTALLATION, GENERAL**

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

#### **3.4 INSTALLATION OF GENERAL BUILDING INSULATION**

- A. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
  - 1. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
  - 2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.

#### **3.5 PROTECTION**

- A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

**END OF SECTION**

## SECTION 099123

### INTERIOR PAINTING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates.

##### 1.2 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
  - 1. Indicate VOC content.
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
  - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
  - 2. Apply coats on Samples in steps to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
- C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

##### 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

##### 1.5 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
    - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
    - b. Other Items: Architect will designate items or areas required.
  - 2. Final approval of color selections will be based on mockups.
    - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Behr Process Corporation.
  - 2. PPG Architectural Coatings.
  - 3. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

- A. Material Compatibility:
  - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- B. Colors: As scheduled.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
  - 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
  - 2. Testing agency will perform tests for compliance with product requirements.
  - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

**PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- F. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

### 3.3 SURFACE PREPARATION OF PREVIOUSLY COATED SURFACES

- A. General:
  - 1. Remove cracked and deteriorated sealants and caulking.
  - 2. Remove chalk deposits and loose, blistered, peeling, scaling, or crazed finish to bare base material or sound substrate by scraping and sanding.
  - 3. Wash surfaces with solution of TSP to remove wax, oil, grease, and other foreign material; rinse, and allow to dry. Exercise caution that TSP solution does not soften existing coating.
  - 4. Abrade glossy surfaces by sanding or wiping with liquid de-glosser.
  - 5. Remove mildew as specified above.
  - 6. Test compatibility of existing coatings by applying new coating to small, inconspicuous area. If new coatings lift or blister existing coatings, request recommendation from Architect.
  - 7. Apply specified primer to surfaces scheduled to receive coatings.
- B. Gypsum Wallboard:
  - 1. Fill cracks and voids with spackling compound.
  - 2. Apply primer over bare surfaces and newly applied texture coatings.
- C. Metal:
  - 1. Remove rust from surfaces to bare metal in accordance with SP3 "Power Tool Cleaning".
  - 2. Exercise care not to remove galvanizing.
  - 3. Complete preparation as specified for new work.

### 3.4 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.



- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
  - D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
  - E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
    - 1. Paint the following work where exposed in equipment rooms:
      - a. Equipment, including panelboards and switch gear.
      - b. Uninsulated metal piping.
      - c. Uninsulated plastic piping.
      - d. Pipe hangers and supports.
      - e. Metal conduit.
      - f. Plastic conduit.
      - g. Tanks that do not have factory-applied final finishes.
      - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    - 2. Paint the following work where exposed in occupied spaces:
      - a. Equipment, including panelboards.
      - b. Uninsulated metal piping.
      - c. Uninsulated plastic piping.
      - d. Pipe hangers and supports.
      - e. Metal conduit.
      - f. Plastic conduit.
      - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
      - h. Other items as directed by Architect.
    - 3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.
  - F. Rated Wall Assemblies Identification:
    - 1. Identify fire-rated wall assemblies with stenciled lettering on wall surface above ceiling line.
    - 2. Provide stenciled block letters in red to identify each rated wall assembly.
    - 3. Refer to Section 0929000 "Gypsum Board" and Life Safety Legend on Code Compliance Plan.
- 3.5 FIELD QUALITY CONTROL
- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
    - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
    - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.
- 3.6 CLEANING AND PROTECTION
- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
  - B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
  - C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
  - D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.7 INTERIOR PAINTING SCHEDULE

- A. Gypsum Board, Flat Latex-Based Acrylic Finish: 2 finish coats over a primer.
  - 1. Sherwin-Williams:
    - a. Primer: Roller applied latex texturing compound, ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
    - b. Second Coat: PorMar 200 Zero VOC Interior Latex Flat, B30-2600 Series 1.6 mils DFT.
    - c. Third Coat: Same as second coat.
- B. Gypsum Board, Semi-Gloss, Epoxy, Low VOC: 2 finish coats over a primer.
  - 1. Sherwin-Williams:
    - a. Primer: ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
    - b. Second Coat: Pre-Catalyzed Water Based Epoxy Semi-Gloss, K46-150 Series, 1.5 mils DFT.
    - c. Third Coat: Same as second coat.
- C. Gypsum Board, Semi-Gloss, Low Odor: 2 finish coats over a primer.
  - 1. Sherwin-Williams:
    - a. Primer: ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
    - b. Second Coat: PorMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series 1.6 mils DFT.
    - c. Third Coat: Same as second coat.
- D. Gypsum Board, Eggshell, Low Odor: 2 finish coats over a primer.
  - 1. Sherwin-Williams:
    - a. Primer: ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
    - b. Second Coat: PorMar 200 Zero VOC Interior Latex Eg-Shel, B20-2600 Series 1.7 mils DFT.
    - c. Third Coat: Same as second coat.
  - 2. Sherwin-Williams: Alternate for Health Care
    - a. Primer: Roller applied latex texturing compound, ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
    - b. Second Coat: Roller Applied – Paint Shield Interior Latex Eg-Shel Microbicidal Paint Coating, EPA Reg.#64695-1, D12W51 1.8 mils DFT.
    - c. Third Coat: Same as second coat.
- E. Ferrous Metal, Epoxy, Semi-Gloss, Low VOC: 2 finish coats over a primer. Wherever wall surfaces are scheduled to receive epoxy paint, paint doors and frames within the wall with epoxy.
  - 1. Sherwin-Williams:
    - a. Primer: Pro Industrial Pro-Cryl Universal Primer, B66-310 Series 2.0 - 4.0 mils DFT.
    - b. Second Coat: Water Based Catalyzed Epoxy, B70-200 Series, 3.0 mils DFT.
    - c. Third Coat: Same as second coat.

**END OF SECTION**

## SECTION 101400

### SIGNAGE

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Identifying devices where shown on the Drawings complete and as specified including the following:
    - a. Interior code required signs.

##### 1.2 SUBMITTALS

- A. Product Data: Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.
- B. Shop Drawings: Provide shop drawings for fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, accessories, layout, and installation details.

##### 1.3 QUALITY ASSURANCE

- A. Single-Source Responsibility: For each separate type of sign required, obtain signs from one source from a single manufacturer.
- B. Manufacturer shall have a minimum of five years experience in the manufacturing of signs specified.
- C. Codes and Standards:
  - 1. Panel signs shall have 1/32-inch raised copy and grade 2 Braille, and shall comply with all existing federal, state, and local accessibility standards.
  - 2. Code and Standards: Comply with American with Disabilities Act of 1990, Title 3 Provisions, Public Accommodations and Commercial Facilities. Updated March 15, 2012.
  - 3. Comply with the State of Texas Accessibility Standards, 2012 edition, as administered by the Texas Department of Licensing and Regulation.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Best Sign Systems, Montrose, Colorado.
  - 2. Mohawk Sign Systems, Schenectady, New York.
  - 3. Nelson-Harkins, Chicago, Illinois.
  - 4. ASI Signs, Dallas, Texas.

##### 2.2 ROOM SIGNAGE SYSTEMS

- A. Basis-of-Design Product: ASI Unframed SP Series Signs with requirements indicated for materials, thickness, finish colors, designs, shapes, sizes and details.
- B. Sign Face: Clear acrylic, 0.080-inch thick, matte first surface.
  - 1. Adhesive: Pressure sensitive adhesive film, second surface.
- C. Tactile Graphics and Text:
  - 1. Fabrication: Provide tactile copy and grade 2 Braille raised 1/32 inch minimum from plaque first surface by manufacturer's stratification process as follows:
    - a. Basis-of-Design Product: ASI Intouch, photo-mechanical method.
  - 2. Provide lettering and graphics precisely formed, uniformly opaque to comply with relevant ADA regulations and requirements indicated for size, style, spacing, content, position, and colors.

- D. Non-Tactile Graphics and Text:
  - 1. Fabrication options:
    - a. Basis-of-Design Product: ASI; Series SPE/SPJ: Non-tactile graphic plaque, no back plate.
  - 2. Text or graphic technique:
    - a. Screen process using subsurface method.
  - 3. Provide lettering and graphics precisely formed, uniformly opaque, and consistent in size, style, spacing, content, position, and colors.
- E. Overall Panel Size: Refer to Drawings.
- F. Panel Colors: As selected by Architect.
- G. Text or Graphic Colors: As selected by Architect.
- H. Letter styles, colors, letter sizes and layout position: As selected by Architect.
- I. Installation Method: System SA, silicone adhesive.

### **PART 3 - EXECUTION**

#### **3.1 DELIVERY AND STORAGE**

- A. Deliver and store identifying devices in protective wrappings until ready for installation. Install letters in protective wrappings and remove wrappings just prior to substantial completion.

#### **3.2 INSTALLATION**

- A. Install signs plumb, level and square and in proper planes with other work, at heights required by accessibility codes and standards.
- B. Anchor each plastic laminate sign with adhesive.
- C. Install signs with sufficient amount of foam tape for proper installation.
- D. Attach as recommended by sign manufacturer.
- E. Anchor each sign with adhesive.
- F. Coordinate arrival and installation of graphic signs with hardware installation. Graphic signs function as and are coordinated with the hardware as shown on the Drawings.
- G. Room name signs shall be placed on the public side of the door except where noted otherwise.
- H. Single Door Sign: Provide one sign as specified above, mounted to wall adjacent to door on knob side.
- I. Pair of Doors: Provide one sign as specified above, mounted to adjacent wall closest to active leaf of door. Do not install sign where it will be obstructed by door when door is in the 'open' position.
- J. Attachment: Mounting to surfaces shall be done by pressure sensitive frame double-faced tape. Signs shall be delivered to the project site with the tape in place and trimmed on each sign, but with the protective paper layer not removed. Paper layer shall be removed just prior to installation of signs.

#### **3.3 COORDINATION**

- A. Coordinate the installation of the identifying devices with the hardware manufacturer for lockset and knob leave outs as detailed and scheduled.

#### **3.4 DAMAGE**

- A. Any identifying device which is scratched or defaced will be rejected.

#### **3.5 CLEANING**

- A. Remove protective materials and clean all signs. Clean surfaces with plain water or water with soap or household detergent.

**END OF SECTION**

## SECTION 102600

### WALL AND DOOR PROTECTION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Corner guards.
  - 2. End-wall guards.

##### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For each type of wall and door protection showing locations and extent.
  - 1. Include plans, elevations, sections, and attachment details.
- C. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:
  - 1. Corner and End-Wall Guards: 12 inches (300 mm) long. Include example top caps.

##### 1.3 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type of exposed plastic material.

##### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.
  - 1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

##### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Wall-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, 96-inch- (2400-mm-) long units.
  - 2. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, 48-inch- (1200-mm-) long units.
  - 3. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

##### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
  - 1. Maintain room temperature within storage area at not less than 70 deg F (21 deg C) during the period plastic materials are stored.
  - 2. Keep plastic materials out of direct sunlight.
  - 3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F (21 deg C).
    - a. Store corner-guard covers in a vertical position.
    - b. Store wall-guard- covers in a horizontal position.

## 1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
    - b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
  - 2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain wall- and door-protection products of each type from single source from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 25 or less.
  - 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities.

### 2.3 CORNER GUARDS

- A. Surface-Mounted, Plastic-Cover Corner Guards: Manufacturer's standard assembly consisting of snap-on, resilient plastic cover installed over retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Balco, Inc.
    - b. Construction Specialties, Inc.
    - c. InPro Corporation (IPC).
    - d. Korogard Wall Protection Systems; a division of RJF International Corporation.
    - e. Musson Rubber Company.
    - f. Pawling Corporation.
  - 2. Basis-of-Design Product: As scheduled.
  - 3. Cover: Extruded rigid plastic, minimum 0.100-inch (2.5-mm) wall thickness; in dimensions and profiles indicated on Drawings.
    - a. Profile: Nominal 3-inch- (75-mm-) long leg and 1/4-inch (6-mm) corner radius .
    - b. Height: 8 feet (2.4 m).
    - c. Color and Texture: As scheduled.
  - 4. Continuous Retainer: Minimum 0.060-inch- (1.5-mm-) thick, one-piece, extruded aluminum.
  - 5. Retainer Clips: Manufacturer's standard impact-absorbing clips.
  - 6. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

### 2.4 END-WALL GUARDS

- A. Surface-Mounted, Plastic-Cover, End-Wall Guard: Manufacturer's standard assembly consisting of snap-on, resilient plastic cover installed over continuous retainer; including mounting hardware.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Balco, Inc.
    - b. Construction Specialties, Inc.
    - c. IPC Door and Wall Protection Systems; Division of InPro Corporation.
    - d. Korogard Wall Protection Systems; a division of RJF International Corporation.
    - e. Pawling Corporation.
  - 2. Basis-of-Design Product: As scheduled.

3. Cover: Extruded rigid plastic, minimum 0.100-inch (2.5-mm) wall thickness; as follows:
  - a. Profile: Nominal 3-inch- (75-mm-) long leg and 1/4-inch (6-mm) corner radius .
  - b. Height: 8 feet (2.4 m).
  - c. Color and Texture: As scheduled. .
4. Retainer: Minimum 0.060-inch- (1.5-mm-) thick, one-piece, extruded aluminum.
5. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

## 2.5 MATERIALS

- A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required, thickness as indicated.
- B. Polycarbonate Plastic Sheet: ASTM D 6098, S-PC01, Class 1 or Class 2, abrasion resistant; with a minimum impact-resistance rating of 15 ft.-lbf/in. (800 J/m) of notch when tested according to ASTM D 256, Test Method A.
- C. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- D. Adhesive: As recommended by protection product manufacturer.

## 2.6 FABRICATION

- A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.
- B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

## 2.7 FINISHES

- A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
  1. For wall and door protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing wall and door protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

### 3.3 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated on Drawings.

- C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.
  - 1. Provide anchoring devices and suitable locations to withstand imposed loads.
  - 2. Where splices occur in horizontal runs of more than 20 feet (6.1 m), splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches (305 mm) apart.
  - 3. Adjust end caps as required to ensure tight seams.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

**END OF SECTION**



## SECTION 102800

### TOILET, BATH, AND LAUNDRY ACCESSORIES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Public-use washroom accessories.

##### 1.2 COORDINATION

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

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
  - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
  - 1. Identify locations using room designations indicated.
  - 2. Identify accessories using designations indicated.

##### 1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

##### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

#### PART 2 - PRODUCTS

##### 2.1 PUBLIC-USE WASHROOM ACCESSORIES

- A. Accessories: As Scheduled on Drawings.

##### 2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.
- C. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

##### 2.3 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.
  - 1. Peened finish is not acceptable.

#### **3.2 ADJUSTING AND CLEANING**

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

**END OF SECTION**

## SECTION 123661.16

### SOLID SURFACING COUNTERTOPS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Solid surface material countertops.
  - 2. Solid surface material backsplashes.
  - 3. Solid surface material end splashes.
  - 4. Solid surface material apron fronts.

##### 1.2 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
  - 1. Show locations and details of joints.
  - 2. Show direction of directional pattern, if any.
- C. Samples for Verification: For the following products:
  - 1. Countertop material, 6 inches (150 mm) square.

##### 1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

##### 1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.
- C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.
  - 1. Build mockup of typical countertop as shown on Drawings.
  - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

##### 1.5 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

##### 1.6 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

#### PART 2 - PRODUCTS

##### 2.1 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Affinity Surfaces; a brand of Domain Industries, Inc.
    - b. Avonite Surfaces.
    - c. E. I. du Pont de Nemours and Company.
    - d. Formica Corporation.
    - e. LG Chemical, Ltd.

- f. Meganite Inc.
      - g. Samsung Chemical USA, Inc.
      - h. Swan Corporation (The).
      - i. Transolid Div of Trumbull Industries.
      - j. Wilsonart.
    - 2. Basis-of-Design Product: As scheduled.
    - 3. Type: Provide Standard type unless Special Purpose type is indicated.
    - 4. Colors and Patterns: As scheduled.
  - B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
  - C. Wire-Management Grommets: Circular, molded-plastic grommets and matching plastic caps with slot for wire passage.
    - 1. Products: Subject to compliance with requirements, provide the following:
      - a. Doug Mockett & Company, Inc.: TG Flip-Top Series.
    - 2. Outside Diameter: 2 inches (51-mm).
    - 3. Color: As selected by Architect from Manufacturer's full range.
  - D. Countertop Support Brackets: Steel, 18 inches by 24 inches, minimum 1,000 lb load limit, factory-applied primer for field painting in accordance with Section 099123 "Interior Painting."
    - 1. Acceptable Products:
      - a. A & M Hardware; Work Station Brackets.
- 2.2 COUNTERTOP FABRICATION
- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
    - 1. Grade: Custom.
  - B. Countertops: 1/2-inch- (12.7-mm-) thick, solid surface material.
  - C. Backsplashes: 1/2-inch- (12.7-mm-) thick, solid surface material with wood-trimmed edges.
  - D. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
    - 1. Fabricate with loose backsplashes for field assembly.
    - 2. Install integral sink bowls in countertops in the shop.
  - E. Joints: Fabricate countertops without joints.
  - F. Cutouts and Holes:
    - 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
      - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch (5 mm) into fixture opening.
    - 2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
    - 3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.
- 2.3 INSTALLATION MATERIALS
- A. Adhesive: Product recommended by solid surface material manufacturer.
  - B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m), 1/4 inch (6 mm) maximum. Do not exceed 1/64-inch (0.4-mm) difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- E. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- F. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Pre-drill holes for screws as recommended by manufacturer.
- G. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
  - 1. Seal edges of cutouts in particleboard subtops by saturating with varnish.
- H. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

**END OF SECTION**

## SECTION 134900

### RADIATION PROTECTION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes lead-lining for openings and partitions as required by the Physicist Reports.
  - 1. Lead sheet, strip, and plate.
  - 2. Lead-lined gypsum board.
  - 3. Lead glass.
  - 4. Lead-lined, observation-window frames.

##### 1.2 DEFINITIONS

- A. Lead Equivalence: The thickness of lead that provides the same attenuation (reduction of radiation passing through) as the material in question under the specified conditions.
  - 1. Lead equivalence specified for materials used in diagnostic x-ray rooms is as measured at 100 kV unless otherwise indicated.

##### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to radiation protection including, but not limited to, the following:
    - a. Sequence and schedule of radiation protection work in relation to other work.
    - b. Supplementary lead shielding at duct, pipe, and conduit penetrations of radiation protection.
    - c. Methods of attaching other construction and equipment to lead-lined finishes.
    - d. Notification procedures for work that requires modifying radiation protection.
    - e. Requirements for field quality control.

##### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show layout of radiation-protected areas. Indicate lead thickness or lead equivalence of components. Show components and installation conditions not fully dimensioned or detailed in product data.
  - 1. Show ducts, pipes, conduit, and other objects that penetrate radiation protection; include details of penetrations.
- C. Product Schedule: For observation windows, doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

##### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For flush wood door manufacturer.
- B. Field quality-control reports.

##### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For neutron-shielding doors to include in operation and maintenance manuals.

##### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

##### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Lead-Lined Gypsum Panels: Neatly stack panels flat to prevent deformation.
- B. Lead-Lined, Hollow-Metal Frames: Comply with requirements in Section 081115 "Interior Hollow Metal Door Frames" for delivery, storage, and handling.

## 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install radiation protection until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Provide materials and workmanship, including joints and fasteners, that maintain continuity of radiation protection at all points and in all directions equivalent to materials specified in thicknesses and locations indicated.
  - 1. Materials, thicknesses, and configurations indicated are based on radiation protection design prepared by Owner's radiation health physicist. This design is available to Contractor on request.
- B. Lead-Lined Assemblies: Unless otherwise indicated, provide lead thickness in doors, door frames, window frames, penetration shielding, joint strips, film transfer cabinets, and other items located in lead-lined assemblies not less than that indicated for assemblies in which they are installed.
- C. Lead Glazing: Unless otherwise indicated, provide lead equivalence not less than that indicated for assembly in which glazing is installed.

### 2.2 MANUFACTURERS

- A. Source Limitations: Obtain each type of radiation protection product from single source from single manufacturer unless otherwise indicated.

### 2.3 MATERIALS

- A. Lead Sheet, Strip, and Plate: ASTM B 749, Alloy UNS No. L51121 (chemical-copper lead).
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Radiation Protection Products, Inc.
- B. Lead-Lined Gypsum: 5/8 inch- (16 mm-) thick gypsum board complying with Section 092900 "Gypsum Board," of width and length required for support spacing and to prevent cracking during handling, and with a single sheet of lead laminated to the back of the board.
  - 1. Lead Sheet Lining: Full width and length of board.
  - 2. Furnish 3 inch- (75 mm-) wide lead strips for wrapping metal stud flanges.
  - 3. Furnish lead-headed nails for fastening gypsum board, accessories, and trim to wood members.
  - 4. Furnish finishing materials, accessories, and trim for lead-lined gypsum board complying with Section 092900 "Gypsum Board."
- C. Lead Glass: Lead-barium, polished glass containing not less than 60 percent heavy metal oxides, including not less than 48 percent lead oxide by weight.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Amerope Enterprises, Inc.
    - b. McGrory Glass, Inc.
    - c. Schott North America, Inc.
  - 2. Safety Glass: Tempered lead glass.
- D. Glazing Compounds, Gaskets, and Accessories: Comply with requirements in Section 088000 "Glazing."
- E. Accessories and Fasteners: Manufacturer's standard fasteners and accessories as required for installation, maintaining same lead equivalence as rest of system.
- F. Asphalt Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- G. Asphalt Felt: ASTM D 226/D 226M.

### 2.4 LEAD-LINED, OBSERVATION-WINDOW FRAMES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Radiation Protection Products, Inc.

- B. General: Fabricate from 0.043 inch- (1.1 mm-) thick, formed-steel sheet or 0.064 inch- (1.6 mm-) thick aluminum extrusions with mitered corners, welded or bolted with concealed fasteners.
  - 1. Line with lead sheet formed to match frame contour, continuous in each jamb and across head and sill, lapping the stops, and fabricated wide enough to maintain an effective lap with lead of adjoining assemblies.
  - 2. Construct so lead lining overlaps glazing material perimeter by at least 3/8 inch (9.5 mm) and furnish removable stops.
  - 3. Form sill with an opening for sound transmission. Offset sound passage to make opening lightproof and to maintain required lead equivalence at all points and in all directions.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates in areas to receive radiation protection, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of radiation protection.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 INSTALLATION OF LEAD-LINED GYPSUM BOARD**

- A. Install with long edge parallel to supports and lead lining facing supports. Provide blocking at end joints.
- B. Fastening to Metal Supports: Use steel drill screws spaced as recommended in writing by gypsum board manufacturer.
  - 1. Install lead strips covering face of framing and wrap around flange to cover points of screws. Where possible, install lead-lined gypsum board before installing gypsum board on other side of partition, and do not fold lead strips back over inside of flange until after lead-lined gypsum board is applied. Apply lead disks recessed flush with surface of board over heads of screws securing trim.
  - 2. Install lead strips, 2 inches (50 mm) wide and same thickness as lead lining, to face of supports and blocking where joints occur. Secure lead strips with construction adhesive. Provide shims at face of supports and blocking where joints do not occur.
- C. Fastening to Metal and Wood Supports: Use steel drill screws spaced as recommended in writing by gypsum board manufacturer.
  - 1. Install lead strips, 2 inches (50 mm) wide and same thickness as lead lining, to face of supports and blocking where joints occur. Secure lead strips with construction adhesive. Provide shims at face of supports and blocking where joints do not occur.
  - 2. Apply lead disks recessed flush with surface of board over heads of screws securing gypsum board and trim.
- D. Fastening to Wood Supports: Use lead-headed nails spaced as recommended in writing by gypsum board manufacturer. Drill pilot holes to prevent deforming nails or distorting board. Drive nail heads slightly below exposed surface.
  - 1. Install lead strips, 2 inches (50 mm) wide and same thickness as lead lining, to face of supports and blocking where joints occur. Secure lead strips with construction adhesive. Provide shims at face of supports and blocking where joints do not occur.
  - 2. Fasten accessories and trim to wood supports with lead-headed nails as specified above for fastening gypsum board.
- E. Two-Layer System: Apply a facing sheet of gypsum board vertically over base sheet using laminating adhesive recommended in writing by gypsum board manufacturer. Offset joints in finish layer from joints in base layer, and fasten at top and bottom of sheet to support finish panel until adhesive has set.
  - 1. Locate fasteners above ceiling or behind wall base and cover fasteners with lead disks recessed flush with surface of board.
- F. Openings: Extend lead-lined gypsum board into frames of openings, lapping lead lining with lead frames or frame linings at least 1 inch (25 mm). Arrange board around openings so neither horizontal nor vertical joints occur at corners of openings.
- G. Install control and expansion joints where indicated, with appropriate trim accessories. Install lead strip on face of framing, extending across joint, and lap with lead lining of gypsum board.
- H. Finish lead-lined gypsum board to comply with Section 092900 "Gypsum Board."



### 3.3 INSTALLATION OF LEAD-LINED OBSERVATION WINDOWS

- A. Install observation windows according to manufacturer's written installation instructions.
  - 1. Apply a coat of asphalt mastic or paint to lead lining in frames where lead comes in contact with masonry or grout.
- B. Install windows level, plumb, square, true to line, and anchored securely in place to structural support.
- C. Install leaded side of frame on radiation side of wall. Lap lead lining of frames over lining in walls at least 1 inch (25 mm).
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with manufacturer's written instructions.

### 3.4 INSTALLATION OF PENETRATING ITEMS

- A. At penetrations of lead linings, provide lead shields to maintain continuity of protection.
- B. Provide lead linings, sleeves, shields, and other protection in thickness not less than that required in assembly being penetrated.
- C. Secure shields at penetrations using adhesive or wire ties but not penetrating fasteners unless indicated on Drawings.
- D. Outlet Boxes and Conduit: Cover or line with lead sheet lapped over adjacent lead lining at least 1 inch (25 mm). Wrap conduit with lead sheet for a distance of not less than 10 inches (250 mm) from box.
- E. Duct Openings: Unless otherwise indicated, line or wrap ducts with lead sheet for distance from partition/ceiling equal to three times the largest opening dimension. Lap lead sheet with adjacent lead lining at least 1 inch (25 mm).
- F. Piping: Unless otherwise indicated, wrap piping with lead sheet for a distance of not less than 10 inches (250 mm) from point of penetration.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections after radiology equipment has been installed and placed in operating condition.
- B. Correct deficiencies in or remove and replace radiation protection that inspection reports indicate does not comply with specified requirements.

### 3.6 PROTECTION

- A. Lock radiation-protected rooms once doors and locks are installed, and limit access to only those persons performing work in the rooms.

**END OF SECTION**



# Radcom Associates, LLC

## Medical Physics Consultants

2302 Guthrie Road, Suite 210, Garland, TX 75043

December 7, 2023

Susan O'Donnell  
JPS Southeast Medical Home  
1050 W Arkansas Ln.  
Arlington, TX 76013

**RE: Shielding Design for New Radiographic Room**

Dear Ms. O'Donnell,

Please find enclosed results of shielding calculations performed for the renovation plan for the Radiography room 201 at your facility in Arlington, TX. Design limits and recommendations are based on applicable federal and state regulations. Also, National Council on Radiation Protection and Measurements (NCRP) recommendations, and recognized standards of practice were applied. Specifically, design limits for this assessment are 100 millirem/year for unrestricted areas (ICRP 1991 and NCRP 1993 recommendations), and 500 millirem/year for controlled areas (10% of the annual limit for occupational radiation exposure, limit for fetal exposure to a pregnant radiation worker). Workloads used in this evaluation are based on guidance provided in NCRP Report Number 147: *Structural Shielding Design for Medical X-ray Imaging Facilities*.

*Results, including structural diagrams and specific recommendations are enclosed on page 4 of this report.*

Additionally, NCRP Report Number 147 is often used as a standard for shielding design and installation. This report provides guidance and information that may assist you in the interpretation and implementation of the results provided in this report. To this end, additional information is summarized below:

**A. Lead as additional shielding**

Lead is the most common material used for added shielding. It is typically installed as sheet lead, or lead-lined wall board. Sheet lead is commercially available in thickness from less than a



millimeter to about a centimeter. Its flexibility is advantageous for use on curved or irregular surfaces. However, care must be taken to provide adequate support to avoid sagging of the lead or damage during installation. Sheet lead is typically provided with supplemental lead caps for covering nails or screws used to install the lead; however, research has shown that lead caps are not necessary so long as the integrity of lead is not compromised. NCRP Report 147 indicates that “insertion of the nails or screws does not result in significant radiation leaks.” It is more important to consider gaps that may be created at joints, and interfaces between sheets of lead. *Continuity of shielding must be ensured at the joints of two sheets of lead by sufficient overlap of the lead sheets or a supplemental cover strip.* Because sheet lead is easily damaged and is not self-supporting, it is usually covered with some form of wall-board, tile, or plaster. Leaded wall-board is more durable, and may be removed and reinstalled as part of future construction changes. Supplemental lead strips should still be considered at seams of leaded wall board.

It should be noted that lead sheets of less than 1/32<sup>nd</sup> inch thickness are often more expensive than heavier sheets in cost of material and installation. Typical thickness of manufactured lead in inches, millimeters, nominal weight, and pounds per square inch are provided on the last page of this report.

### B. Concrete

Concrete is sufficiently dense to be considered in shielding calculations. The radiation attenuation of a concrete barrier depends on its thickness, density, and composition. For this report, it is assumed that common poured concrete with a density of 2.35 g cm<sup>-3</sup> (147 lb ft<sup>-3</sup>) is used. This may significantly reduce added expense of shielding outside walls, floors, and ceilings if the concrete is sufficiently thick to provide the protection needed.

Calculations in this report are based on the following values for locations where existing concrete was considered:

Location	Existing Concrete/Supplemental Shielding
Outside Walls	None
Inside Walls	None specified
Floor	Standard concrete slab foundation
Ceiling	None

### C. Voids in Protective Barriers

All leaded shielding in walls should extend to a height of 2.1 meters (7 feet) if no shielding is required in the ceiling. If additional shielding is required in the ceiling, all leaded shielding in walls should extend the entire height of the wall and abut the shielding installed in the ceiling. Openings in protective barriers for doors, windows, ventilating ducts, conduits, pipes, etc. will require additional consideration with regard to the installation of lead to ensure that the



required degree of overall protection is maintained. If possible, such openings should be located in a secondary barrier where the required shielding thickness is less. The following guidelines should be adhered to when supplemental shielding is required:

- a. Where ducts terminate at a grill in the wall surface of a protective barrier, a lead-lined baffle may be required in front of the grill. Consideration should be given to design such that air-flow is not compromised.
- b. Where service boxes, conduits, etc. are imbedded in protective barriers, supplemental shielding must be added to compensate for the concrete or lead removed in construction. The lead should cover not only the back of the service boxes, but also the sides, or extend sufficiently to offer equivalent protection.
- c. Windows and doors should offer equivalent protection as that specified for the wall in which they are installed. This protection should extend into and within the frames to ensure that no gaps are created. Leaded glass should be used with the same specified lead equivalence as that for the associated wall.
- d. *Lead baffles under doors are not necessary for this installation.*

Results are based on room drawings provided by Thad Smith (email dated 12/4/2023).

It is noted that shielding specified in this report may not be sufficient to protect members of the public from unanticipated use of the imaging systems. Please note that state law requires that surveys of radiation levels in unrestricted areas be made to demonstrate compliance with the dose limits for individual members of the public. This report does not satisfy this requirement, but provides recommendations for additional shielding that should result in compliance once these surveys are made. Changes in building design, room layouts, workloads, positioning of equipment, etc. may void the applicability of results presented in this report. Any changes in design should be communicated to us as soon as practical.

If you have any questions or require additional information, please do not hesitate to call.

Sincerely,

Michael Nimmo, MS, DABR  
FMP 02000115  
Michael@RadcomAssociates.com  
214-709-4542



### Radiography Room

= 1/32<sup>nd</sup> inch Pb equivalent

= 1/16<sup>th</sup> inch Pb equivalent

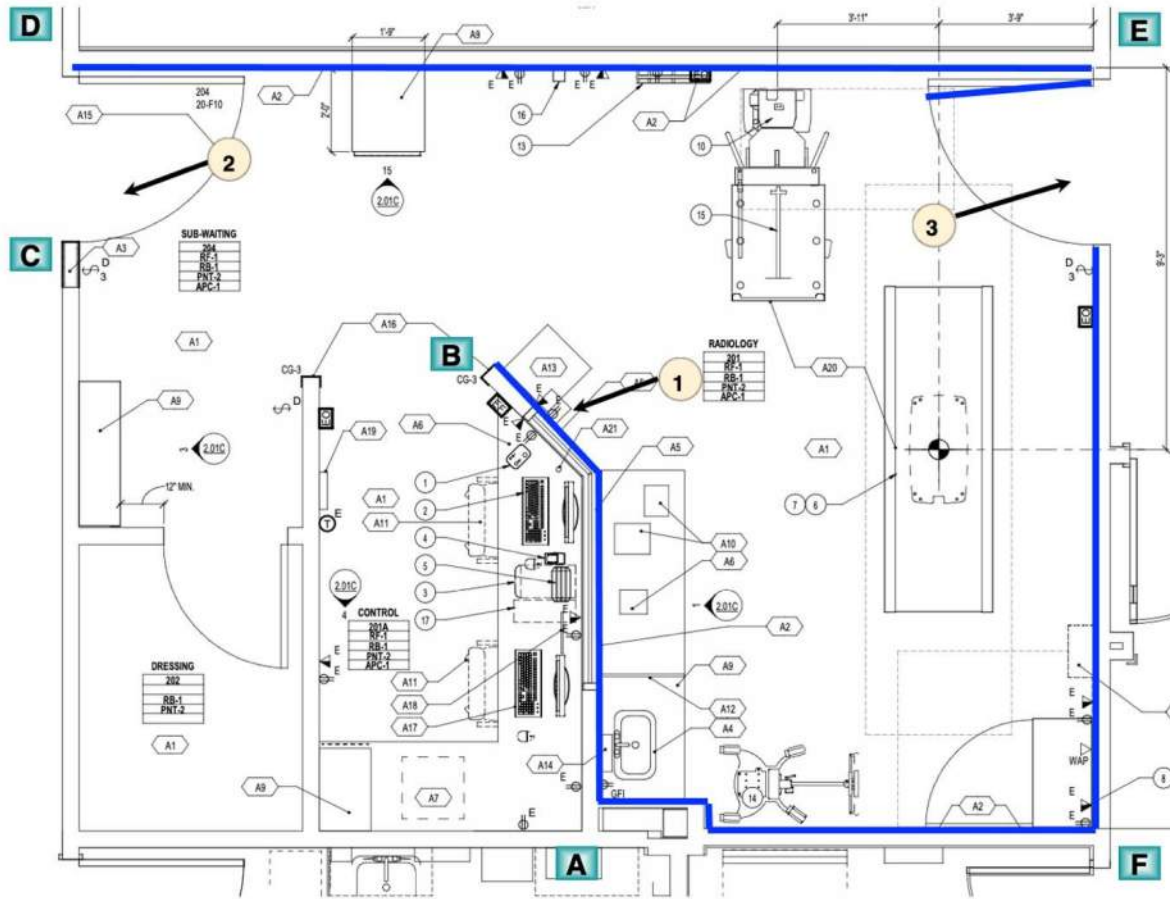


Table 2. Recommended Shielding: Radiography Room

Wall	Description	Restricted Area?	Occupancy	Recommended Shielding (Inches)	Comment
AB	Control booth	Yes	1	<b>1/32<sup>nd</sup> in. Pb</b>	See note 1
CD	Entry	No	1/8	<b>None</b>	See note 2
DE	Tech Corridor	No	1/2	<b>1/32<sup>nd</sup> in. Pb</b>	-
EF	Corridor & Entry	No	1/5	<b>1/32<sup>nd</sup> in. Pb</b>	See note 3
FA	Bone Density	No	1/2	<b>1/32<sup>nd</sup> in. Pb</b>	-
xx	Ceiling & Floor	No	0	<b>None</b>	See note 4



Table 3. Notes and Recommendations

Note	Comment / Recommendation
1	The window and frame for the control room should contain at least the same amount of Pb equivalent shielding as the surrounding wall (1/32 <sup>nd</sup> inch). Regular plate glass should <b>not</b> be substituted.
2	The entry door and frame for the Radiography Room should contain the same amount of lead as the surrounding wall (1/32 <sup>nd</sup> in. Pb). <i>A regular wooden door should not be substituted.</i>
3	Distance to the occupied areas indicate that no lead supplemental shielding is required in these locations. For the doorway, install an American Woodwork Institute type PC-5 (solid wooden core) or C-45 (mineral core door). Keep door closed during exposures..
4	Supplemental shielding is not required in the floor or ceiling for this type of installation. The facility is a single level structure with no expected occupancy above or below.

Table 4. Suggested Occupancy Factors from NCRP Report 147 (Table 4.1, pg. 31)

*Note: These values are used in calculations to more accurately determine required shielding. If significantly different occupancy is expected, this information should be communicated to us as soon as possible.*

Location	Occupancy Factor (T)
Administrative or clerical offices; laboratories, pharmacies and other work areas fully occupied by an individual; receptionist areas, attended waiting rooms, children's indoor play areas, adjacent x-ray rooms, film reading areas, nurse's stations, x-ray control rooms	1
Rooms used for patient examinations and treatments	1/2
Corridors, patient rooms, employee lounges, staff restrooms	1/5
Corridor Doors	1/8
Public toilets, unattended vending areas, storage rooms, outdoor areas with seating, unattended waiting rooms, patient holding areas	1/20
Outdoor areas with only transient pedestrian or vehicular traffic, unattended parking lots, vehicular drop off areas (unattended), attics, stairways, unattended elevators, janitor's closets	1/40



**Table 5. NCRP No. 49, Table 26: Commercial Lead Sheets**

Thickness		Weight in Pounds for a 1 Square Foot Section	
Inches	Millimeter equivalent	Nominal Weight	Actual Weight
1/64	0.40	1	0.92
3/128	0.60	1 1/2	1.38
1/32	0.79	2	1.85
5/128	1.00	2 1/2	2.31
3/64	1.19	3	2.76
7/128	1.39	3 1/2	3.22
-	1.50	-	3.48
1/16	1.58	4	3.69
5/64	1.98	5	4.60
3/32	2.38	6	5.53
-	2.50	-	5.80
-	3.00	-	6.98
1/8	3.17	8	7.38
5/32	3.97	10	9.22
3/16	4.76	12	11.06
7/32	5.55	14	12.90
1/4	6.35	16	14.75
1/3	8.47	20	19.66
2/5	10.76	24	23.60
1/2	12.70	30	29.50
2/3	16.93	40	39.33
1	25.40	60	59.00

1. Shaded rows indicate most common specifications in diagnostic radiology designs.
2. The density of commercially rolled lead is  $11.36 \text{ g cm}^{-3}$
3. It should be noted that lead sheet less than 1/32 inch thick is often more expensive than heavier sheets in cost of material and installation.

**SECTION 210010**

**BASIC FIRE PROTECTION REQUIREMENTS**

**PART 1 - GENERAL**

**1.01 GENERAL PROVISIONS AND SUPPLEMENTAL GENERAL PROVISIONS**

- A The "General Conditions" and "Supplementary Conditions" are by reference made a part of this section and shall apply to each and every heading as though included herein.
- B In the event of conflict, the requirements of the "General Conditions" and "Supplementary Conditions" will take precedence over these "General Requirements".

**1.02 GENERAL**

- A The Contractor shall provide all plans, labor, equipment, appliances and materials, and shall perform all operations in connection with the installation of the fire protection work in accordance with the Specifications, applicable drawings, and the conditions specified above.
- B Contractor shall provide all equipment required and usually furnished in connection with such work and systems whether or not specifically mentioned or specifically indicated on the drawings.

**1.03 INSPECTION OF THE SITE**

- A The Contractor shall visit the site, verifying all existing items indicated on drawings and/or specified, and familiarize himself with the existing work conditions, hazards, grades, actual formations, soil conditions, and local requirements. The submission of bids shall be deemed evidence of such visits.
- B All proposals shall take these existing conditions into consideration, and the lack of specific information on the drawings shall not relieve the Contractor of any responsibility.
- C The trade furnishing the equipment shall be responsible for notifying the Contractor prior to ordering it, in the event that equipment specified and/or reviewed is incompatible with this requirement.

**1.04 PERMITS, UTILITY CONNECTIONS, AND INSPECTIONS**

- A Refer to other sections of the specifications for construction phasing and time increments.
- B The Contractor shall obtain and pay for all required utility connections, impact fees, utility extensions and/or relocations and shall pay all costs and inspection fees for all work included herein.

**1.05 APPLICABLE CODES AND STANDARDS**

- A The installation shall meet the minimum standards prescribed in the latest editions of the following listed codes and standards, which are made a part of the Specifications, except as may be hereinafter modified in these Specifications and associated drawings.
- B Latest edition of the National Fire Protection Association Standards (NFPA):
  - 1. NFPA No. 13 Installation of Sprinkler Systems
  - 2. NFPA No. 14 Installation of Standpipes and Hose Systems
  - 3. NFPA No. 24 Installation of Private Fire Service mains and their Appurtenances
  - 4. NFPA No. 70 National Electrical Code
  - 5. NFPA No. 90A Installation of Air Conditioning and Ventilating systems
  - 6. NFPA No. 91 Exhaust systems of Air Conveying of Gases, etc.
  - 7. NFPA No. 96 Ventilation control and Fire Protection of Commercial Cooking Operations
  - 8. NFPA No. 101 Safety to Life from Fire in Buildings and Structures
  - 9. NFPA No. 255 Test of Surface Burning Characteristics of Building Materials
- C United States of America Standards Institute (ASA) Standards:
  - 1. A40.8 National Plumbing Code
  - 2. B31.1 & B31.1a Code for Pressure Piping
- D American Society of Mechanical Engineers (ASME): Boiler and Pressure Vessel Codes.
- E Air Conditioning and Refrigeration Institute Standards (ARI): All standards related to refrigeration and air conditioning equipment and piping furnished under these Specifications.



- F Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) 1985: All applicable manuals and standards.
- G American Society of Testing and Material (ASTM): All applicable manuals and standards.
- H American Water Works Association (AWWA): All applicable manuals and standards.
- I National Electrical Manufacturer's Association (NEMA): All applicable manuals and standards.
- J City Fire Department as applicable to construction of this site.
- K City and State Building Codes.
- L State of Texas Occupational Safety Act: Applicable safety standards.
- M Refer to Specifications sections hereinafter bound for additional codes and standards.
- N All materials and workmanship shall comply with all applicable state and national codes, specifications, and industry standards. All material shall be listed by the Underwriter's Laboratories, Inc., as conforming to its standards and so labeled in every case where such a standard has been established for the particular type of material in question.
- O The Contract Documents are intended to comply with the aforementioned rules and regulations; however, some discrepancies may occur. Where such discrepancies occur, the Contractor shall immediately apply for an interpretation. Should the discovery and notification occur after the execution of a contract, any additional work required for compliance with said regulations shall be paid for as covered by other specifications of the Contract Documents, providing no work or fabrication of materials has been accomplished in a manner of non-compliance. Should the Contractor fabricate and/or install materials and/or workmanship in such a manner that does not comply with the applicable codes, rules and regulations, the Contractor who performed such work shall bear all costs arising in correcting these deficiencies to comply with said rules and regulations.

#### 1.06 CONTRACT DOCUMENTS

- A These specifications are accompanied by drawings of the building and details of the installations indicating the locations of equipment, piping, ductwork, outlets, switch controls, circuits, lines, etc. The drawings and these specifications are complementary to each other, and what is required by one shall be as binding as if required by both.
- B If the Contractor deems any departures from the drawings necessary, details of such departures and the reasons therefore shall be submitted to the Architect for review. No departures shall be made without prior written acceptance.
- C There are intricacies of construction that are impractical to specify or indicate in detail; however, in such cases the current rules of good practice and applicable specifications shall govern.
- D It is the Contractor's responsibility to properly use all information found on the Civil, Architectural, Structural, Mechanical and Electrical drawings where such information affects his work.
- E All dimensional information related to new structures should be taken from the appropriate drawings. All dimensional information related to existing facilities shall be taken from actual measurements made by the Contractor on the site.
- F The interrelation of the specifications, the drawings, and the schedules is as follows: The specifications determine the nature and setting of the several materials, the drawings establish the quantities, dimensions and details, and the schedules give the performance characteristics.
- G Should the drawings or specifications disagree within themselves, or with each other, the better quality of greater quantity of work or materials shall be estimated upon, and unless otherwise directed by the Architect in writing, shall be performed or furnished. Figures indicated on drawings govern scale measurements and large-scale details govern small-scale drawings.

#### 1.07 SPACE AND EQUIPMENT ARRANGEMENT

- A The size of fire protection, plumbing, mechanical, and electrical equipment indicated on the drawings is based on the dimensions of a particular manufacturer. While other manufacturers may be acceptable, it is the responsibility of the Contractor to determine if the equipment he proposes to furnish will fit in the space. Shop drawings shall be prepared to indicate a suitable arrangement.
- B All equipment shall be installed in a manner to permit access to all surfaces. All valves, motors, drives, filters, and other accessory items shall be installed in a position to allow removal for service without disassembly of another part.
- C Maintain all Code required clearances for equipment access.

#### 1.08 FABRICATION DRAWINGS

- A Each contractor shall submit shop drawings whenever (1) equipment proposed varies in physical size and arrangement from that indicated on the drawings, thus causing rearrangement of equipment space, (2) where tight spaces require extreme coordination between ductwork, piping, conduit and other equipment, and (3) where called for elsewhere in the specifications.
- B All required shop drawings, except as hereinafter specified, shall be prepared at a scale of not less than 1/8 inch equal to 1 foot..

#### 1.09 SUPERVISION

- A Each contractor shall keep a competent superintendent or foreman on the job at all times necessary for the timely and proper completion of the work.
- B It shall be the responsibility of each superintendent to study all drawings and familiarize himself with the work to be done by other trades. He shall coordinate this work with other trades, and before material is fabricated or installed, make sure that his work will not cause an interference that cannot be resolved without major changes to the drawings. If a conflict between trades arises that cannot be resolved at the jobsite, the matter shall be referred to the Architect for his ruling.

#### 1.10 EXISTING FACILITIES

- A The Contractor shall be responsible for loss or damage to the existing facilities caused by him and his workmen, and shall be responsible for repairing or replacing such loss or damage. The Contractor shall send proper notices, make necessary arrangements, and perform other services required for the care, protection and in-service maintenance of all plumbing, heating, air conditioning, and ventilating services for the new and existing facilities. The Contractor shall erect temporary barricades, with necessary safety devices, as required to protect personnel from injury, and remove all such temporary protection upon completion of the work. All barricades and safety devices shall be in compliance with OSHA.
- B The Contractor shall provide temporary or new services to all existing facilities as required to maintain their proper operation when normal services are disrupted as a result of the work being accomplished under this project.
- C Where existing construction is removed to provide working and extension access to existing utilities, Contractor shall remove doors, piping, conduit, outlet boxes, wiring, light fixtures, air conditioning ductwork and equipment, etc., to provide this access and shall reinstall same upon completion of work in the areas affected.
- D Where partitions, walls, floors, or ceilings of existing construction are indicated to be removed, all Contractors shall remove and reinstall, in locations approved by the Architect, all devices required for the operation of the various systems installed in the existing construction. This is to include, but is not limited to, temperature control system devices, electrical switches, relays, fixtures, piping, conduit, etc.
- E Outages of services, as required by the new installation, will be permitted only at a time approved by the Architect.

#### 1.11 DEMOLITION AND RELOCATION

- A The Contractor shall modify, remove and/or relocate all materials and items so indicated on the drawings or required by the installation of new facilities. Materials and/or items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to good operative condition.
- B All items that are to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The Contractor shall clean and repair and provide all new materials, fittings, and appurtenances required to complete the relocations and to restore to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved.
- C Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points indicated on the drawings, specified, or acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed and sealed, capped, or otherwise tied-off or disconnected in a safe manner acceptable to the Architect. All disconnections or connections into the existing facilities shall be done in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas of facilities, which must remain in operation during the construction period, shall not be interrupted without prior specific approval of the Architect as hereinbefore specified.
- D All equipment and materials indicated to be removed and not be re-used shall be disposed of by the Contractor.

#### 1.12 OPERATING AND MAINTENANCE INSTRUCTIONS

- A The Contractor shall prepare, in triplicate for the Owner's Manual, complete sets of operating and maintenance instructions, system piping, valving, control and interlock diagrams, manuals, parts lists, etc., for each item of equipment. Include copies of all equipment warranties.
- B In addition, the Contractor shall provide the services of a competent engineer or a technician acceptable to the Architect to instruct a representative of the Owner in the complete and detailed operation of all equipment and systems. These instructions shall be provided for a period of not less than 8 hours to fully accomplish the desired results. Upon completion of these instructions, a letter of release will be required, stating the dates of instruction and the personnel to whom instructions were given. The Contractor shall be responsible for proper maintenance until the instructions have been given to the Owner's maintenance personnel.

#### 1.13 GUARANTEE

- A All work and equipment shall be guaranteed for a period of one year from the date of substantial completion.
- B Guarantee shall be for all labor and materials.
- C Certain items for equipment shall have additional or extended warranties when so specified.

#### 1.14 MATERIALS AND WORKMANSHIP

- A All materials, unless otherwise specified, shall be of current U.S. manufacture, new, free from all defects, and of the best quality of their respective kinds. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of work involved. All work shall be executed by mechanics skilled in their respective trades, and the installations shall present a neat, workmanlike appearance. Materials, and/or equipment damaged in shipment, or otherwise damaged prior to installation, shall not be repaired at the job site, but shall be replaced with new materials and/or equipment.
- B The responsibility for furnishing the proper equipment and/or material, and to see that it is installed as intended by the manufacturer rests entirely upon the Contractor, who shall request advice and supervisory assistance from the representative of specific manufacturers during the installation.

#### 1.15 FLAME SPREAD PROPERTIES OF MATERIALS

- A Materials and adhesives incorporated in this project shall conform to NFPA 255, latest edition. The classification shall not exceed No. 2, with the range of indices between 0 to 25 for these Classifications as listed in the Federal Specifications. Modifications shall be made to insulating materials, etc., as required to comply with the Federal Specification.

#### 1.16 LARGE APPARATUS

- A Any large piece of apparatus which is to be installed in any space in the building, and which is too large to permit access through stairways, doorways, or shafts shall be brought to the job and placed in the space before the enclosing structure is completed. Following placement in the space, such apparatus shall be thoroughly, completely protected from damage as hereinafter specified.

#### 1.17 SLEEVES, INSERTS AND FASTENINGS

- A Proper openings through floors, walls, roofs, etc., for the passage of piping, ductwork, etc., shall be provided. All penetrations must pass through sleeves except soil pipe installed under concrete slabs on fill. Sleeves shall be set in new construction before concrete is poured, as cutting holes through any part of the concrete will not be permitted unless acceptable to the Architect.
- B Pipes passing through concrete or cinder walls and floor or other corrosive material shall be protected by a protective sheathing or wrapping or by sleeves, as required to meet the local code. Annular spaces between sleeves and pipes shall be filled or tightly caulked in an approved manner. Annular spaces between sleeves and pipes in fire-resistance-rated assemblies shall be filled or tightly caulked in accordance with the local code.
- C The minimum clearance between horizontal penetrations including insulation where applicable, and sleeves shall be 1/4 in., except that the minimum clearance shall be 2 in. where piping contacts the ground. Sleeves through walls and partitions shall be installed flush with exposed surfaces. Sleeves through floors shall be extended 2 in. above finished floor.

- D Above grade and dry location sleeves shall be constructed from 20 to 22 gauge galvanized steel. Sleeves passing through walls or floors on or below grade and/or moist areas such as mechanical rooms shall be constructed of galvanized steel Schedule 40 pipe and shall be designed with suitable flange in the center of the floor or wall to form a waterproof passage. After the pipes have been installed in the sleeves, void space around the pipe shall be sealed with "Link-Seal" modular wall and casing seals as manufactured by Thunderline Corporation.
- E Suitable concrete inserts for pipe and equipment hangers shall be set and properly located for all pipe and equipment to be suspended from concrete construction.
- F Fastening of pipes, conduits, etc., in the building shall be as follows: To wood members - by wood screws; to masonry - by threaded metal inserts, metal expansion screws, or toggle bolts, whichever is appropriate for the particular type of masonry; to steel - machine screws or welding (when specifically permitted or directed), or bolts, and to concrete by suitable inserts anchored to reinforcing steel, and poured in place unless other means are acceptable for general use, and will only be permitted where specifically acceptable to the Architect.
- G Under no circumstances will the use of plastic anchors or plastic expansion shields be permitted for any purpose whatsoever.
- H Vermin Proofing: The open space around all ductwork, piping, etc., passing through the ground floor and/or exterior walls shall be sealed with a continuous bead of sealant.
- I The space around piping, ductwork, etc., penetrating walls, ceilings and floors that define air plenums shall be sealed airtight in an acceptable manner. Ceiling plenums used for return air are considered air plenums.

#### 1.18 ACCESS DOORS

- A This Contractor shall provide wall or ceiling access doors for unrestricted access to all concealed shutoff, service or drain valves, and other items of concealed fire protection equipment. All access door locations are not shown on the drawings. It is the Contractor's responsibility to provide access doors at all locations required.
- B Access doors mounted in painted surfaces shall be equal to Milcor (Inland-Ryerson Construction Products Company) manufacture, Style K for plastered surfaces and Style M or DW for non-plastered surfaces. The Style K doors shall be set so that the finished surface of the door is even with the finished surfaces of the adjacent finishes. Access doors mounted on tile surfaces shall be stainless steel materials. Access doors shall be minimum of 18 in. x 18 in. in size.

#### 1.19 CONSTRUCTION REQUIREMENTS

- A The Civil, Architectural, Structural, Mechanical, Plumbing, and Electrical plans and specifications including the General Provisions, Supplemental General Provisions, and other pertinent documents issued by the Architect, are a part of these specifications and the accompanying fire protection drawings, and shall be complied with in every respect. All the above is included in the Contract Documents, and shall be examined by all bidders. Failure to comply shall not relieve the Contractor of responsibility or be used as a basis for additional compensation due to omission of architectural, structural and electrical details from the fire protection drawings.
- B It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details or special construction may be required for work indicated or specified in this section or work specified in other sections, it shall be the responsibility of the Contractor to provide same as well as to provide material and equipment usually furnished with such systems or required to complete the installation, whether mentioned or not.
- C The Contractor shall be responsible for fitting his material and apparatus into the building and shall carefully lay out his work at the site to conform to the structural conditions, to avoid all obstructions, to conform to the details of the installation supplied by the manufacturer of the equipment to be installed and thereby to provide an integrated satisfactory operating installation.
- D The fire protection and associated drawings are necessarily diagrammatic in character and cannot show every connection in detail or every pipe or equipment in its exact location. These details are subject to the requirements of ordinances and also structural and architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. Work shall be installed to avoid crippling of structural members; therefore, inserts to accommodate pipe hangers shall be set before concrete is poured, and proper openings through floor, walls, beams, etc., shall be provided as hereinafter specified or as otherwise indicated or required. All work shall be installed parallel or perpendicular to the lines of the building unless otherwise noted.

- E When the drawings do not give exact details as to the elevation of pipe, ducts, etc., physically arrange the systems to fit in the space available at the elevations intended with the proper grades for the functioning of the system involved. Piping and duct systems are generally intended to be installed true and square to the building construction, and located as high as possible against the structure in a neat and workmanlike manner, and the plans do not show all required offsets, control lines, pilot lines and other location details. Work shall be concealed in all finished areas. Piping specified to be insulated shall be supported in a manner that will allow the insulation to be installed without gaps. Insulated piping in concealed areas shall be offset with fittings as necessary to permit installation of insulation. Bending of pipes or installing pipes in a strain in order to insulate will not be permitted.
- F All oiling devices and all parts of equipment requiring adjustment shall be easily accessible. Equipment shall be so located and installed as to permit convenient and safe maintenance and future replacement. Piping, ductwork, valve stems, etc., shall not block service space.

1.20 FIRE PROTECTION SUBMITTALS

- A Refer to the Conditions of the Contract (General and Supplementary) and Division 01 Section: "SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES" for submittal definitions, requirements, and procedures.
- B Submittal of Shop Drawings, product data, and samples will be accepted only when submitted by The Contractor. Data submitted from Subcontractors and material suppliers directly to the Architect will not be processed.
- C Submit Shop Drawings, product data, and samples on items indicated in the individual sections.
- D Shop Drawings and submittal data shall not be used as requests or proposals for alternate equipment or materials. Refer to Item "Product Options and Substitutions" elsewhere in this section.
- E **THIRD PARTY CERTIFICATION:** All Packaged equipment shall be independently Third Party labeled as a system for its intended use by a Nationally Recognized Testing Laboratory (NRTL) in accordance with OSHA Federal Regulations 29CFR1910.303 and .399, as well as NFPA Pamphlet #70, National Electric Code (NEC), Article 90-7.

1.21 PRODUCT OPTIONS AND SUBSTITUTIONS

- A Refer to the Instructions to Bidders and the Division 01 Section "SUBSTITUTION PROCEDURES" for requirements in selecting products and requesting substitutions.
- B Standards for Materials:
  - 1. These specifications indicate a standard for all materials incorporated into the work, with manufacturer's names and catalog numbers used to establish a grade and quality of materials and equipment. The manufacturer listed on the equipment schedules, or named first in the specifications, is the one on whose equipment the layout is based. Other named manufacturers must meet the indicated performance and space requirements.
  - 2. The "approved equal" clause used in these specifications is to permit the proposal of unnamed manufacturer's products for the work, and the Architect's decision concerning equal products is final.
  - 3. Considerations as to determination of equal products include, but are not limited to, the following:

Materials	Physical Size
Workmanship	Weight
Gauges of Materials	Appearance
Available Local Service Personnel	Performance
Previous successful installations	Capacity
Delivery Schedules	Required Equipment Clearances

- C Requests for substitutions for equipment, materials and apparatus listed in Division 21 Sections must be submitted in writing a **MINIMUM OF 10 DAYS** prior to the scheduled bid date. Such requests must be accompanied by complete data to permit proper evaluation.
- D **BIDS SHALL NOT BE BASED ON UN-APPROVED MATERIALS, EQUIPMENT, OR APPARATUS. UNAPPROVED MATERIAL, EQUIPMENT OR APPARATUS WILL NOT BE ACCEPTED.**
- E Should electrical, water, drain, natural gas, structural support, or other similar requirements for alternate equipment, whether named in the specifications or approved as a substitution, be different from requirements for the products used in laying out the project, such changes shall be the responsibility of the Contractor, and shall not result in extra charges to the Owner, Architect, or Engineer.

1.22 RECORD DOCUMENTS

- A Refer to the Division 01 Section: "CLOSEOUT PROCEDURES" for requirements. The following paragraphs supplement the requirements of Division 01.

- B Mark Drawings to indicate revisions to piping and ductwork, size and location both exterior and interior; including locations of coils, dampers and other control devices, filters, boxes, and similar units requiring periodic maintenance or repair; actual equipment locations, dimensioned for column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned to column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.); Change Orders; concealed control system devices.
- C Mark Specifications to indicate approved substitutions; Change Orders; actual equipment and materials used.

1.23 PAINTING

- A Field painting of fire protection equipment, piping systems, etc., shall be accomplished under Division 09 of these specifications.
- B Protection of Factory-applied Finishes:
  - 1. Factory-applied finishes on equipment and apparatus installed on the project shall be carefully protected.
  - 2. At the conclusion of the work, and prior to final acceptance of the project, equipment and apparatus shall be thoroughly cleaned of all construction dirt, oil and grease smears, temporary labels, debris, paint droppings, etc.
  - 3. Damaged factory finishes shall be restored to their original condition using procedures, materials and application techniques as set forth in Division 09 found elsewhere in these specifications.

1.24 CLEANING

- A Refer to the Division 01 Section: "CLOSEOUT PROCEDURES" for general requirements for final cleaning.
- B Name Plates:
  - 1. All nameplates shall be protected from damage during the construction process.
  - 2. At the conclusion of the work, the nameplates shall be carefully cleaned and left in a fully legible condition.
- C Removal of Rubbish: Each Contractor is responsible for the timely removal of rubbish and trash generated by his work, such as empty cartons, containers, materials crates, etc. Particular attention is called to residue that may present a potential tripping or injury hazard.

1.25 MOTORS AND DRIVES

- A Motors:
  - 1. General: Motors shall be U/L-approved, with copper windings, and with a minimum Service Factor of 1.15. The nominal capacity shall exceed the brake horse-power requirements at duty schedules.
  - 2. Motors 1/2 HP and smaller shall be 120-volt, single-phase with internal overload protection.
  - 3. Motors 3/4 HP and larger shall be 208/230 or 460 -volt, 3-phase, unless scheduled or noted otherwise, and shall have thermal over-load cutouts in each phase as recommended by the motor manufacturer.
  - 4. Motors shall be as manufactured by Century, General Electric, US Motors, Wagner, Westinghouse, or approved equal.
- B Specific requirements:
  - 1. Provide high-efficiency motors for the following:
    - a. Air-Handling Units, as scheduled.
    - b. Ventilating Fans, as scheduled.
    - c. HVAC Pumps, as scheduled.
  - 2. Efficiency ranges shall be as follows:

	Nominal HP	Minimum Efficiency	Premium Efficiency
	3	86.5	89.5
	5	87.5	89.5
	7.5	88.5	91.7
	10	89.5	91.7
	15	91.0	92.4
	20	91.0	93.0
	25	91.7	93.6
	30	92.4	93.6
	40	93.0	94.1
	50, 60, 75	93.0, 93.6, 94.1	94.5, 95.0, 95.4

	100	94.1	95.4
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3. Motor efficiency certification shall be included with Product Submittal Data in accordance with Division 01 of these specifications.
4. Variable Speed (Frequency) AC Drives:
  - a. Where scheduled on the plans, provide and install variable speed (frequency) AC drives for motors.
  - b. Variable speed (frequency) AC drives shall be as described in Section 238965 - MOTOR CONTROLLERS - of these Specifications.
5. Motor Starters and Controllers:
  - a. Motor starters and controllers for fans, pumps, air-handling units, compressors, etc., which are not provided as an integral part of a factory-assembled package, shall be provided under Division 23 of the specifications. Refer to Section 238965 "MOTOR CONTROLLERS."

## PART 2 - PRODUCTS

### 2.01 GENERAL MATERIALS AND EQUIPMENT REQUIREMENTS

- A The manufacturer's published instructions shall be followed for preparing, assembling, installing, erecting, and cleaning manufacturer's materials or equipment, unless otherwise indicated. The Contractor shall promptly notify the Architect in writing of any conflict between the requirements of the Contract Documents and the manufacturer's directions and shall obtain the Architect's instructions before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturer's directions or such instructions from the Architect, he shall bear all costs arising in connection with the deficiencies.
- B The Contractor shall not receive material or equipment at the jobsite until there is suitable space provided to properly protect equipment from rust, drip, humidity, and dust damage.
- C Capacities shall be not less than those indicated but shall be such that no component or system becomes inoperative or is damaged because of start-up or other overload conditions.
- D Where materials or equipment are specified to be approved, listed, tested, or labeled by the Underwriter's Laboratories, Inc., or constructed and/or tested in accordance with the standards of the American Society of Mechanical Engineers, the Contractor shall submit proof that the items furnished under these sections of the specifications conform to such requirements. The ASME stamp will be acceptable as sufficient evidence that the items conform to the respective requirements.
- E Each major component of equipment shall have the manufacturer's name, address, and catalog number on a plate securely attached to the item of equipment. All data on nameplates shall be legible at the time of Final Observation.
- F Standard factory finish will be acceptable on equipment specified by model number; otherwise surfaces of ferrous metal shall be given a rust-inhibiting coating. The treatment shall withstand 200 hours in salt-spray fog test, in accordance with Method 6061 of Federal Standard No. 141. Immediately after completion of the test, the specimen shall show no signs of wrinkling or cracking, and no signs of rust creepage beyond 1/8 in. on either side of the scratch mark. Where rust-inhibitor coating is specified hereinafter, any treatment that will pass the above test is acceptable, unless a specific coating is specified, except that coal tar or asphalt type coatings will not be acceptable, unless so stated for a specific item. Where steel is specified to be hot-dip galvanized, mill-galvanized sheet steel may be used provided all raw edges are painted with a zinc-pigmented paint conforming to Military Specification MIL-P-6215.
- G Belts, pulleys, chains, gears, couplings, projecting setscrews, keys and other rotating parts located so that any person can come in close proximity thereto, shall be fully enclosed or properly guarded.
- H The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, to verify all dimensions in the field, and to advise the Architect of any discrepancy before performing any work. Adjustments to the work required, in order to facilitate a coordinated installation, shall be made at no additional cost to the Owner.

## 2.02 PROTECTION

- A The Contractor shall at all times take such precautions as may be necessary to properly protect all materials and equipment from damage from the time of delivery until the completion of the work. This shall include the erection of all required temporary shelters and supports to adequately protect any items stored in the open on the site from the weather, the ground and surrounding work; the cribbing of any items above the floor of the construction; and the covering of items in the incomplete building with tarpaulins or other protective covering. Failure on the part of the Contractor to comply with the above will be sufficient cause for the rejection of the items in question.
- B Take particular care not to damage the building structure in performing work. All finished floors, steel treads, and workmen or their tools and equipment shall cover finished surfaces to prevent any damage during the construction of the building.
- C Equipment and materials shall be protected from rust both before and after installation. Any equipment or materials found in a rusty condition at the time of final observation must be cleaned of rust and repainted as specified elsewhere in these specifications.

## 2.03 COOPERATION BETWEEN TRADES AND WITH OTHER CONTRACTORS

- A Each trade, subcontractor and/or contractor must work in harmony with the various other trades, subcontractors, and/or contractors on the job as may be required to facilitate the progress to the best advantage of the job as a whole. Each trade, subcontractor, and/or contractor must pursue his work promptly and carefully as not to delay the general progress of the job. This Contractor shall work in harmony with contractors working under other contracts on the premises.

## 2.04 PRECEDENCE OF MATERIALS

- A These specifications and the accompanying drawings are intended to cover systems which will not interfere with the structural design of the building, which will fit into the available space, and which will insure complete and satisfactory systems. Each Contractor shall be responsible for the proper fitting of his material and apparatus into the building.
- B Each Contractor shall so harmonize his work with that of the other trades so that it may be installed in the most direct and workmanlike manner without hindering or handicapping the other trades. Piping interferences shall be handled by giving precedence to pipelines that require a stated grade for proper operation. Where space requirements conflict, the following order of precedence shall, in general, be observed:
  - 1. Building lines
  - 2. Structural members
  - 3. Drain piping
  - 4. Vent piping
  - 5. Condensate piping
  - 6. Refrigerant piping
  - 7. Supply ductwork
  - 8. Return ductwork
  - 9. Exhaust ductwork
  - 10. Chilled water and heating water piping
  - 11. Automatic Fire Protection Sprinkler Piping
  - 12. Domestic hot and cold water piping
  - 13. Electrical conduit

## 2.05 LOCATION OF OUTLETS IN ROOMS

- A All fire protection, plumbing, acoustical tile, diffusers, grilles, registers, and other devices shall be referenced to coordinated, established data points and shall be located to present symmetrical arrangements with these points and to facilitate the proper arrangements of acoustical tile panels and other similar panels with respect to the mechanical and electrical outlets and devices. Those mechanical and electrical outlets shall be referenced to such features as wall and ceiling furrings, balanced border widths, masonry joints, etc. Outlets in acoustical tile shall occur symmetrically in tile joints or in the center of whole tiles. When locations of mechanical and electrical devices shown on the Architect's reflected ceiling plans need to be modified, the final determination of the exact location of each outlet and the arrangement to be followed shall be acceptable to the Architect.



- B The drawings show diagrammatically the location of the various outlets and apparatus. Exact locations of these outlets and apparatus shall be determined by reference to the general plans and to all detail drawings, equipment drawings, roughing-in drawings, etc., by measurements at the building, and in cooperation with the other trades. The Architect reserves the right to make any reasonable change in location of any outlet or apparatus before installation, without additional cost to the Owner.
- C The Contractor, by submitting a bid on this work, sets forth that he has the necessary technical training and ability, and that he will install his work in a satisfactory and workmanlike manner which is up to the best standards of the trade, complete, and in good working order. If any of the requirements of the drawings and specifications are impossible of performance, or if the installation, when made in accordance with such requirements, will not perform satisfactorily, he shall report it to the Architect for correction promptly after discovery of the discrepancy.

### **PART 3 - INSTALLATION**

#### **3.01 INSTALLATION METHODS**

- A All pipes shall be concealed in pipe chases, walls, furred spaces, or above the building, unless otherwise indicated.
- B Piping may be run exposed in mechanical rooms, janitors' closets, or storage spaces, but only where necessary. All exposed piping shall be run in the neatest, most inconspicuous manner, and parallel or perpendicular to the building lines.
- C All piping shall be adequately and properly supported from the building structure by means of hanger rods or clamps to walls as herein specified.
- D Where limited space is available above the ceilings and below concrete beams or other deep projections, pipe and conduit shall be sleeved through the projection where it crosses, in a manner to provide maximum above-floor clearance. Sleeves shall be as specified or as required.
- E All pipe, conduits, etc., shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. All ducts, pipes and conduits run, exposed in machinery and equipment rooms, shall be installed parallel to the building plans, except as otherwise shown. Conduits in furred ceilings and in other concealed spaces may be run at angles to the construction but shall be neatly grouped and racked indicating good workmanship. All conduit and pipe openings shall be kept closed until the systems are closed with final connections.
- F There shall be no pipe joints nearer than 12 in. to a wall, ceiling, or floor penetration, unless pipe joint is the welded type joint.
- G The Contractor shall study all construction documents and carefully lay out all work in advance of fabrication and erection in order to meet the requirements of the extremely limited spaces. Where conflicts occur, the Contractor shall meet with all involved trades and the Architect and resolve the conflict, prior to erection of any work, in the area involved.

#### **3.02 CUTTING AND PATCHING**

- A Cut and patch openings through walls, floors, etc., resulting from work in existing construction or by failure to provide proper openings or recesses in new construction.
- B Openings cut through concrete and masonry shall be made with masonry saws and/or core drills at locations acceptable to the Architect. Impact-type equipment will not be used, except where specifically acceptable to the Architect. Openings in Precast concrete slabs for pipes, conduits, outlet boxes, etc., shall be core drilled or cast to exact size.
- C All openings shall be restored to "as-new" condition under the appropriate Specification Section for the materials involved, and shall match remaining surrounding materials and/or finishes.
- D Where openings are cut through masonry walls, provide and install lintels or other structural supports to protect the remaining masonry. Adequate supports shall be provided during the cutting operation to prevent any damage to the masonry occasioned by the operation. All structural members, supports, etc., shall be of the proper size and shape, and shall be installed in a manner acceptable to the Architect.
- E All fire protection work in areas containing plaster shall be completed prior to the application of the finish plaster coat. Cutting of finish plaster coat will not be permitted.
- F No cutting, boring, or excavating, which will weaken the structure, shall be undertaken. **NO STRUCTURAL MEMBER MAY BE CUT WITHOUT THE WRITTEN APPROVAL OF THE ARCHITECT.**

### 3.03 FABRICATION OF PIPE

- A All the various piping systems shall be made up straight and true and run at proper grades to permit proper flow of the contained material. Lines shall also be graded for proper drainage.
- B Piping shall follow as closely as possible the routes shown on plans, but shall take into consideration conditions to be met at the site.
- C Should any unforeseen conditions arise, lines shall be changed or rerouted as required after approval has been obtained.
- D All piping shall be installed with due regard to expansion and contraction and so as to prevent excessive strain and stress in the piping, in connections, and in equipment to which lines are connected.
- E All piping shall be clean when it is installed. Before installation it shall be checked, upended, swabbed, if necessary, and all rust or dirt from storage shall be removed. Pipe shall not be permitted to lie on the ground during storage. Pipe ends shall be sealed during storage.

### 3.04 IDENTIFICATION AND LABELING

- A The Contractor shall make it possible for the personnel operating and maintaining the equipment and systems in this project to readily identify the various pieces of equipment, valves, piping, etc., by marking them.
- B The Contractor shall install identification tags to be affixed to those valves that have functions that are not obvious. For example, it would not be expected that valves at a pressure reducing station in a machine room would be tagged. The valve identification tags shall be brass discs, 2 in. in diameter. Each tag shall be attached to its valve with copper clad annealed iron wire or other approved material.

### 3.05 TESTS AND INSPECTIONS

- A The Contractor shall, during the progress of the work and upon its completion, test his work and make all tests as required by the specifications, state, municipal and other authorities having jurisdiction of the work. Piping pressure tests shall be made before pipe is concealed or covered. Tests shall be made in the presence of authorities requiring tests. The Contractor shall pay all costs, inspection charges and fees required for the tests of his work.
- B The Contractor shall provide all apparatus, temporary piping connection, etc., required for tests. The Contractor shall take all due precautions to prevent damage to the building or its contents incurred by such tests. The Contractor shall repair and make good at his own expense any damage caused by failures or leaks during the tests.
- C Leaks, defects or deficiencies shall be repaired and/or replaced, and tests shall be repeated until the test requirements are complied with fully.
- D All equipment shall be placed in operation and tested for proper automatic control before the final balancing of the system is started.
- E All tests shall have pertinent data logged by the Contractor at the time of testing. Data shall include date, time, personnel, description, and extent of system tested, test condition, test results, specified results, and any other pertinent data. Data shall be delivered to the Architect.

### 3.06 COOPERATION AND CLEANUP

- A It shall be the responsibility of each trade to cooperate fully with the other trades on the job to help keep the job site in a clean and safe condition. At the end of each day's work, each trade shall properly store all of his tools, equipment and materials and shall clean his debris from the job. Upon the completion of the job, each trade shall immediately remove all of his tools, equipment, any surplus materials and all debris caused by his portion of the work.

### 3.07 CLEANING AND PAINTING

- A All equipment, piping, ductwork, grills, insulation, etc., in finished areas furnished and installed by the Contractor shall be painted. Finished areas include mechanical rooms, boiler rooms, and outside the building as well as occupied areas inside the building. Final painting is to be done by the General Contractor. This Contractor shall thoroughly clean all part of materials and equipment of cement, plaster, and other materials, and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all cracks and corners scraped out. Exposed metal work shall be carefully brushed down with steel brushes to remove rust and other spots and left smooth and clean.

- B This Contractor shall thoroughly clean the finish on all parts of the materials and equipment with factory applied finishes. Exposed parts in equipment rooms, above crawl space slabs, and all other spaces except sealed chases and attics shall be thoroughly cleaned of cement, plaster and other materials, and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all cracks and corners scraped out. If the finish has been damaged, the Contractor shall re-paint to the satisfaction of the Architect.
- C No nameplates on equipment shall be painted, and suitable protection shall be afforded to the plates to prevent their being rendered illegible during painting operation.

### 3.08 ELECTRICAL PROVISIONS OF FIRE PROTECTION WORK

- A The extent of electrical provisions to be provided as fire protection work is indicated in other sections of the specifications, on the drawings and as further specified in this section.
- B Starters, Controllers: In general, fire protection work includes furnishing combination starters. Controllers are specifically included as electrical work when mounted in motor control centers. Electrical work includes installation, mounting and wiring of starters and controllers that are furnished as mechanical work. Free standing, large motor controllers shall be set in place, on pads, as fire protection work.
- C Wherever possible, match the elements of the electrical provisions of fire protection work with similar elements of the electrical work specified in electrical sections of the specifications.
- D Standards:
  - 1. For electrical equipment and products, comply with applicable NEMA standards, and refer to NEMA standards to definitions of terminology herein.
  - 2. Comply with National Electrical Code (NFPA No. 70) for installation requirements.
  - 3. Comply with National Electrical Contractors Association (NECA) "Standard of Installation".

### 3.09 TEMPORARY FACILITIES

- A Unless noted otherwise in the Supplementary General Conditions; provide temporary facilities.

### 3.10 EQUIPMENT INSTALLATION REQUIREMENTS

- A All fire protection equipment shall be furnished and installed complete and ready for use.

**END OF SECTION**

**SECTION 210512**

**FIRE PROTECTION AND ELECTRICAL COORDINATION**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Refer to Section 210010 - BASIC FIRE PROTECTION REQUIREMENTS.
- C Refer to Section 220010 - BASIC PLUMBING REQUIREMENTS.
- D Refer to Section 230010 - BASIC MECHANICAL REQUIREMENTS.

1.02 SUMMARY

- A This Section describes the coordination between the Fire Protection, Plumbing, Mechanical and Electrical portions of the work.
- B This Section is included under the Division 21 portion of the Specifications as Section 210512, under the Division 22 portion of the Specifications as Section 220512, under the Division 23 portion of the Specifications as Section 230512, and under the Division 26 portion of the Specifications as Section 260512.

1.03 WORK INCLUDED

- A Responsibility: Unless otherwise indicated, motors and controls shall be furnished, set in place and wired in accordance with the following schedule. **This schedule may include equipment and systems that are not required for this project. Only the equipment and systems that are required on the drawings and/or specified elsewhere will be required by this section:**

	ITEM	FURNISHED UNDER DIVISION	INSTALLED UNDER DIVISION	WIRED AND CONNECTED UNDER DIVISION
1.	Equipment Motors	21/22/23	21/22/23	26
2.	Magnetic Motor Starters			
	a. Automatically controlled, with or without HOA switches	21/22/23	26	Notes 1,3,5
	b. Automatically controlled, with or without HOA switches and furnished as part of factory wired equipment	21/22/23	22/23	Notes 1,3,5
	c. Manually controlled	21/22/23	26	Notes 1,3,5
	d. Manually controlled and furnished as part of factory wired equipment	21/22/23	26	Notes 1,3,5
	e. Furnished in Motor Control Centers	26	26	Notes 1,3,5
3.	Variable Speed (Frequency) AC Drives	22/23	26	Notes 1,4,5
4.	Line voltage thermostats, time clocks, etc., not connected to control panel systems	23	26	23
5.	Electric thermostats, time clocks, remote bulb thermostats, motorized valves, float controls, etc. which are an integral part or directly attached to ducts, pipes, etc.	22/23	22/23	22/23
6.	Temperature control panels and	23	23	23

	ITEM	FURNISHED UNDER DIVISION	INSTALLED UNDER DIVISION	WIRED AND CONNECTED UNDER DIVISION
	time switches mounted on temperature control panels			
7.	Motorized valves, motorized dampers, solenoid valves, EP and PE switches, etc.	23	23	Note 1
8.	Alarm bells furnished with equipment installed by Division 22 or 23	22/23	22/23	22/23
9.	Wiring to obtain power for control circuits, including circuit breaker	21/22/23	21/22/23	21/22/23
10.	Low voltage controls	21/22/23	21/22/23	21/22/23
11.	Fire protection system (sprinkler) controls	21	21	Note 8
12.	Fire and smoke detectors installed on mechanical units and in ductwork	28	23	Note 8
13.	All relays required for fan shutdown, motorized dampers, smoke control devices, and other items integral with HVAC equipment to provide operation and control of HVAC equipment	23	23	Note 1
14.	Smoke dampers, and combination fire/smoke dampers	23	23	Note 7
15.	Boiler and water heater controls, boiler burner controls panels	22/23	22/23	22/23
16.	Pushbutton stations, pilot lights	22/23	22/23	22/23
17.	Heat Tape	21/22/23	21/22/23	26
18.	Disconnect switches, manual operating switches furnished as a part of the equipment	21/22/23	21/22/23	Notes 1,5
19.	Disconnect switches, manual operating switches furnished separate from equipment	26	26	26
20.	Multispeed switches	23	23	26
21.	Thermal overloads	21/22/23	21/22/23	21/22/23
22.	Control relays, transformers	21/22/23	21/22/23	21/22/23
23.	Refrigeration cycle, cooling tower and controls	23	23	23
24.	Tamper switches for fire protection (sprinkler) system	21	21	28
25.	Flow and/or pressure switches for fire protection (sprinkler) system	21	21	28
26.	Fire and jockey pump controllers and automatic transfer switch	21	21	Note 6
27.	Alarm bells or horns for fire protection (sprinkler) system	21	21	28

FIRE PROTECTION AND ELECTRICAL COORDINATION

	ITEM	FURNISHED UNDER DIVISION	INSTALLED UNDER DIVISION	WIRED AND CONNECTED UNDER DIVISION
28.	Generator (underground) fuel tank	22	22	--
29.	Generator fuel level indicator	22	22	26
30.	Generator fuel piping from tank to generator	22	22	--
31.	Underground fuel tank leak detection and monitoring system	22	22	22
NOTES:	(1)	Power wiring as defined in Section 262913 of the specifications shall be provided under Division 26; control wiring as defined in Section 262913 of the specifications shall be provided under Division 21/22/23.		
	(2)	Wiring from alarm contacts to alarm systems provided by Division 26, wiring from auxiliary contacts to air handling system controls provided by Division 23. Division 26 shall provide power to smoke detector. Smoke detectors required for all air handling systems 2000 CFM or greater. Refer to other Division 23 specifications, Division 26 and Drawings for more specific requirements.		
	(3)	For requirements for Magnetic Motor Starters, refer to Section 238965 - MOTOR CONTROLLERS.		
	(4)	For requirements for Variable Speed (Frequency) AC drives, refer to Section 238965 - MOTOR CONTROLLERS.		
	(5)	Disconnect switches, operating switches, starters and other similar items that are factory-mounted, as a part of complete assembly, shall comply with applicable provisions of the National Electric Code. All such disconnect switches shall be fused.		
	(6)	Power wiring from energy source to controllers and automatic transfer switch provide shall be provided under Division 26. Interconnection power and control wiring from controllers and automatic transfer switch to pumps shall be provided under Division 21, 22 or 23 and conforming to Division 26 specifications. Control wiring from automatic transfer switch to generator starter shall be provided under Division 26.		
	(7)	Division 26 will provide power to all smoke and combination fire/smoke dampers, and Division 28 will provide control for all such dampers using area smoke detectors.		
	(8)	Wiring for sprinkler system controls to be provided by Division 21. Wiring from devices to Fire Alarm System to be provided by Division 28.		

B CONNECTIONS: Make all connections to controls that are directly attached to ducts, piping and mechanical equipment with flexible connections.

C PRECEDENCE

1. In general, piping systems that require a stated grade for proper operation shall have precedence over other systems.
2. Precedence for pipe, conduit and duct systems shall be as follows.
  - a. Building lines
  - b. Structural members
  - c. Soil and drain piping
  - d. Vent piping
  - e. Condensate piping
  - f. Refrigerant piping
  - g. Supply ductwork

- h. Return ductwork
  - i. Exhaust ductwork
  - j. Chilled water and heating water piping
  - k. Automatic Fire Protection Sprinkler Piping
  - l. Domestic hot and cold water piping
  - m. Electrical conduit
3. Lighting Fixtures shall have precedence over air grilles and diffusers.
- D FINAL INSPECTION AND REPORT
1. At the completion of the work, there shall be a meeting of the Fire Protection, Plumbing, Mechanical, Electrical Fire Alarm and Temperature Control Contractors, representatives of mechanical and electrical equipment manufactures whose equipment was actually installed on the project, and similarly-involved individuals, who shall thoroughly inspect all systems, and who shall mutually agree that all equipment has been properly wired and installed, and that all temperature and safety controls are properly functioning. A written report of this meeting, listing those in attendance, and the companies that they represent, shall be filed with the Owner and Architect or Engineer.

**END OF SECTION**

**SECTION 211100**

**FIRE PROTECTION PIPING**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A Extent of Fire Protection Piping Work required by this section is indicated on Drawings and by requirements of this section.
- B This section includes pipe, fittings and valves for Fire Protection Systems. Types of Fire Protection Piping Systems specified in this section include the following:
  - 1. Automatic Sprinkler Systems.
  - 2. Standpipe and Hose Systems.

**1.02 REFERENCES**

- A ANSI/ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
- B ANSI/ASME B16.3 - Malleable Iron Threaded Fittings, Class 150 and 300.
- C ANSI/ASME B16.4 - Cast Iron Threaded Fittings, Class 125 and 250.
- D ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings.
- E ANSI/ASME B16.9 - Factory-made Wrought Steel Buttwelding Fittings.
- F ANSI/ASME B16.11 - Forged Steel Fittings, Socket-welding and Threaded.
- G ANSI/ASME B16.18 - Cast Copper Alloy Solder-Joint Pressure Fittings.
- H ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- I ANSI/ASME B16.25 - Buttwelding Ends.
- J ANSI/ASME B36.10 - Welded and Seamless Wrought Steel Pipe.
- K ANSI/ASME Section 9 - Welding and Brazing Qualifications.
- L ANSI/ASTM A135 - Electric-Resistance-Welded Steel Pipe.
- M ANSI/ASTM A47 - Malleable Iron Castings.
- N ANSI/ASTM B32 - Solder Metal.
- O ANSI/AWS A5.8 - Brazing Filler Metal.
- P ANSI/AWWA C110 - Ductile Iron and Gray Iron Fittings.
- Q ANSI/AWWA C151 - Ductile Iron Pipe, Centrifugally Cast.
- R ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless.
- S ASTM A120 - Pipe, Steel, Black and Hot-Dipped, Zinc-coated (Galvanized) Welded and Seamless, for Ordinary Uses.
- T ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- U ASTM B75 - Seamless Copper Tube.
- V ASTM B88 - Seamless Copper Water Tube.
- W ASTM B251 - General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.
- X AWS D10.9 - Specifications for Qualification of Welding Procedures and Welders for Piping and Tubing.
- Y NFPA 13 - Installation of Sprinkler Systems, latest edition
- Z NFPA 14 - Installation of Standpipe and Hose Systems, latest edition.
- AA NFPA 24 - Installation of Private Fire Service Mains and their Appurtenances, latest edition.

**1.03 QUALITY ASSURANCE**

- A Conformance with applicable state and local codes and ordinances.
- B Welding Materials and Procedures: Conform to ASTM Code and AWS D10.12.
- C Employ certified welders in accordance with ANSI/ASME Section 9.
- D Valves: Bear UL label or marking. Provide manufacturer's name and pressure rating marked on valve body.

**1.04 REGULATORY REQUIREMENTS**

- A Install in accordance with NFPA 13, City Fire Codes and Ordinances, and the requirements of Owner's Insurance Underwriter.



- B Piping materials specified herein are acceptable products to the Architect but all are not necessarily acceptable to applicable local codes and ordinances. It is the responsibility of the Contractor to provide materials, from the options listed herein that are acceptable to both the Architect and applicable local codes and ordinances.
- C Pipe sizes as shown on the Drawings are minimum pipe sizes. Contractor shall increase those pipe sizes if calculations so require, but under no circumstance shall pipe sizes be decreased.

#### 1.05 SUBMITTALS

- A Prior to submittal to Architect, submit shop drawings, product data, and hydraulic calculations to local Fire Marshal and Owner's Insurance.
- B After approval from local Fire Marshal and Owner's Insurance Underwriter, submit shop drawings, product data, and hydraulic calculations to Architect (with Certificate of Approval from local Fire Marshal and Owner's Insurance Underwriter for approval in accordance with Division 01 and Section 210010.
- C Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals.
- D Indicate valve data and ratings.
- E Submit certificates as listed below to Architect in accordance with Division 01 and Section 210010.
  - 1. Test Certificate of Approval for Piping System.

### PART 2 - PRODUCTS

#### 2.01 PIPE, FITTINGS, AND VALVES

- A Provide above floor pipe, fittings, valves in accordance with City codes and ordinances, NFPA 13 for sprinkler and Owner's Insurance.
- B The minimum thin wall piping allowed shall be schedule 40 for pipe up to 2 in. and Schedule 10 for pipe over 2 in. All thin wall piping shall be joined using rolled grooves with coupling.
- C Grooved and Shouldered Pipe End Couplings: Malleable iron housing clamps to engage and lock, designed to permit some angular deflection, contraction and expansion; "C" shape composition sealing gasket; steel bolts, nuts, and washers; galvanized couplings for galvanized pipe.
  - 1. Acceptable Manufacturers:
    - a. Victaulic
    - b. Tyco (Grinnell Mechanical Products)
    - c. Gruvlok (Anvil International)
- D For all threaded pipe, use Schedule 40.
- E Piping for all dry pipe sprinkler systems and all dry standpipes shall be galvanized.

### PART 3 - EXECUTION

#### 3.01 PREPARATION

- A Ream pipe and tube ends to full inside diameter.
- B Remove burrs and bevel plain end ferrous pipe.
- C Remove scale and foreign material, inside and outside, before assembly.

#### 3.02 INSTALLATION - PIPE

- A Thread steel pipe joints up to and including 1-1/2 in. diameter. Thread, weld, or groove 2-in. diameter and larger, including branch connections.
- B Mechanical joints may be used instead of threaded or welded joints.
- C Die-cut threaded joints with full-cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.
- D Coat threaded ends with pipe lubricant compound.
- E In steel piping, main sized saddle branch connections or direct connection of branch lines to mains is permitted if main is two pipe sizes larger than the branch. Do not project branch pipes inside the main pipe.
- F Solder or braze copper tubes.
- G Install piping in accordance with NFPA 13, for sprinkler systems and NFPA 24 for private fire service mains and their appurtenances.
- H Do not penetrate or cut building structural members.
- I Provide sleeves when penetrating floors and walls.

- J Seal pipe and sleeve penetration to achieve fire and smoke resistance equivalent to fire and smoke separation.
- K Fire protection water service piping below building shall be provided with both flanged joints and thrust block restraint in accordance with NFPA 24. Flange bolts and nuts shall be stainless steel. Thrust block restraint shall be provided on the below floor elbow at the base of the riser. Area of bearing face of concrete thrust block shall be a minimum of 3.2 square feet.
- L Establish elevation of buried pipe outside the building to ensure not less than 3 ft. of cover over top of pipe.
- M Piping shall not run through grade beams. Piping shall run under grade beams.

### 3.03 INSTALLATION - VALVES

- A Install valves with stems upright or horizontal, not inverted.
- B Provide drain valves at main shut-off valve and after all zone valves. In addition, provide auxiliary drains at all low points.
- C Adjust all pressure reducing valves to minimum pressures within the operating pressure range as required by NFPA 13. Fire Department valve outlet shall not exceed 150 psig. Automatic sprinkler systems shall not exceed 100 psig.

### 3.04 CLEANING

- A Flush entire piping system of foreign matter in accordance with NFPA 13.

### 3.05 TESTING

- A Hydrostatically test entire system in accordance with local Fire Marshal, Owner's Insurance Underwriter, and NFPA 13 or 1-1/2 times the operating pressure, whichever is greater.
- B Test results shall be witnessed and approved by local Fire Marshal, Owner's Insurance Underwriter, and Architect.
- C Submit Test Certificate of Approval for Piping System stating that all test results are satisfactory. Certificate of Approval must be signed by Contractor, local Fire Marshal, Owner's Insurance Underwriter, and Architect.

**END OF SECTION**

## SECTION 211300

### AUTOMATIC SPRINKLER SYSTEMS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A Extent of Automatic Sprinkler Fire Extinguishing System Work required by this section is indicated on Drawings and by requirements of this section.
- B This section includes design and provisions of an Automatic Sprinkler Fire Extinguishing System. Types of Fire Extinguishing Automatic Sprinkler Systems specified in this section include the following:
  - 1. Wet Pipe System

##### 1.02 REFERENCES

- A NFPA 13 - Installation of Sprinkler Systems, latest edition.
- B NFPA 24 - Installation of Private Fire Service Mains and Their Appurtenances, latest edition.

##### 1.03 DESIGN CRITERIA

- A System to provide coverage for building areas noted.
- B Interface system with building fire and smoke alarm system.
- C Design systems to the occupancy requirements of NFPA 13, City Codes and Ordinances, and the Owner's Insurance Underwriter.
- D Provide Fire Department connection.
- E Provide detailed shop drawings of the automatic sprinkler systems in accordance with NFPA 13.
- F Provide hydraulic calculations of the automatic sprinkler systems in accordance with NFPA 13. Hydraulic calculations shall not exceed 90% of the available pressure.

##### 1.04 QUALITY ASSURANCE

- A Conformance with applicable state and local codes and ordinances.
- B Equipment and Components: Bear UL label or marking.
- C Specialist Firm: Company specializing in sprinkler systems design and installation, Licensed Fire Protection Contractor by the Texas State Board of Insurance Underwriters with minimum three years' experience.
  - 1. Preferred Vendors:
    - a. FireWise
      - 1) Contact: Shane Bassham
      - 2) Phone: 817.304.9576
      - 3) Email: shane@firewisetx.com
    - b. Liberty Building Technologies
      - 1) Contact: Larry Clay
      - 2) Phone: 817.829.2295
      - 3) Email: larry.clay@libertybuildingtech.com

##### 1.05 REGULATORY REQUIREMENTS

- A Design and install in accordance with NFPA 13, City Codes and Ordinances and the requirements of Owner's Insurance Underwriter.
- B Pipe sizes as shown on the Drawings are minimum pipe sizes. Contractor shall increase those pipe sizes if calculations so require at no additional cost, but under no circumstance shall pipe sizes be decreased.

##### 1.06 SUBMITTALS

- A Prior to submittal to Architect submit shop drawings, product data, and hydraulic calculations to local Fire Marshal and Owner's Insurance Underwriter.
- B After approval from local Fire Marshal and Owner's Insurance Underwriter submit shop drawings, product data and hydraulic calculations to Architect (with Certificate of Approval from local Fire Marshal and Owner's Insurance Underwriter) for approval in accordance with Division 01 and Section 210010.
- C Indicate hydraulic calculations, detailed pipe layout, hangers and supports, components and accessories.

- D Submit certificates as listed below to Architect in accordance with Division 01 and Section 210010.
  - 1. Test Certificate of Approval for equipment and system operation.

1.07 PROJECT RECORD DOCUMENTS

- A Submit documents in accordance with Division 01 and Section 210010.

1.08 OPERATION AND MAINTENANCE DATA

- A Submit manufacturer's operation and maintenance data under provisions of Division 01 and Section 210010.
- B Include written maintenance data on components of system, servicing requirements, and Record Drawings.

1.09 DELIVERY, STORAGE, AND HANDLING

- A Deliver and store equipment in shipping containers with labeling in place under provisions of Division 01 and Section 210010.

1.10 EXTRA STOCK

- A Provide extra sprinkler heads under provisions of NFPA 13.
- B Provide suitable wrenches for each head type.
- C Provide metal storage sprinkler head and wrench cabinet in location designated.

**PART 2 - PRODUCTS**

2.01 PIPING MATERIALS

- A See Section 211100.

2.02 AIR SUPPLY SYSTEM

- A Air supply systems for dry pipe system shall be provided from existing dry pipe air compressor.

2.03 SPRINKLER HEADS

- A Suspended Ceiling Type:
  - 1. Semi-recessed "Standard" pendent type with chrome-plated finish and matching escutcheon.
  - 2. Fully recessed pendent type with white cover plate.
  - 3. For dry-pipe system installations, provide "dry" pendent type as specified above.
  - 4. Semi-recessed commercial/residential "Quick Response" vandal resistant pendent type with chrome-plated finish and matching escutcheon for all sleeping rooms equal to Reliable ZX-QR-INST pendent or sidewall.
  - 5. In all electrical and mechanical rooms provide high temperature rated at 286°F pendant type sprinkler heads with sprinkler head guards.
  - 6. The use of o-ring sealed sprinkler heads is prohibited.
- B Hard Ceiling Type: Semi recessed pendent type with white cover plate.
- C Exposed Area Type: Standard upright types with chrome finish.
- D Fusible Link: Temperature rated for specific area hazard.
- E Guards: Finish to match sprinkler head.

**PART 3 - EXECUTION**

3.01 PREPARATION

- A Coordinate Work of this Section with other affected work.

3.02 INSTALLATION

- A Installation shall be in accordance with NFPA 13.
- B Locate fire department connection in accordance with City requirements with sufficient clearance from walls, obstructions, or adjacent Siamese connectors to allow full swing of Fire Department wrench handles.
- C Place pipe runs to minimize obstruction to other work.
- D Place piping in concealed spaces above finished ceilings.
- E Center heads two directions in 2 ft. 0 in. x 2 ft. 0 in. ceiling tile and provide piping offsets as required.
- F Apply strippable tape or paper cover to ensure sprinkler heads do not receive field paint finish.

- G Installation of preaction system and accessories shall be in accordance with manufacturer's recommendations.
- H Provide 3/4-in. ball drip at low point of fire department connection and pipe to floor drain or through exterior wall.
- I Dry and preaction sprinkler systems located in areas with ceilings shall be concealed with dry pendant type sprinkler heads.

### 3.03 SYSTEM TESTS

- A Test dry pipe system, wet pipe system, alarm switches, supervisory switches, electric alarm bells, and interfacing with building fire and smoke alarm system to ensure proper operation. Tests shall be performed in accordance with the City Fire Marshal, Factory Mutual, and NFPA 13.
- B Tests shall be witnessed and approved by local Fire Marshal, Owner's Insurance Underwriter, and Architect.
- C After completion and approval of testing submit "Test Certificate of Approval" for alarm switches, supervisory switches, and electric alarm bells stating that all test results are satisfactory. Certificate of Approval must be signed by Contractor.

### 3.04 DEMONSTRATION OF SYSTEM AND EQUIPMENT

- A Prior to final acceptance, Contractor shall provide a minimum of 4 hours (or as long as required by the Owner) to demonstrate to the Owner the proper operation of the wet pipe automatic sprinkler system including associated accessories and controls.
- B After completion and approval of demonstrations, submit "Demonstration Certificates of Completion" for wet pipe automatic sprinkler system and dry pipe automatic sprinkler system including all associated accessories and controls stating that the Demonstrations of the systems are satisfactory. Certificates must be signed by the Manufacturer's Representative, Contractor, Owner, and Architect.

**END OF SECTION**

## SECTION 220010

### BASIC PLUMBING REQUIREMENTS

#### PART 1 - GENERAL

##### 1.01 GENERAL PROVISIONS AND SUPPLEMENTAL GENERAL PROVISIONS

- A The "General Conditions" and "Supplementary Conditions" are by reference made a part of this section and shall apply to each and every heading as though included herein.
- B In the event of conflict, the requirements of the "General Conditions" and "Supplementary Conditions" will take precedence over these "General Requirements".

##### 1.02 GENERAL

- A The Contractor shall provide all plans, labor, equipment, appliances and materials, and shall perform all operations in connection with the installation of the plumbing work in accordance with the Specifications, applicable drawings, and the conditions specified above.
- B Contractor shall provide all equipment required and usually furnished in connection with such work and systems whether or not specifically mentioned or specifically indicated on the drawings.

##### 1.03 INSPECTION OF THE SITE

- A The Contractor shall visit the site, verifying all existing items indicated on drawings and/or specified, and familiarize himself with the existing work conditions, hazards, grades, actual formations, soil conditions, and local requirements. The submission of bids shall be deemed evidence of such visits.
- B All proposals shall take these existing conditions into consideration, and the lack of specific information on the drawings shall not relieve the Contractor of any responsibility.
- C The trade furnishing the equipment shall be responsible for notifying the Contractor prior to ordering it, in the event that equipment specified and/or reviewed is incompatible with this requirement.

##### 1.04 PERMITS, UTILITY CONNECTIONS, AND INSPECTIONS

- A Refer to other sections of the specifications for construction phasing and time increments.
- B The Contractor shall obtain and pay for all required utility connections, impact fees, utility extensions and/or relocations and shall pay all costs and inspection fees for all work included herein.

##### 1.05 APPLICABLE CODES AND STANDARDS

- A The installation shall meet the minimum standards prescribed in the latest editions of the following listed codes and standards, which are made a part of the Specifications, except as may be hereinafter modified in these Specifications and associated drawings.
- B Latest edition of the National Fire Protection Association Standards (NFPA):
  - 1. NFPA No. 70 National Electrical Code
  - 2. NFPA No. 101 Safety to Life from Fire in Buildings and Structures
  - 3. NFPA No. 255 Test of Surface Burning Characteristics of Building Materials
- C United States of America Standards Institute (ASA) Standards:
  - 1. A40.8 National Plumbing Code
  - 2. B31.1 & B31.1a Code for Pressure Piping
- D American Society of Mechanical Engineers (ASME): Boiler and Pressure Vessel Codes.
- E American Society of Testing and Material (ASTM): All applicable manuals and standards.
- F American Water Works Association (AWWA): All applicable manuals and standards.
- G National Electrical Manufacturer's Association (NEMA): All applicable manuals and standards.
- H City and State Building Codes.
- I State of Texas Occupational Safety Act: Applicable safety standards.
- J Occupational Safety and Health Act (OSHA).
- K State of Texas Energy Conservation Construction Code.
- L All work shall be in accordance with all regulations and requirements of the State of Texas Architectural Barriers Act (TAS).
- M Texas Department of Health (TDH) Hospital Licensing Standards.

- N Refer to Specifications sections hereinafter bound for additional codes and standards.
- O All materials and workmanship shall comply with all applicable state and national codes, specifications, and industry standards. All material shall be listed by the Underwriter's Laboratories, Inc., as conforming to its standards and so labeled in every case where such a standard has been established for the particular type of material in question.
- P All equipment provided and all installation methods shall meet all applicable requirements of the Fort Worth Energy Code (IECC 2015 with Fort Worth Amendments).
- Q The Contract Documents are intended to comply with the aforementioned rules and regulations; however, some discrepancies may occur. Where such discrepancies occur, the Contractor shall immediately apply for an interpretation. Should the discovery and notification occur after the execution of a contract, any additional work required for compliance with said regulations shall be paid for as covered by other specifications of the Contract Documents, providing no work or fabrication of materials has been accomplished in a manner of non-compliance. Should the Contractor fabricate and/or install materials and/or workmanship in such a manner that does not comply with the applicable codes, rules and regulations, the Contractor who performed such work shall bear all costs arising in correcting these deficiencies to comply with said rules and regulations.

#### 1.06 CONTRACT DOCUMENTS

- A These specifications are accompanied by drawings of the building and details of the installations indicating the locations of equipment, piping, ductwork, outlets, switch controls, circuits, lines, etc. The drawings and these specifications are complementary to each other, and what is required by one shall be as binding as if required by both.
- B If the Contractor deems any departures from the drawings necessary, details of such departures and the reasons therefore shall be submitted to the Architect for review. No departures shall be made without prior written acceptance.
- C There are intricacies of construction that are impractical to specify or indicate in detail; however, in such cases the current rules of good practice and applicable specifications shall govern.
- D It is the Contractor's responsibility to properly use all information found on the Civil, Architectural, Structural, Fire Protection, Plumbing, Mechanical and Electrical drawings where such information affects his work.
- E All dimensional information related to new structures should be taken from the appropriate drawings. All dimensional information related to existing facilities shall be taken from actual measurements made by the Contractor on the site.
- F The interrelation of the specifications, the drawings, and the schedules is as follows: The specifications determine the nature and setting of the several materials, the drawings establish the quantities, dimensions and details, and the schedules give the performance characteristics.
- G Should the drawings or specifications disagree within themselves, or with each other, the better quality of greater quantity of work or materials shall be estimated upon, and unless otherwise directed by the Architect in writing, shall be performed or furnished. Figures indicated on drawings govern scale measurements and large-scale details govern small-scale drawings.

#### 1.07 SPACE AND EQUIPMENT ARRANGEMENT

- A The size of fire protection, plumbing, mechanical, and electrical equipment indicated on the drawings is based on the dimensions of a particular manufacturer. While other manufacturers may be acceptable, it is the responsibility of the Contractor to determine if the equipment he proposes to furnish will fit in the space. Shop drawings shall be prepared to indicate a suitable arrangement.
- B All equipment shall be installed in a manner to permit access to all surfaces. All valves, motors, drives, filters, and other accessory items shall be installed in a position to allow removal for service without disassembly of another part.
- C Maintain all Code required clearances for equipment access.

#### 1.08 FABRICATION DRAWINGS

- A Contractor shall submit shop drawings whenever (1) equipment proposed varies in physical size and arrangement from that indicated on the drawings, thus causing rearrangement of equipment space, (2) where tight spaces require extreme coordination between ductwork, piping, conduit and other equipment, and (3) where called for elsewhere in these specifications.
- B Contractor shall submit piping shop drawings for review by the Architect. Fabrication drawings shall be fully coordinated with ALL other trades and with existing conditions.
- C All required shop drawings, except as hereinafter specified, shall be prepared at a scale of not less than 1/8 in. equal to 1 ft. for floor plans and 1/4 in. equal to 1 ft. for mechanical rooms.

#### 1.09 SUPERVISION

- A Each contractor shall keep a competent superintendent or foreman on the job at all times necessary for the timely and proper completion of the work.
- B It shall be the responsibility of each superintendent to study all drawings and familiarize himself with the work to be done by other trades. He shall coordinate this work with other trades, and before material is fabricated or installed, make sure that his work will not cause an interference that cannot be resolved without major changes to the drawings. If a conflict between trades arises that cannot be resolved at the jobsite, the matter shall be referred to the Architect for his ruling.

#### 1.10 EXISTING FACILITIES

- A The Contractor shall be responsible for loss or damage to the existing facilities caused by him and his workmen, and shall be responsible for repairing or replacing such loss or damage. The Contractor shall send proper notices, make necessary arrangements, and perform other services required for the care, protection and in-service maintenance of all plumbing, heating, air conditioning, and ventilating services for the new and existing facilities. The Contractor shall erect temporary barricades, with necessary safety devices, as required to protect personnel from injury, and remove all such temporary protection upon completion of the work. All barricades and safety devices shall be in compliance with OSHA.
- B The Contractor shall provide temporary or new services to all existing facilities as required to maintain their proper operation when normal services are disrupted as a result of the work being accomplished under this project.
- C Where existing construction is removed to provide working and extension access to existing utilities, Contractor shall remove doors, piping, conduit, outlet boxes, wiring, light fixtures, air conditioning ductwork and equipment, etc., to provide this access and shall reinstall same upon completion of work in the areas affected.
- D Where partitions, walls, floors, or ceilings of existing construction are indicated to be removed, all Contractors shall remove and reinstall, in locations approved by the Architect, all devices required for the operation of the various systems installed in the existing construction. This is to include, but is not limited to, temperature control system devices, electrical switches, relays, fixtures, piping, conduit, etc.
- E Outages of services, as required by the new installation, will be permitted only at a time approved by the Architect.

#### 1.11 DEMOLITION AND RELOCATION

- A The Contractor shall modify, remove and/or relocate all materials and items so indicated on the drawings or required by the installation of new facilities. Materials and/or items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to good operative condition.
- B All items that are to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The Contractor shall clean and repair and provide all new materials, fittings, and appurtenances required to complete the relocations and to restore to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved.
- C Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points indicated on the drawings, specified, or acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed and sealed, capped, or otherwise tied-off or disconnected in a safe manner acceptable to the Architect. All disconnections or connections into the existing facilities shall be done in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas of facilities, which must remain in operation during the construction period, shall not be interrupted without prior specific approval of the Architect as hereinbefore specified.
- D All equipment and materials indicated to be removed and not be re-used shall be disposed of by the Contractor.

#### 1.12 OPERATING AND MAINTENANCE INSTRUCTIONS

- A The Contractor shall prepare, in triplicate for the Owner's Manual, complete sets of operating and maintenance instructions, system piping, valving, control and interlock diagrams, manuals, parts lists, etc., for each item of equipment. Include copies of all equipment warranties.
- B In addition, the Contractor shall provide the services of a competent engineer or a technician acceptable to the Architect to instruct a representative of the Owner in the complete and detailed operation of all equipment and systems. These instructions shall be provided for a period of not less than 8 hours to fully accomplish the desired results. Upon completion of these instructions, a letter of release will be required, stating the dates of instruction and the personnel to whom instructions were given. The Contractor shall be responsible for proper maintenance until the instructions have been given to the Owner's maintenance personnel.



#### 1.13 GUARANTEE

- A All work and equipment shall be guaranteed for a period of one year from the date of substantial completion.
- B Guarantee shall be for all labor and materials.
- C Certain items for equipment shall have additional or extended warranties when so specified.

#### 1.14 MATERIALS AND WORKMANSHIP

- A All materials, unless otherwise specified, shall be of current U.S. manufacture, new, free from all defects, and of the best quality of their respective kinds. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of work involved. All work shall be executed by mechanics skilled in their respective trades, and the installations shall present a neat, workmanlike appearance. Materials, and/or equipment damaged in shipment, or otherwise damaged prior to installation, shall not be repaired at the job site, but shall be replaced with new materials and/or equipment.
- B The responsibility for furnishing the proper equipment and/or material, and to see that it is installed as intended by the manufacturer rests entirely upon the Contractor, who shall request advice and supervisory assistance from the representative of specific manufacturers during the installation.

#### 1.15 FLAME SPREAD PROPERTIES OF MATERIALS

- A Materials and adhesives incorporated in this project shall conform to NFPA 255, latest edition. The classification shall not exceed No. 2, with the range of indices between 0 to 25 for these Classifications as listed in the Federal Specifications. Modifications shall be made to insulating materials, etc., as required to comply with the Federal Specification.

#### 1.16 LARGE APPARATUS

- A Any large piece of apparatus which is to be installed in any space in the building, and which is too large to permit access through stairways, doorways, or shafts shall be brought to the job and placed in the space before the enclosing structure is completed. Following placement in the space, such apparatus shall be thoroughly, completely protected from damage as hereinafter specified.

#### 1.17 FLOOR AND CEILING PLATES

- A Except as otherwise noted, provide chrome plated brass floor and ceiling plates around all pipes, conduits, ducts, etc., passing exposed through walls, floors, or ceilings, in any spaces, except under floor and attic spaces. Plates shall be sized to fit snugly against the outside of the pipe or against the insulation on lines that are insulated and positively secured to such pipe or insulation. Plates will not be required for piping where pipe sleeves extend 3/4 in. above finished floor. All equipment rooms are classified as finished areas. Round and rectangular ducts shall have plates made to fit accurately at all floor, wall and ceiling penetrations.

#### 1.18 SLEEVES, INSERTS AND FASTENINGS

- A Proper openings through floors, walls, roofs, etc., for the passage of piping, ductwork, etc., shall be provided. All penetrations must pass through sleeves except soil pipe installed under concrete slabs on fill. Sleeves shall be set in new construction before concrete is poured, as cutting holes through any part of the concrete will not be permitted unless acceptable to the Architect.
- B Pipes passing through concrete or cinder walls and floor or other corrosive material shall be protected by a protective sheathing or wrapping or by sleeves, as required to meet the local code. Annular spaces between sleeves and pipes shall be filled or tightly caulked in an approved manner. Annular spaces between sleeves and pipes in fire-resistance-rated assemblies shall be filled or tightly caulked in accordance with the local code.
- C The minimum clearance between horizontal penetrations including insulation where applicable, and sleeves shall be 1/4 in., except that the minimum clearance shall be 2 in. where piping contacts the ground. Sleeves through walls and partitions shall be installed flush with exposed surfaces. Sleeves through floors shall be extended 2 in. above finished floor.
- D Above grade and dry location sleeves shall be constructed from 20 to 22 gauge galvanized steel. Sleeves passing through walls or floors on or below grade and/or moist areas such as mechanical rooms shall be constructed of galvanized steel Schedule 40 pipe and shall be designed with suitable flange in the center of the floor or wall to form a waterproof passage. After the pipes have been installed in the sleeves, void space around the pipe shall be sealed with "Link-Seal" modular wall and casing seals as manufactured by Thunderline Corporation.

- E Suitable concrete inserts for pipe and equipment hangers shall be set and properly located for all pipe and equipment to be suspended from concrete construction.
- F Fastening of pipes, conduits, etc., in the building shall be as follows: To wood members - by wood screws; to masonry - by threaded metal inserts, metal expansion screws, or toggle bolts, whichever is appropriate for the particular type of masonry; to steel - machine screws or welding (when specifically permitted or directed), or bolts, and to concrete by suitable inserts anchored to reinforcing steel, and poured in place unless other means are acceptable for general use, and will only be permitted where specifically acceptable to the Architect.
- G Under no circumstances will the use of plastic anchors or plastic expansion shields be permitted for any purpose whatsoever.
- H Vermin Proofing: The open space around all ductwork, piping, etc., passing through the ground floor and/or exterior walls shall be sealed with a continuous bead of sealant.
- I The space around piping, ductwork, etc., penetrating walls, ceilings and floors that define air plenums shall be sealed airtight in an acceptable manner. Ceiling plenums used for return air are considered air plenums.

#### 1.19 ACCESS DOORS

- A This Contractor shall provide wall or ceiling access doors for unrestricted access to all concealed shutoff or service valves, strainers, unions, flow switches, pressure reducing valves, control valves, air terminal units, fire and/or smoke dampers, and other items of concealed mechanical equipment. All access door locations are not shown on the drawings. It is the Contractor's responsibility to provide access doors at all locations required.
- B Access doors mounted in painted surfaces shall be equal to Milcor (Inland-Ryerson Construction Products Company) manufacture, Style K for plastered surfaces and Style M or DW for non-plastered surfaces. The Style K doors shall be set so that the finished surface of the door is even with the finished surfaces of the adjacent finishes. Access doors mounted on tile surfaces shall be stainless steel materials. Access doors shall be minimum of 18 in. x 18 in. in size.

#### 1.20 CONSTRUCTION REQUIREMENTS

- A The Civil, Architectural, Structural, Fire Protection, Mechanical, Plumbing, and Electrical plans and specifications including the General Provisions, Supplemental General Provisions, and other pertinent documents issued by the Architect, are a part of these specifications and the accompanying fire protection drawings, and shall be complied with in every respect. All the above is included in the Contract Documents, and shall be examined by all bidders. Failure to comply shall not relieve the Contractor of responsibility or be used as a basis for additional compensation due to omission of architectural, structural and electrical details from the plumbing drawings.
- B It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details or special construction may be required for work indicated or specified in this section or work specified in other sections, it shall be the responsibility of the Contractor to provide same as well as to provide material and equipment usually furnished with such systems or required to complete the installation, whether mentioned or not.
- C The Contractor shall be responsible for fitting his material and apparatus into the building and shall carefully lay out his work at the site to conform to the structural conditions, to avoid all obstructions, to conform to the details of the installation supplied by the manufacturer of the equipment to be installed and thereby to provide an integrated satisfactory operating installation.
- D The plumbing and associated drawings are necessarily diagrammatic in character and cannot show every connection in detail or every pipe or equipment in its exact location. These details are subject to the requirements of ordinances and also structural and architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. Work shall be installed to avoid crippling of structural members; therefore, inserts to accommodate pipe hangers shall be set before concrete is poured, and proper openings through floor, walls, beams, etc., shall be provided as hereinafter specified or as otherwise indicated or required. All work shall be installed parallel or perpendicular to the lines of the building unless otherwise noted.

- E When the plumbing drawings do not give exact details as to the elevation of pipe, ducts, etc., physically arrange the systems to fit in the space available at the elevations intended with the proper grades for the functioning of the system involved. Piping and duct systems are generally intended to be installed true and square to the building construction, and located as high as possible against the structure in a neat and workmanlike manner, and the plans do not show all required offsets, control lines, pilot lines and other location details. Work shall be concealed in all finished areas. Piping specified to be insulated shall be supported in a manner that will allow the insulation to be installed without gaps. Insulated piping in concealed areas shall be offset with fittings as necessary to permit installation of insulation. Bending of pipes or installing pipes in a strain in order to insulate will not be permitted.
- F All oiling devices and all parts of equipment requiring adjustment shall be easily accessible. Equipment shall be so located and installed as to permit convenient and safe maintenance and future replacement. Piping, ductwork, valve stems, etc., shall not block service space.

1.21 PLUMBING SUBMITTALS

- A Refer to the Conditions of the Contract (General and Supplementary) and Division 01 Section: "SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES" for submittal definitions, requirements, and procedures.
- B Submittal of Shop Drawings, product data, and samples will be accepted only when submitted by The Contractor. Data submitted from Subcontractors and material suppliers directly to the Architect will not be processed.
- C Submit Shop Drawings, product data, and samples on items indicated in the individual sections.
- D Shop Drawings and submittal data shall not be used as requests or proposals for alternate equipment or materials. Refer to Item "Product Options and Substitutions" elsewhere in this section.
- E **THIRD PARTY CERTIFICATION:** All Packaged equipment shall be independently Third Party labeled as a system for its intended use by a Nationally Recognized Testing Laboratory (NRTL) in accordance with OSHA Federal Regulations 29CFR1910.303 and .399, as well as NFPA Pamphlet #70, National Electric Code (NEC), Article 90-7.

1.22 PRODUCT OPTIONS AND SUBSTITUTIONS

- A Refer to the Instructions to Bidders and the Division 01 Section "SUBSTITUTION PROCEDURES" for requirements in selecting products and requesting substitutions.
- B Standards for Materials:
  - 1. These specifications indicate a standard for all materials incorporated into the work, with manufacturer's names and catalog numbers used to establish a grade and quality of materials and equipment. The manufacturer listed on the equipment schedules, or named first in the specifications, is the one on whose equipment the layout is based. Other named manufacturers must meet the indicated performance and space requirements.
  - 2. The "approved equal" clause used in these specifications is to permit the proposal of unnamed manufacturer's products for the work, and the Architect's decision concerning equal products is final.
  - 3. Considerations as to determination of equal products include, but are not limited to, the following:

	Materials	Physical size
	Workmanship	Weight
	Gauges of Materials	Appearance
	Available Local Service Personnel	Performance
	Previous successful installations	Capacity
	Delivery Schedules	Required Equipment Clearances

- C Requests for substitutions for equipment, materials and apparatus listed in Division 22 Sections must be submitted in writing a **MINIMUM OF 10 DAYS** prior to the scheduled bid date. Such requests must be accompanied by complete data to permit proper evaluation.
- D **BIDS SHALL NOT BE BASED ON UN-APPROVED MATERIALS, EQUIPMENT, OR APPARATUS. UNAPPROVED MATERIAL, EQUIPMENT OR APPARATUS WILL NOT BE ACCEPTED.**
- E Should electrical, water, drain, natural gas, structural support, or other similar requirements for alternate equipment, whether named in the specifications or approved as a substitution, be different from requirements for the products used in laying out the project, such changes shall be the responsibility of the Contractor, and shall not result in extra charges to the Owner, Architect, or Engineer.

1.23 RECORD DOCUMENTS

- A Refer to the Division 01 Section: "CLOSEOUT PROCEDURES" for requirements. The following paragraphs supplement the requirements of Division 01.

- B Mark Drawings to indicate revisions to piping and ductwork, size and location both exterior and interior; including locations of coils, dampers and other control devices, filters, boxes, and similar units requiring periodic maintenance or repair; actual equipment locations, dimensioned for column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned to column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.); Change Orders; concealed control system devices.
- C Mark Specifications to indicate approved substitutions; Change Orders; actual equipment and materials used.

1.24 PAINTING

- A Field painting of plumbing equipment, piping systems, etc., shall be accomplished under Division 09 of these specifications.
- B Protection of Factory-applied Finishes:
  - 1. Factory-applied finishes on equipment and apparatus installed on the project shall be carefully protected.
  - 2. At the conclusion of the work, and prior to final acceptance of the project, equipment and apparatus shall be thoroughly cleaned of all construction dirt, oil and grease smears, temporary labels, debris, paint droppings, etc.
  - 3. Damaged factory finishes shall be restored to their original condition using procedures, materials and application techniques as set forth in Division 09 found elsewhere in these specifications.

1.25 CLEANING

- A Refer to the Division 01 Section: "CLOSEOUT PROCEDURES" for general requirements for final cleaning.
- B Refer to Division 23 Section: "TESTING, ADJUSTING, AND BALANCING" for requirements for cleaning filters, strainers, and mechanical systems prior to final acceptance.
- C Name Plates:
  - 1. All nameplates shall be protected from damage during the construction process.
  - 2. At the conclusion of the work, the nameplates shall be carefully cleaned and left in a fully legible condition.
- D Removal of Rubbish: Each Contractor is responsible for the timely removal of rubbish and trash generated by his work, such as empty cartons, containers, materials crates, etc. Particular attention is called to residue that may present a potential tripping or injury hazard.

1.26 MOTORS AND DRIVES

- A Motors:
  - 1. General: Motors shall be U/L-approved, with copper windings, and with a minimum Service Factor of 1.15. The nominal capacity shall exceed the brake horse-power requirements at duty schedules.
  - 2. Motors 1/2 HP and smaller shall be 120-volt, single-phase with internal overload protection.
  - 3. Motors 3/4 HP and larger shall be 208/230 or 460 -volt, 3-phase, unless scheduled or noted otherwise, and shall have thermal over-load cutouts in each phase as recommended by the motor manufacturer.
  - 4. Motors shall be as manufactured by Century, General Electric, US Motors, Wagner, Westinghouse, or approved equal.
- B Drives:
  - 1. Belts drives shall be rated for 150% of motor-rated horsepower.
  - 2. Drive assemblies up to two (2) belts shall have adjustable motor sheaves with the mid-point of the adjustment range at the RPM required for the specified performance.
  - 3. On drive assemblies with 3 or more belts, provide fixed motor sheaves for the specified RPM. Provide and install up to 2 pulley changes as necessary to achieve the required air quantities.
  - 4. All multiple-belt drives shall be factory-marked-matched sets.
- C Specific requirements:
  - 1. Provide high-efficiency motors for the following:
    - a. Pumps, as scheduled.
  - 2. Efficiency ranges shall be as follows:

	Nominal HP	Minimum Efficiency	Premium Efficiency
	3	86.5	89.5
	5	87.5	89.5
	7.5	88.5	91.7
	10	89.5	91.7

	15	91.0	92.4
	20	91.0	93.0
	25	91.7	93.6
	30	92.4	93.6
	40	93.0	94.1
	50, 60, 75	93.0, 93.6, 94.1	94.5, 95.0, 95.4
	100	94.1	95.4

3. Motor efficiency certification shall be included with Product Submittal Data in accordance with Division 01 of these specifications.
4. Variable Speed (Frequency) AC Drives:
  - a. Where scheduled on the plans, provide and install variable speed (frequency) AC drives for motors.
  - b. Variable speed (frequency) AC drives shall be as described in Section 238965 - MOTOR CONTROLLERS - of these Specifications.
5. Motor Starters and Controllers:
  - a. Motor starters and controllers for fans, pumps, air-handling units, compressors, etc., which are not provided as an integral part of a factory-assembled package, shall be provided under Division 23 of the specifications. Refer to Section 238965 "MOTOR CONTROLLERS."

## PART 2 - PRODUCTS

### 2.01 GENERAL MATERIALS AND EQUIPMENT REQUIREMENTS

- A The manufacturer's published instructions shall be followed for preparing, assembling, installing, erecting, and cleaning manufacturer's materials or equipment, unless otherwise indicated. The Contractor shall promptly notify the Architect in writing of any conflict between the requirements of the Contract Documents and the manufacturer's directions and shall obtain the Architect's instructions before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturer's directions or such instructions from the Architect, he shall bear all costs arising in connection with the deficiencies.
- B The Contractor shall not receive material or equipment at the jobsite until there is suitable space provided to properly protect equipment from rust, drip, humidity, and dust damage.
- C Capacities shall be not less than those indicated but shall be such that no component or system becomes inoperative or is damaged because of start-up or other overload conditions.
- D Where materials or equipment are specified to be approved, listed, tested, or labeled by the Underwriter's Laboratories, Inc., or constructed and/or tested in accordance with the standards of the American Society of Mechanical Engineers, the Contractor shall submit proof that the items furnished under these sections of the specifications conform to such requirements. The ASME stamp will be acceptable as sufficient evidence that the items conform to the respective requirements.
- E Each major component of equipment shall have the manufacturer's name, address, and catalog number on a plate securely attached to the item of equipment. All data on nameplates shall be legible at the time of Final Observation.
- F Standard factory finish will be acceptable on equipment specified by model number; otherwise surfaces of ferrous metal shall be given a rust-inhibiting coating. The treatment shall withstand 200 hours in salt-spray fog test, in accordance with Method 6061 of Federal Standard No. 141. Immediately after completion of the test, the specimen shall show no signs of wrinkling or cracking, and no signs of rust creepage beyond 1/8 in. on either side of the scratch mark. Where rust-inhibitor coating is specified hereinafter, any treatment that will pass the above test is acceptable, unless a specific coating is specified, except that coal tar or asphalt type coatings will not be acceptable, unless so stated for a specific item. Where steel is specified to be hot-dip galvanized, mill-galvanized sheet steel may be used provided all raw edges are painted with a zinc-pigmented paint conforming to Military Specification MIL-P-6215.
- G Belts, pulleys, chains, gears, couplings, projecting setscrews, keys and other rotating parts located so that any person can come in close proximity thereto, shall be fully enclosed or properly guarded.
- H The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, to verify all dimensions in the field, and to advise the Architect of any discrepancy before performing any work. Adjustments to the work required, in order to facilitate a coordinated installation, shall be made at no additional cost to the Owner.

## 2.02 PROTECTION

- A The Contractor shall at all times take such precautions as may be necessary to properly protect all materials and equipment from damage from the time of delivery until the completion of the work. This shall include the erection of all required temporary shelters and supports to adequately protect any items stored in the open on the site from the weather, the ground and surrounding work; the cribbing of any items above the floor of the construction; and the covering of items in the incomplete building with tarpaulins or other protective covering. Failure on the part of the Contractor to comply with the above will be sufficient cause for the rejection of the items in question.
- B Take particular care not to damage the building structure in performing work. All finished floors, steel treads, and workmen or their tools and equipment shall cover finished surfaces to prevent any damage during the construction of the building.
- C Equipment and materials shall be protected from rust both before and after installation. Any equipment or materials found in a rusty condition at the time of final observation must be cleaned of rust and repainted as specified elsewhere in these specifications.

## 2.03 COOPERATION BETWEEN TRADES AND WITH OTHER CONTRACTORS

- A Each trade, subcontractor and/or contractor must work in harmony with the various other trades, subcontractors, and/or contractors on the job as may be required to facilitate the progress to the best advantage of the job as a whole. Each trade, subcontractor, and/or contractor must pursue his work promptly and carefully as not to delay the general progress of the job. This Contractor shall work in harmony with contractors working under other contracts on the premises.

## 2.04 PRECEDENCE OF MATERIALS

- A These specifications and the accompanying drawings are intended to cover systems which will not interfere with the structural design of the building, which will fit into the available space, and which will insure complete and satisfactory systems. Each Contractor shall be responsible for the proper fitting of his material and apparatus into the building.
- B Each Contractor shall so harmonize his work with that of the other trades so that it may be installed in the most direct and workmanlike manner without hindering or handicapping the other trades. Piping interferences shall be handled by giving precedence to pipelines that require a stated grade for proper operation. Where space requirements conflict, the following order of precedence shall, in general, be observed:
  - 1. Building lines
  - 2. Structural members
  - 3. Drain piping
  - 4. Vent piping
  - 5. Condensate piping
  - 6. Refrigerant piping
  - 7. Supply ductwork
  - 8. Return ductwork
  - 9. Exhaust ductwork
  - 10. Chilled water and heating water piping
  - 11. Automatic Fire Protection Sprinkler Piping
  - 12. Domestic hot and cold water piping
  - 13. Electrical conduit

## 2.05 LOCATION OF OUTLETS IN ROOMS

- A All fire protection, plumbing, acoustical tile, diffusers, grilles, registers, and other devices shall be referenced to coordinated, established data points and shall be located to present symmetrical arrangements with these points and to facilitate the proper arrangements of acoustical tile panels and other similar panels with respect to the mechanical and electrical outlets and devices. Those mechanical and electrical outlets shall be referenced to such features as wall and ceiling furrings, balanced border widths, masonry joints, etc. Outlets in acoustical tile shall occur symmetrically in tile joints or in the center of whole tiles. When locations of mechanical and electrical devices shown on the Architect's reflected ceiling plans need to be modified, the final determination of the exact location of each outlet and the arrangement to be followed shall be acceptable to the Architect.

- B The drawings show diagrammatically the location of the various outlets and apparatus. Exact locations of these outlets and apparatus shall be determined by reference to the general plans and to all detail drawings, equipment drawings, roughing-in drawings, etc., by measurements at the building, and in cooperation with the other trades. The Architect reserves the right to make any reasonable change in location of any outlet or apparatus before installation, without additional cost to the Owner.
- C The Contractor, by submitting a bid on this work, sets forth that he has the necessary technical training and ability, and that he will install his work in a satisfactory and workmanlike manner which is up to the best standards of the trade, complete, and in good working order. If any of the requirements of the drawings and specifications are impossible of performance, or if the installation, when made in accordance with such requirements, will not perform satisfactorily, he shall report it to the Architect for correction promptly after discovery of the discrepancy.

#### 2.06 CONNECTIONS FOR OTHERS

- A This Contractor shall rough-in for and make all gas, water, steam, sewer, etc., connections to all fixtures, equipment, machinery, etc., provided by others in accordance with detailed roughing-in drawings provided by the equipment suppliers, along with actual measurements of the equipment connections, or as detailed.
- B After the equipment is set in place, this Contractor shall make all final connections and shall provide all required pipe, fittings, valves, traps, etc.
- C Provide all air gap fittings where required. In each water line serving an item of equipment or piece of machinery, provide a shut-off valve. On each drain not provided with a trap, provide a suitable trap.
- D All pipe fittings, valves, traps, etc., exposed in finished areas and connected to chrome-plated lines provided by others shall be chrome plated to match.

#### 2.07 WALL HUNG CARRIERS

- A Provide floor mounted carriers for all wall mounted fixtures. Refer to Architectural plans and confirm walls intended to conceal carriers are adequate in depth to provide necessary space and clearance to properly install the carriers.

### **PART 3 - INSTALLATION**

#### 3.01 INSTALLATION METHODS

- A All pipes shall be concealed in pipe chases, walls, furred spaces, or above the ceiling, unless otherwise indicated.
- B Piping may be run exposed in mechanical rooms, janitors' closets, or storage spaces, but only where necessary. All exposed piping shall be run in the neatest, most inconspicuous manner, and parallel or perpendicular to the building lines.
- C All piping shall be adequately and properly supported from the building structure by means of hanger rods or clamps to walls as herein specified.
- D Where limited space is available above the ceilings and below concrete beams or other deep projections, pipe and conduit shall be sleeved through the projection where it crosses, in a manner to provide maximum above-floor clearance. Sleeves shall be as specified or as required.
- E All pipe, conduits, etc., shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. All ducts, pipes and conduits run, exposed in machinery and equipment rooms, shall be installed parallel to the building plans, except as otherwise shown. Conduits in furred ceilings and in other concealed spaces may be run at angles to the construction but shall be neatly grouped and racked indicating good workmanship. All conduit and pipe openings shall be kept closed until the systems are closed with final connections.
- F There shall be no pipe joints nearer than 12 in. to a wall, ceiling, or floor penetration, unless pipe joint is the welded type joint.
- G The Contractor shall study all construction documents and carefully lay out all work in advance of fabrication and erection in order to meet the requirements of the extremely limited spaces. Where conflicts occur, the Contractor shall meet with all involved trades and the Architect and resolve the conflict, prior to erection of any work, in the area involved.

#### 3.02 CUTTING AND PATCHING

- A Cut and patch openings through walls, floors, etc., resulting from work in existing construction or by failure to provide proper openings or recesses in new construction.

- B Openings cut through concrete and masonry shall be made with masonry saws and/or core drills at locations acceptable to the Architect. Impact-type equipment will not be used, except where specifically acceptable to the Architect. Openings in Precast concrete slabs for pipes, conduits, outlet boxes, etc., shall be core drilled or cast to exact size.
- C All openings shall be restored to "as-new" condition under the appropriate Specification Section for the materials involved, and shall match remaining surrounding materials and/or finishes.
- D Where openings are cut through masonry walls, provide and install lintels or other structural supports to protect the remaining masonry. Adequate supports shall be provided during the cutting operation to prevent any damage to the masonry occasioned by the operation. All structural members, supports, etc., shall be of the proper size and shape, and shall be installed in a manner acceptable to the Architect.
- E All plumbing work in areas containing plaster shall be completed prior to the application of the finish plaster coat. Cutting of finish plaster coat will not be permitted.
- F No cutting, boring, or excavating, which will weaken the structure, shall be undertaken. **NO STRUCTURAL MEMBER MAY BE CUT WITHOUT THE WRITTEN APPROVAL OF THE ARCHITECT.**

### 3.03 ROOF PENETRATIONS

- A Pipe and duct sleeves and flashings compatible with the roofing installation shall be provided for roof penetrations. Manufacturer of roofing materials shall approve methods and materials.
  - 1. Pitch pans are not acceptable.

### 3.04 ROOF PIPING SUPPORTS

- A Provide adjustable height threaded rod assembly supports as manufactured by MAPA Products model MS-1/MS-1-E or equal for supporting roof mounted condensate drain piping for pipe up to 2 in. Supports shall consist of a reinforced nylon support base, clamped pipe support bracket, and an adjustable threaded rod height assembly. A neoprene pad shall be adhered to the base. Install per manufacturer's instructions. Coordinate exact locations of supports with contractor.

### 3.05 FABRICATION OF PIPE

- A All the various piping systems shall be made up straight and true and run at proper grades to permit proper flow of the contained material. Lines shall also be graded for proper drainage.
- B Piping shall follow as closely as possible the routes shown on plans, but shall take into consideration conditions to be met at the site.
- C Should any unforeseen conditions arise, lines shall be changed or rerouted as required after approval has been obtained.
- D All piping shall be installed with due regard to expansion and contraction and so as to prevent excessive strain and stress in the piping, in connections, and in equipment to which lines are connected.
- E All piping shall be clean when it is installed. Before installation it shall be checked, upended, swabbed, if necessary, and all rust or dirt from storage shall be removed. Pipe shall not be permitted to lie on the ground during storage. Pipe ends shall be sealed during storage.

### 3.06 IDENTIFICATION AND LABELING

- A The Contractor shall make it possible for the personnel operating and maintaining the equipment and systems in this project to readily identify the various pieces of equipment, valves, piping, etc., by marking them.
- B All items of mechanical and electrical equipment shall be identified by the attachment of engraved nameplates constructed from laminated phenolic plastic, at least 1/16 in. thick, 3-ply, with black surfaces and white core. Engraving shall be condensed gothic, at least 1/2 in. high, appropriately spaced. Nomenclature on the label shall include the name of the item, its mark number, area, space, or equipment served, and other pertinent information. Equipment to be labeled shall include, but not be limited to, the following:
  - 1. Miscellaneous similar and/or related items.
- C The Contractor shall install identification tags to be affixed to those valves that have functions that are not obvious. For example, it would not be expected that valves at a pressure reducing station in a machine room would be tagged. The valve identification tags shall be brass discs, 2 in. in diameter. Each tag shall be attached to its valve with copper clad annealed iron wire or other approved material.



### 3.07 TESTS AND INSPECTIONS

- A The Contractor shall, during the progress of the work and upon its completion, test his work and make all tests as required by the specifications, state, municipal and other authorities having jurisdiction of the work. Piping pressure tests shall be made before pipe is concealed or covered. Tests shall be made in the presence of authorities requiring tests. The Contractor shall pay all costs, inspection charges and fees required for the tests of his work.
- B The Contractor shall provide all apparatus, temporary piping connection, etc., required for tests. The Contractor shall take all due precautions to prevent damage to the building or its contents incurred by such tests. The Contractor shall repair and make good at his own expense any damage caused by failures or leaks during the tests.
- C Leaks, defects or deficiencies shall be repaired and/or replaced, and tests shall be repeated until the test requirements are complied with fully.
- D All equipment shall be placed in operation and tested for proper automatic control before the final balancing of the system is started.
- E All tests shall have pertinent data logged by the Contractor at the time of testing. Data shall include date, time, personnel, description, and extent of system tested, test condition, test results, specified results, and any other pertinent data. Data shall be delivered to the Architect.

### 3.08 COOPERATION AND CLEANUP

- A It shall be the responsibility of each trade to cooperate fully with the other trades on the job to help keep the job site in a clean and safe condition. At the end of each day's work, each trade shall properly store all of his tools, equipment and materials and shall clean his debris from the job. Upon the completion of the job, each trade shall immediately remove all of his tools, equipment, any surplus materials and all debris caused by his portion of the work.

### 3.09 CLEANING AND PAINTING

- A All equipment, piping, ductwork, grills, insulation, etc., in finished areas furnished and installed by the Contractor shall be painted. Finished areas include mechanical rooms, boiler rooms, and outside the building as well as occupied areas inside the building. Final painting is to be done by the General Contractor. This Contractor shall thoroughly clean all part of materials and equipment of cement, plaster, and other materials, and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all cracks and corners scraped out. Exposed metal work shall be carefully brushed down with steel brushes to remove rust and other spots and left smooth and clean.
- B This Contractor shall thoroughly clean the finish on all parts of the materials and equipment with factory applied finishes. Exposed parts in equipment rooms, above crawl space slabs, and all other spaces except sealed chases and attics shall be thoroughly cleaned of cement, plaster and other materials, and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all cracks and corners scraped out. If the finish has been damaged, the Contractor shall re-paint to the satisfaction of the Architect.
- C All canvas finishes shall be painted with one sizing coat if not already sized, containing a mildew resistant additive and Arabol adhesive prior to any other specified finish paint.
- D No nameplates on equipment shall be painted, and suitable protection shall be afforded to the plates to prevent their being rendered illegible during painting operation.

### 3.10 ELECTRICAL PROVISIONS OF PLUMBING WORK

- A The extent of electrical provisions to be provided as plumbing work is indicated in other sections of the specifications, on the drawings and as further specified in this section.
- B Starters, Controllers: In general, plumbing includes furnishing combination starters. Controllers are specifically included as electrical work when mounted in motor control centers. Electrical work includes installation, mounting and wiring of starters and controllers that are furnished as mechanical work. Free standing, large motor controllers shall be set in place, on pads, as plumbing work.
- C Electrical heating equipment shall be furnished complete with internal or integral fusing and subdivision of loads to comply with the NEC.
- D Wherever possible, match the elements of the electrical provisions of plumbing work with similar elements of the electrical work specified in electrical sections of the specifications.
- E Standards:
  - 1. For electrical equipment and products, comply with applicable NEMA standards, and refer to NEMA standards to definitions of terminology herein.
  - 2. Comply with National Electrical Code (NFPA No. 70) for installation requirements.

3. Comply with National Electrical Contractors Association (NECA) "Standard of Installation".

3.11 TEMPORARY FACILITIES

- A Unless noted otherwise in the Supplementary General Conditions; provide temporary facilities.

3.12 EQUIPMENT INSTALLATION REQUIREMENTS

- A All plumbing equipment shall be furnished and installed complete and ready for use.

3.13 OWNER FURNISHED EQUIPMENT

- A The Contractor's responsibility shall include receiving and installing all Owner-furnished equipment.

**END OF SECTION**

**SECTION 220529**

**PLUMBING SUPPORTS AND ANCHORS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A Extent of supports and anchors required by this section is indicated on Drawings and/or specified in other Division 22 sections.
- B Types of supports and anchors specified in this section include the following:
  - 1. Pipe and equipment hangers, supports, and anchors.
  - 2. Equipment bases.
- C Supports and anchors furnished as part of factory-fabricated equipment are specified as part of equipment assembly in other Division 22 sections.

**1.02 QUALITY ASSURANCE**

- A Manufacturer's Qualifications: Firms regularly engaged in manufacture of supports and anchors, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B Codes and Standards:
  - 1. Code Compliance: Comply with applicable plumbing codes pertaining to product materials and installation of supports and anchors.
  - 2. MSS Standard Compliance:
    - a. Provide pipe hangers and supports of which materials, design, and manufacture comply with MSS SP-58.
    - b. Select and apply pipe hangers and supports, complying with MSS SP-69.
    - c. Fabricate and install pipe hangers and supports, complying with MSS SP-89.
    - d. Terminology used in this section is defined in MSS SP-90.

**1.03 SUBMITTALS**

- A Submit product data as required under provisions of Division 01 and Section 220010.
- B Product Data: Submit manufacturer's technical product data, including installation instructions for each type of support and anchor.

**PART 2 - PRODUCTS**

**2.01 HORIZONTAL-PIPING HANGERS AND SUPPORTS**

- A General: Except as otherwise indicated, provide factory-fabricated horizontal-piping hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.
- B Adjustable Steel Clevis Hangers: MSS Type 1.
- C Yoke Type Pipe Clamps: MSS Type 2.
- D Steel Double Bolt Pipe Clamps: MSS Type 3.
- E Steel Pipe Clamps: MSS Type 4.
- F Pipe Hangers: MSS Type 5.
- G Adjustable Swivel Pipe Rings: MSS Type 6.
- H Adjustable Steel Band Hangers: MSS Type 7.
- I Adjustable Band Hangers: MSS Type 9.
- J Adjustable Swivel Rings, Band Type: MSS Type 10.
- K Split Pipe Rings: MSS Type 11.
- L Extension Split Pipe Clamps: MSS Type 12.
- M U-Bolts: MSS Type 24.

- N Clips: MSS Type 26.
- O Pipe Slides and Slide Plates: MSS Type 35, including one of the following plate types:
  - 1. Plate: Unguided type.
  - 2. Plate: Guided type.
  - 3. Plate: Hold-down clamp type.
- P Pipe Saddle Supports: MSS Type 36, including steel pipe base-support and cast-iron floor flange.
- Q Pipe Stanchion Saddles: MSS Type 37, including steel pipe base support and cast-iron floor flange.
- R Adjustable Pipe Saddle Supports: MSS Type 38, including steel pipe base support and cast-iron floor flange.
- S Single Pipe Rolls: MSS Type 41.
- T Adjustable Roller Hangers: MSS Type 43.
- U Pipe Roll Stands: MSS Type 44.
- V Pipe Rolls and Plates: MSS Type 45.
- W Adjustable Pipe Roll Stands: MSS Type 46.

## 2.02 VERTICAL-PIPING CLAMPS

- A General: Except as otherwise indicated, provide factory-fabricated vertical-piping clamps complying with MSS SP-58, of one of the following types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.
- B Two-Bolt Riser Clamps: MSS Type 8.
- C Four-Bolt Riser Clamps: MSS Type 42.

## 2.03 HANGER-ROD ATTACHMENTS

- A General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.
- B Steel Turnbuckles: MSS Type 13.
- C Steel Clevises: MSS Type 14.
- D Swivel Turnbuckles: MSS Type 15.
- E Malleable Iron Sockets: MSS Type 16.
- F Steel Weldless Eye Nuts: MSS Type 17.

## 2.04 BUILDING ATTACHMENTS

- A General: Except as otherwise indicated, provide factory-fabricated building attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.
- B Top Beam C-Clamps: MSS Type 19.
- C Side Beam or Channel Clamps: MSS Type 20.
- D Center Beam Clamps: MSS Type 21.
- E Welded Beam Attachments: MSS Type 22.
- F C-Clamps: MSS Type 23.
- G Top Beam Clamps: MSS Type 25.
- H Side Beam Clamps: MSS Type 27.
- I Steel Beam Clamps W/Eye Nut: MSS Type 28.
- J Linked Steel Clamps W/Eye Nut: MSS Type 29.
- K Malleable Beam Clamps: MSS Type 30.
- L Steel Brackets: One of the following for indicated loading:
  - 1. Light Duty: MSS Type 31, suspending 750 lbs. max.
  - 2. Medium Duty: MSS Type 32, suspending 1500 lbs. max.
  - 3. Heavy Duty: MSS Type 33, suspending 3000 lbs. max.
- M Side Beam Brackets: MSS Type 34.
- N Plate Lugs: MSS Type 57.
- O Horizontal Travelers: MSS Type 58.

## 2.05 CONCRETE INSERTS

- A Drill-In Spot Type: Steel, attached wedge, lock washer and nut. Size inserts to suit threaded hanger rod.
  - 1. Acceptable Manufacturers and Models:
    - a. Hilti "Kwik Bolt"
    - b. Ramset "Wedge Anchor"
    - c. Rawl "Stud"
- B Continuous Channel Type: Steel, anchoring lugs, with channel nuts, rated for 2000 lbs. per foot minimum load. Size channel nut to suit threaded hanger rod.
  - 1. Acceptable Manufacturers and Models:
    - a. B-Line B22
    - b. Elcen 1150
    - c. Unistrut P3200

## 2.06 SADDLES AND SHIELDS

- A General: Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.
- B Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.
- C Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.
- D Thermal Hanger Shields: Constructed of 360° insert of high density, 125-psi compressive strength, and water-proofed calcium silicate, encased in 360° sheet metal shield. Provide assembly of same thickness as adjoining insulation.
  - 1. Manufacturer: Subject to compliance with requirements, provide thermal hanger shields of one of the following:
    - a. Elcen Metal Products Co.
    - b. Pipe Shields, Inc.

## 2.07 SPRING HANGERS AND SUPPORTS

- A General: Except as otherwise indicated, provide factory-fabricated spring hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select spring hangers and supports to suit pipe size and loading.
- B Restraint Control Devices: MSS Type 47.
- C Spring Cushion Hangers: MSS Type 48.
- D Spring Cushion Roll Hangers: MSS Type 49.
- E Spring Sway Braces: MSS Type 50.
- F Variable Spring Hangers: MSS Type 51; preset to indicated load and limit variability factor to 25%.
- G Variable Spring Base Supports: MSS Type 52; preset to indicated load and limit variability factor to 25%; include load flange.
- H Variable Spring Trapeze Hangers: MSS Type 53; preset to indicated load and limit variability factor to 25%.
- I Constant Supports: Provide one of the following types, selected to suit piping system. Include auxiliary stops for erection and hydrostatic test, and field load-adjustment capability.
  - 1. Horizontal Type: MSS Type 54.
  - 2. Vertical Type: MSS Type 55.
  - 3. Trapeze Type: MSS Type 56.

## 2.08 MANUFACTURERS OF HANGERS AND SUPPORTS

- A Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:
  - 1. B-Line Systems Inc.
  - 2. ITT Grinnell Corp.

## 2.09 MISCELLANEOUS MATERIALS

- A Metal Framing: Provide products complying with NEMA STD ML 1.
- B Steel Plates, Shapes and Bars: Provide products complying with ASTM A 36.

- C Cement Grout: Portland cement (ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.
- D Auxiliary Steel: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS standards.
- E Pipe Guides: Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of bolted two-section outer cylinder and base with two-section guiding spider bolted tight to pipe. Size guide and spiders to clear pipe and insulation (if any), and cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.

#### 2.10 SLEEVES, INSETS AND FASTENINGS

- A Pipes passing through concrete or cinder walls and floor or other corrosive material shall be protected by a protective sheathing or wrapping or by sleeves, as required to meet the local code. Annular spaces between sleeves and pipes shall be filled or tightly caulked in an approved manner. Annular spaces between sleeves and pipes in fire-resistance-rated assemblies shall be filled or tightly caulked in accordance with the local code.

### PART 3 - EXECUTION

#### 3.01 INSPECTION

- A Examine areas and conditions under which supports and anchors are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

#### 3.02 PREPARATION

- A Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments.
- B Prior to installation of hangers, supports, anchors and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, inspection and testing agency representatives (if any), installers of other work requiring coordination with work of this section and Architect for purpose of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.

#### 3.03 INSTALLATION OF BUILDING ATTACHMENTS

- A Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at all changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts.

#### 3.04 INSTALLATION OF HANGERS AND SUPPORTS

- A General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Install additional at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at all changes in direction of piping. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.
- B Install hangers and supports complete with necessary inserts, bolts, nuts, washers and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
- C Support fire-water piping independently of other piping.
- D Prevent electrolysis in support of copper tubing by use of hangers and supports that are copper plated, or by other recognized industry methods.
- E Support and laterally brace vertical pipe runs at every floor level and at intervals not to exceed 20 ft. 0 in. Support vertical pipe with riser clamps installed below hubs, couplings or lugs welded to the pipe.
- F Provisions for Movement:

1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.
  2. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
  3. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 Pressure Piping Codes are not exceeded.
- G Insulated Piping: Comply with the following installation requirements.
1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
  2. Piping hangers shall be sized large enough to allow insulation to pass through. Hangers for piping 2-1/2 in. and greater shall be provided with pipe covering protection saddle, or high compressive strength insulation saddle. Hangers for piping 2 in. and less shall be provided with pipe covering shields. On cold or chilled water piping provide vapor barrier through hanger.
  3. Do NOT utilize "pipe size" hangers with insulation placed over the pipe and hanger.

### 3.05 INSTALLATION OF ANCHORS

- A Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.
- B Fabricate and install anchor by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.
- C Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions, to limit movement of piping and forces to maximums recommended by manufacturer for each unit.
- D Anchor spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

### 3.06 ADJUSTING AND CLEANING

- A Hanger Adjustments: Adjust hangers so as to distribute loads equally on attachments.
- B Support Adjustment: Provide grout under supports so as to bring piping and equipment to proper level and elevations.
- C Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

**END OF SECTION**

**SECTION 220716**

**PLUMBING PIPING INSULATION**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A Extent of plumbing insulation required by this section is indicated on Drawings and schedules, and by requirements of this section.
- B Types of mechanical insulation specified in this section include the following:
  - 1. Piping System Insulation:
    - a. Fiberglass.
    - b. Flexible Unicellular.
- C Refer to Section 220529 - PLUMBING SUPPORTS AND ANCHORS for protection saddles, protection shields, and thermal hanger shields; not work of this section.
- D Refer to Section 220553 - PLUMBING IDENTIFICATION for installation of identification devices for piping, ductwork, and equipment; not work of this section.

**1.02 QUALITY ASSURANCE**

- A Manufacturer's Qualifications: Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B Installer's Qualifications: Firm with at least 5 years successful installation experience on projects with mechanical insulations similar to that required for this project.
- C Flame/Smoke Ratings: Provide composite mechanical (insulating material, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.
  - 1. Exception: Outdoor mechanical insulation may have flame-spread index of 75 and smoke developed index of 150.
  - 2. Exception: Industrial mechanical insulation that will not affect life safety egress of building may have flame-spread index of 75 and smoke developed index of 150.

**1.03 SUBMITTALS**

- A Product Data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, k-value, thickness, and furnished accessories for each mechanical system requiring insulation.

**1.04 DELIVERY, STORAGE AND HANDLING**

- A Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard indexes of products.
- B Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site.

**PART 2 - PRODUCTS**

**2.01 ACCEPTABLE MANUFACTURERS**

- A Manufacturer: Subject to compliance with requirements, provide products of one of the following:
  - 1. Armacell.
  - 2. Manson.
  - 3. Knauf Fiber Glass.
  - 4. Johns Manville Products Corp.
  - 5. Owens-Corning Fiberglass Corp.

**2.02 PIPING INSULATION MATERIALS**

- A Fiberglass Piping Insulation: ASTM C 547, Class 1 unless otherwise indicated.



- B Flexible Unicellular Piping Insulation: ASTM C 534, Type I.
- C Jackets for Piping Insulation: ASTM C 921, Type I (Vapor Barrier) for piping with temperatures below ambient, Type II for piping with temperatures above ambient. Type I may be used for all piping at Installer's option.
  - 1. Encase pipe fittings insulation with one-piece pre-molded PVC fitting covers, fastened as per manufacturer's recommendations.
  - 2. Encase exterior piping insulation with aluminum jacket with weather-proof construction.
- D Staples, Bands, Wires and Cement: As recommended by insulation manufacturer for applications indicated.
- E Adhesives, Sealers and Protective Finishes: As recommended by insulation manufacturer for applications indicated.

### **PART 3 - EXECUTION**

#### **3.01 INSPECTION**

- A Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- B Thickness of insulation shall be as recommended by the manufacturer for the temperatures and pipe sizes involved, and in accordance with standards of T.I.M.A.

#### **3.02 PLUMBING PIPING SYSTEM INSULATION**

- A Insulation Omitted: Omit insulation on chrome-plated exposed piping (except for handicapped fixtures), air chambers, unions, strainers, check valves, balance cocks, flow regulators, drain lines from water coolers, drainage piping located in crawl spaces or tunnels, buried piping, fire protection piping, and pre-insulated equipment.
- B Cold Piping:
  - 1. Application Requirements: Insulate the following cold plumbing piping systems:
    - a. Potable cold water piping.
    - b. Interior horizontal above-ground storm water piping from roof drains and overflow drains.
    - c. Plumbing vents within 6 linear ft. of roof outlet.
    - d. Condensate drains from HVAC units, refrigerated equipment, etc., including traps and lateral lines concealed above ceilings.
  - 2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:
    - a. Fiberglass: 1 in. thickness.
    - b. Flexible Unicellular: 1 in. thickness.
- C Hot Piping:
  - 1. Application Requirements: Insulate the following hot plumbing piping systems:
    - a. Potable hot water piping.
    - b. Potable hot water recirculating piping.
  - 2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:
    - a. Fiberglass (Above Ground Only): 1 in. thick for pipe sizes up to and including 1-1/4 in., 1-1/2 in. thick for pipe sizes 1-1/2 in. and larger.
    - b. Flexible Unicellular: 1 in. thick for all pipe sizes.
    - c. All insulation requirements shall comply with 2015 IECC.

#### **3.03 INSTALLATION OF PIPING INSULATION**

- A General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
- B Install insulation on pipe systems subsequent to installation of heat tracing, painting, testing, and acceptance of tests.
- C Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.
- D Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- E Maintain integrity of vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage.
- F Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.

- G Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.
- H Do NOT insulate over pipe hangers. If pipe hangers for piping to be insulated are not adequately sized for insulation to pass through the hanger, notify the General Contractor and Architect.

3.04 EXISTING INSULATION REPAIR

- A Repair damaged sections of existing mechanical insulation, both previously damaged or damaged during this construction period. Use insulation of same thickness as existing insulation, install new jacket lapping and sealed over existing.

3.05 PROTECTION AND REPLACEMENT

- A Replace damaged insulation that cannot be repaired satisfactorily, including units with vapor barrier damage and moisture-saturated units.
- B Protection: Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

**END OF SECTION**

**SECTION 221000**

**PLUMBING PIPING**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A Extent of Plumbing Piping Work required by this section is indicated on Drawings and by requirements of this section.
- B Types of Plumbing Piping systems specified in this section include the following:
  - 1. Sanitary waste and vent system.
  - 2. Domestic water system.
  - 3. Trap primer-piping system.

**1.02 REFERENCES**

- A ANSI/ASME B16.18 - Cast Copper Alloy Solder - Joint Pressure Fittings.
- B ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- C ANSI/ASME B16.3 - Malleable Iron Threaded Fittings Class 150 NS 300.
- D ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
- E ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- F ANSI/ASME Sec. 9 - Welding and Brazing Qualifications.
- G ANSI/ASTM B32 - Solder Metal.
- H ANSI/ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- I ANSI/AWS D1.1 - Structural Welding Code.
- J AWS D10.12 - Recommended Practices and Procedures for Welding Plain Carbon Steel Pipe.
- K AWS D10.9 - Qualifications and Procedures for Piping and Tubing Welding.
- L AWS B3.0 - Welding Procedure and Performance Qualification.
- M ANSI/AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
- N ANSI/AWWA C110 - Ductile Iron and Gray Iron Fittings 3 in. through 48 in., for Water and Other Liquids.
- O ANSI/AWWA C111 - Rubber-Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings.
- P ANSI/AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
- Q ASME - Boiler and Pressure Vessel Code.
- R ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- S ASTM A74 - Cast Iron Soil Pipe and Fittings.
- T ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses.
- U ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- V ASTM B88 - Seamless Copper Water Tube.
- W ASTM B306 - Copper Drainage Tube (DWV).
- X ASTM C14 - Concrete Sewer, Storm Drain, and Culvert Pipe.
- Y ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings.
- Z ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- AA ASTM C 1540 - Heavy Duty Shielded Hubless Couplings
- BB ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- CC ASTM F477 - Electrometric Seals (Gaskets) for Joining Plastic Pipe.
- DD ASTM F2657 - Standard Test Method for Outdoor Weathering Exposure of Crosslinked Polyethylene (PEX) Tubing
- EE AWS A5.8 - Brazing Filler Metal.
- FF AWWA C601 - Standard Methods for the Examination of Water and Waste Water.
- GG CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.
- HH CISPI 310 - Couplings for Use with Hubless Cast Iron Soil Pipe and Fittings.
- II NFPA 24 - Installation of private fire service mains and their Appurtenances, latest edition.

**1.03 QUALITY ASSURANCE**

- A Plumbing Certification: Persons performing plumbing work shall have a current Texas State Plumbing License.

- B Valves: Manufacturer's name and pressure rating marked on valve body.
- C Welding Materials and Procedures: Conform to ASME Code and AWS 10.12.
- D Welders Certification: In accordance with ANSI/ASME Sec. 9 or AWS D1.1, AWS D10.9, and AWS B3.0, as applicable.
- E Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute or receive prior approval of the engineer.

#### 1.04 REGULATORY REQUIREMENTS

- A Conform to the most recent editions of the applicable City codes and ordinances and NFPA 54.
- B Piping materials specified herein are acceptable products to the Architect, but all are not necessarily acceptable to applicable local codes and ordinances. It is the responsibility of the Contractor to provide materials, from the options listed herein, that are acceptable to both the Architect and applicable local codes and ordinances.

#### 1.05 SUBMITTALS

- A Submit product data on pipe materials, fittings, valves and accessories in accordance with Division 01 and Section 220010.
- B Submit shop drawings and piping layout in accordance with Division 01 and Section 220010.
- C Submit certificates as listed below to Architect in accordance with Division 01 and Section 220010.
  - 1. Test Certificates of Approval for Piping Systems.
  - 2. Flushing Certificates of Approval for Piping Systems.
  - 3. Disinfection Certificates of Approval for Domestic Water Piping Systems.

#### 1.06 WARRANTY

- A Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

### **PART 2 - PRODUCTS**

#### 2.01 SANITARY WASTE AND VENT PIPING

- A Sanitary waste and vent piping, above grade.
  - 1. Cast Iron Pipe & Fittings: CISPI 301, hubless. Joints: ASTM C 564, neoprene gaskets and stainless steel clamp-and-shield assemblies. Joints shall be Heavy Duty couplings conforming to ASTM C 1540 as manufactured by Husky SD 4000 or Clamp All 125.
  - 2. Copper Pipe: ASTM B306, DWV. Fittings; ANSI/ASME B16.3, cast bronze, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B23, solder, Grade 50B.

#### 2.02 WATER PIPING

- A Water piping, above grade.
  - 1. Copper Tubing: For 4 in. diameter and less, ASTM B88, Type "L", hard drawn. Fittings: ANSI/ASME B16.18, cast brass, or ANSI/ASME B16.22, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.

#### 2.03 TRAP PRIMER PIPING

- A Trap primer piping, buried and above grade.
  - 1. Copper Tubing: ASTM B88, Type L, annealed. Fittings: ANSI/ASME B16.18, cast copper or ANSI/ASME B16.22, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA. Exposed piping in finished areas shall be chrome plated.

#### 2.04 FLANGES, UNIONS AND COUPLINGS

- A Pipe Size 2 in. and under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
- B Pipe Size Over 2 in.: 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping; gaskets suitable for intended service – NO ASBESTOS GASKET MATERIAL ALLOWED.
- C Grooved and Shouldered Pipe End Couplings: Malleable iron housing clamps to engage and lock, designed to permit some angular deflection, contraction and expansion; "C" shape composition sealing gasket; steel bolts, nuts, and washers; galvanized couplings for galvanized pipe.
  - 1. Acceptable Manufacturers:

- a. Victaulic
- b. Apollo Shurjoint
- D Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, and water impervious isolation barrier.

## 2.05 BALL VALVES

- A Ball valves: For water, natural gas, and compressed air shut-off and throttling.
  - 1. Ball valves 2 in. and less: Rated 175 lb. minimum water, oil, air and gas pressure, brass or bronze construction, seat material as recommended by manufacturer for material conveying, lever handle, threaded or soldered connections. Throttling valves shall be provided with memory stops (for establishing any setpoint from 0-100% flow).
    - a. Acceptable Manufacturers and Models:
      - 1) Crane 9302, 9322
      - 2) Apollo 70 Series
      - 3) Jomar T-100-SS
      - 4) ITT Grinnell 3500, 3500SJ
      - 5) Milwaukee BA-200, BA-250
      - 6) Watts B-6000, B-6001
      - 7) Nibco T-580, & S-500
      - 8) KITZ 868

## 2.06 CHECK VALVES

- A Swing check valves: For water, air, and pumped waste and drain.
  - 1. Check Valves 2 in. and less: MSS SP-80 rated 175 lb. minimum water and air pressure, brass or bronze construction, renewable seat, bronze disc, threaded or soldered connections.
    - a. Acceptable Manufacturers and Models:
      - 1) Nibco T-413
      - 2) Apollo 163T
      - 3) Crane 137
      - 4) Jomar T/S-511
      - 5) Stockham B-321
      - 6) Milwaukee 508
      - 7) KITZ 822

## 2.07 PIPING SPECIALTIES

- A Provide piping specialties in accordance with Section 221119.

## 2.08 PLUMBING SUPPORTS AND ANCHORS

- A Provide supports and anchors in accordance with Section 220529.

## 2.09 PLUMBING INSULATION

- A Provide mechanical insulation in accordance with Section 220716.

# PART 3 - EXECUTION

## 3.01 PIPING

- A Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B Remove scale and dirt, on inside and outside, before assembly.
- C Prepare piping connections to equipment with flanges or unions.
- D Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- E Route piping in orderly manner and maintain gradient.
- F Install piping to conserve building space and not interfere with use of space.

- G Pipes passing through concrete or cinder walls and floor or other corrosive material shall be protected by a protective sheathing or wrapping or by sleeves, as required to meet the local code. Annular spaces between sleeves and pipes shall be filled or tightly caulked in an approved manner. Annular spaces between sleeves and pipes in fire-resistance-rated assemblies shall be filled or tightly caulked in accordance with the local code.
- H Group piping whenever practical at common elevations.
- I Exposed piping, valves, fittings, escutcheons, trim, etc., serving plumbing fixtures in finished areas, shall be polished chromium plated. Exposed piping, valves, fittings, escutcheons, trim, etc., serving plumbing equipment, kitchen equipment, or other equipment located in finished areas, shall be chrome plated, or when not available with chrome plating, they shall be painted with chromium paint.
- J Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- K Provide clearance for installation of insulation and access to valves and fittings.
- L Provide access where valves and equipment are not accessible. Coordinate size and location of access doors with applicable Section.
- M Slope water piping and arrange to drain at low points.
- N Install piping parallel with or at right angles to walls unless otherwise shown on Drawings.
- O Conceal piping above ceilings, in walls or chases etc., unless otherwise shown or noted on Drawings.
- P Joints in soft copper piping below slab will not be allowed.
- Q Soft copper shall not be routed through areas with exposed ceilings except in mechanical rooms.
- R Bending of rigid piping is not permitted; only ells shall be utilized for a change in direction.
- S Temporarily plug or cap open ends of pipe at the end of each workday.
- T Establish invert elevations for drainage piping. Minimum slopes for drainage are 1/4 in. per foot for 3 in. diameter and less and 1/8 in. per ft. for 4 in. diameter pipe and greater.
- U Install bell and spigot pipe with bell end upstream.
- V Trap primer piping shall slope to floor drain at no less than 1/16 in. per ft. Horizontal trap primer piping shall run below floor. Piping in slab is not permitted.
- W Install vented U-type drain trap on all draw-thru cooling coil drain pans.
- X All sanitary waste stacks and storm drain down spouts 4 in. diameter and larger with vertical drops over 30 ft. 0 in. shall be provided with joint restraint on the horizontal branch or offset below the vertical drop. Threaded joints, grooved joints or a combination of pipe clamps and tie-rods as required in NFPA 24 shall accomplish joint restraint. Thrust blocks shall accomplish joint restraint below ground as required in NFPA 24. Vertical joint restraint shall be provided from the 90° ell at the bottom of the vertical drop through every joint up to the riser clamp at the floor penetration of the floor above. Horizontal joint restraint shall be provided from that same 90° ell through every joint on the horizontal branch.
- Y Materials exposed within ducts or plenums (ceiling spaces used as supply or return air plenums) shall have a flame-spread index of not more than 25 and a smoke-developed rating of not more than 50 when tested in accordance with the test for Surface Burning Characteristics of Materials, U.B.C. Standard No. 42-1. Do not install any PVC piping in any Return Air Plenums.
- Z Piping hangers shall be sized large enough to allow insulation to pass through. Hangers for piping 2-1/2 in. and greater shall be provided with pipe covering protection saddle, or high compressive strength insulation saddle. Hangers for piping 2 in. and less shall be provided with pipe covering shields. On cold or chilled water piping provide vapor barrier through hanger.
- AA Domestic water service piping below building shall be provided with both tie-rod and thrust block restraint in accordance with NFPA 24. Tie-rod restraint shall be provided vertically from the below floor elbow at the base of the riser out to the first hub beyond 5 ft. 0 in. from building. (See NFPA 24-1995 figure A-8-6.2 (b)). Thrust block restraint shall be provided on the below floor elbow at the base of the riser. Area of bearing face of concrete thrust block shall be 32 sq. ft.
- BB A pressure reducing valve station shall be furnished and installed on incoming domestic cold water lines with pressure exceeding 80 psi. Furnish valve station with separate strainer.
- CC Roof penetrations through metal roofs by the Plumbing or Mechanical Contractor will be required to have written approval by the Roofing Contractor.

### 3.02 PIPING CONNECTIONS

- A Threaded Connections
  - 1. Threaded joints shall be in accordance with ANSI B1.20.1. Threaded joints shall be made up Teflon tape or lead free pipe joint compound applied to the male thread only. Should a joint be loosened after being made up, it shall not be made up a second time unless the threads are cleaned and new compound applied.

2. All steel piping which is assembled with screwed joints shall have exposed threads thoroughly primed with a coat of lead free rust resistant paint. Paint immediately after installation. This shall apply to both piping that is to be covered as well as uncovered.

B Soldered Connections

1. Soldered joints shall be in accordance with ASTM B32. Flux shall be nonacid type. Remove composition discs from solder end valves during soldering. Pipe ends, fittings and valves shall be properly cleaned before soldering and wiped clean to remove flux and excess solder after soldering.

C Solvent Cement Connections:

1. Solvent cement connections shall be joined with primer and PVC solvent cement complying with ASTM D2564. Solvent cement connections shall be in compliance with GSR Bulletin SCJ-1 Solvent Cementing Procedure.

D Mechanical Grooved Connections:

1. Pipe shall be prepared and mechanical grooved connections shall be assembled in accordance with ANSI/AWWA C606 and the latest published instructions from the manufacturer.

### 3.03 FLANGES AND UNIONS

- A Provide flanges and unions at all final connections to equipment, and traps. Arrange piping and piping connections so that equipment being served may be serviced or totally removed without disturbing piping beyond final connections and associated shut-off valves.
- B All flanged connections shall be in accordance with ANSI B16.5 for steel flanges and ANSI B16.1 for cast iron flanges.
- C Bolting shall be in accordance with ASTM A307 Grade B with bolts and nuts in accordance with ANSI B18.2.1 and ANSI B18.2.2.
- D Tighten flange bolts in sequence 180° directly opposite each to equal tension.
- E Flanges and unions shall be made of same material or compatible material as piping systems in which they are installed.

### 3.04 VALVES

- A Install valves with stems upright or horizontal, not below horizontal.
- B Horizontal swing check valves shall be installed in a true horizontal position. Vertical lift check valves shall be installed in a true vertical position.
- C Install ball valves for shut-off and to isolate equipment, parts of systems, or vertical risers.
- D Install ball valves for throttling, bypass or manual flow control services.
- E Throttling or balancing valves shall be provided with memory stops.

### 3.05 TESTING

- A General: Furnish pumps, gauges, equipment and personnel required, and test as necessary to demonstrate the integrity of the finished installation.
- B Soil, Waste and Vent, and Storm Drainage: Unless otherwise directed, plug all openings and fill with water to a height equal to the lowest vent or roof drain. Allow to stand one hour or longer as required. Remake leaking joints and retest.
- C Water Lines: Hydrostatically test and make tight at 150 psi. Retain for four hours. Repair all leaking joints and retest.
- D Tests and test procedures shall be witnessed and approved by the Architect.
- E After completion and approval of testing, submit "Test Certificates of Approval" for Sanitary Waste and Vent and Water piping systems stating that all test results are satisfactory. Certificates of approval must be signed by Contractor.

### 3.06 FLUSHING

- A General: After piping systems have been tested and approved, systems shall be flushed. Furnish compressors, pumps, equipment, personnel, etc. required to flush piping systems.
- B Water Lines: Flush piping with water until water flows clear for a minimum of 60 seconds per 100 linear ft. of piping being flushed at a velocity of 9 ft. per second.
- C All strainers and filters shall be cleaned and replaced prior to start-up.
- D Flushing and flushing procedures shall be witnessed and approved by the Architect.
- E After completion and approval of flushing, submit "Flushing Certificates of Approval" for water piping systems stating that all flushing results are satisfactory. Certificates of approval must be signed by Contractor.

### 3.07 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A Prior to starting work, verify system is complete, flushed and clean.
- B Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50-to 80 mg/L residual.
- C Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 5 remote outlets.
- D Maintain disinfectant in system for 24 hours.
- E If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- F Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- G Take samples no sooner than 24 hours after flushing, from 5 remote outlets and from water entry, and analyze in accordance with AWWA C651.
- H Disinfection and disinfection procedures shall be witnessed and approved by the Architect.
- I After disinfection is completed, submit "Disinfection Certificate of Approval" for domestic water piping systems to the Architect stating that all test results are satisfactory. Certificate of Approval must be signed by Contractor. Certificate shall show the date, time and residual of each of the following tests:
  - 1. Initial disinfection residual (50 PPM minimum) - 5 samples.
  - 2. Final disinfection residual (25 PPM minimum) - 5 samples.
  - 3. After flushing residual (5 PPM maximum) - 5 samples.
  - 4. Analyze in accordance AWWA C651 - 5 samples.

### 3.08 CLOSING IN UNINSPECTED WORK

- A Do not cover up or enclose work until it has been properly and completely inspected and approved. Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required. After it has been completely inspected and approved, make all repairs and replacements as necessary to the satisfaction of the Architect. Repairs and replacements shall be at no additional cost to the Owner.

**END OF SECTION**



**SECTION 221001**  
**PLUMBING SPECIALTIES**

**PART 1 - GENERAL**

**1.01 DESCRIPTION OF WORK**

- A Extent of Plumbing Specialties Work required by this section is indicated on Drawings and by requirements of this section.
- B Types of Plumbing Specialties specified in this section include the following:
  - 1. Cleanouts.
  - 2. Water hammer arrestors.
  - 3. Trap primers.

**1.02 REFERENCES**

- A ANSI/ASSE 1015 - Backflow Preventers, Double Check Principle.
- B ANSI/ASSE 1013 - Backflow Preventers, Reduced Pressure Principle.
- C ANSI A112.21.1 - Floor Drains and Area Drains.
- D ANSI A112.26.1 - Water Hammer Arresters.
- E PDI WH-201 Water Hammer Arresters.
- F NFPA 54 - National Fuel Gas Code, latest edition.

**1.03 QUALITY ASSURANCE**

- A Conformance with applicable state and local codes and ordinances.
- B Manufacturer: For each product specified, provide components by same manufacturer throughout.
- C Plumbing Certification: Persons performing plumbing work shall have a current Texas State Plumbing License.

**1.04 REGULATORY REQUIREMENTS**

- A Conform to applicable City codes and ordinances and NFPA 54.

**1.05 SUBMITTALS**

- A Submit product data in accordance with Division 01 and Section 230010.
- B Include component sizes, rough-in requirements, service sizes, and finishes.
- C Submit Certificates as listed below to Architect in accordance with Division 01 and Section 230010.
  - 1. Certificate of Approval - First Heat Tracing System Megohmometer Test.
  - 2. Certificate of Approval - Second Heat Tracing System Megohmometer Test.
  - 3. Certificates of Approval - Backflow Preventers.

**PART 2 - PRODUCTS**

**2.01 CLEANOUTS**

- A Clean out: Cast iron body, adjustable type, inside caulk connection, standard round nickel bronze top, threaded bronze plug.
  - 1. Acceptable Manufacturers and Models:
    - a. Josam Series 56000-X-22-15
    - b. Smith Series 4028C-U
    - c. Tyler/Wade Series W-6000-IC-5
    - d. Zurn Series ZN-1400IC-BP-VP
- B Clean out: Cast iron body, adjustable type, inside caulk connection, vandal proof heavy-duty tractor type round nickel bronze top, threaded bronze plug.
  - 1. Acceptable Manufacturers and Models:
    - a. Josam Series 56040-1-22-15
    - b. Smith Series 4108C-U
    - c. Tyler/Wade Series W-6000-IC-5

- d. Zurn Series ZN-1400IC-BP-HD-VP
- C Floor Clean out: Provide special carpet clean out cover with clean out marker in all carpeted areas and special recessed cover which will allow for the same flooring material to be installed in clean out top in all areas with ceramic, quarry, and vinyl flooring material. Recessed cover shall be designed for type of flooring.
- D Clean out: Recessed wall type, cast iron body with threaded bronze plug, flush mounted stainless steel access cover with countersunk center screw and vandal proof secured.
  - 1. Acceptable Manufacturer and Models:
    - a. Josam Series 58710-15
    - b. Smith Series 4422C-U
    - c. Zurn Series Z-1441-BP-VP

## 2.02 TRAP PRIMERS

- A Trap Primer: Brass, O-ring seals, with the minimum quantity of distribution units as recommended by manufacturer. Trap primer shall automatically activate and deliver 5 ounces of water on a 15 second 1-psi pressure drop.
  - 1. Acceptable Manufacturer and Model:
    - a. Precision Plumbing Products (PPP)P-1
- B Trap Primer: Complete pressure type system for service to multiple floor drains. System shall consist of controller time clock with solenoid valves that will open at a programmed time.
  - 1. Controller: Programmable, solid state, 6 zone, minimum adjustable run time of 1 minute for each zone, 12 hour program battery backup, 120 VAC to 24 VAC internal transformer, fuse protected circuitry, UL listed, 120 VAC input - 24 VAC output, constructed of enameled steel or plastic.
    - a. Acceptable Manufacturers and Models:
      - 1) Toro Vision 1
      - 2) Weathermatic LM
      - 3) Irri-Trol 600
  - 2. Solenoid Valve: Brass body, buna "N" seats, normally closed, 125 psi rated, 24 VAC.
    - a. Acceptable Manufacturers and Models:
      - 1) Asco 8210
  - 3. Provide all interconnecting electrical wiring from controller to solenoid valves and accessories required for a complete operable system. All wiring shall be in conduit.
- C Trap Primer Connection Adapter: Cast iron, with 1/2 in. NPT primer tap for use with required drains.
  - 1. Acceptable Manufacturers and Models:
    - a. Josam 88300, 88350, and 88360
    - b. Smith 2695, 2696, and 2697
    - c. Tyler/Wade W-2400-NH
    - d. Zurn Z-1023, Z-1023-1, and Z-1023-2

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A Coordinate cutting of roof construction to receive drains to required invert elevations.

### 3.02 INSTALLATION AND APPLICATION

- A Install specialties in accordance with manufacturer's instructions to permit intended performance.
- B Extend cleanouts to finished floor or wall surface. Lubricate threaded clean out plugs with mixture of graphite and linseed oil. Ensure clearance at clean out for rodding of drainage system.
- C Trap all drains connected to the sanitary sewer.
- D In addition to cleanouts, as shown on the Drawings, Contractor shall provide any additional cleanouts required by local codes and ordinances at no additional cost to the Owner.
- E Outlet of plumbing vents and flues shall be located a minimum of 10 ft. 0 in. from fresh air intakes. Provide offset as required.
- F Special sanitary waste and vent fittings shall be designed in accordance with local codes and installed in accordance with manufacturer's shop drawings and installation recommendations.
- G Pipe Flashing:

1. Open-end dry vent pipes passing through roof waterproofing membrane shall be installed through a 4-pound lead flashing or a 16-ounce copper flashing, each within an integral skirt or flange. Flashing shall be suitably formed, and the skirt or flange shall extend not less than 8 in. from the pipe and shall be set over the roof membrane in a solid coating of bituminous cement. The flashing shall extend up the pipe and turn down into the pipe to form a waterproof joint. The annular space between the flashing and the bare pipe or between the flashing and the metal-jacket-covered insulation shall be sealed with tightly pack fiberglass wool insulation.
  2. Closed end pipes passing through roof waterproofing membrane shall be installed through a cast iron sleeve with caulking recess, anchor lugs, flashing-clamp device, pressure ring with brass bolts and deck clamping assembly. Flashing shield shall be fitted into the sleeve-clamping device.
- H Install trap primers on all floor drains unless specifically not required by local codes.
- I All trap primers shall be concealed, within cabinets, walls and/or chases as approved by the Architect. Install access doors at each valve location.
- J Install line size wye-pattern strainer upstream of backflow preventer. Strainer shall be lead free for all potable water systems.

### 3.03 TESTING

- A Heat tracing systems shall be continuity tested and insulation resistance tested. Contractor shall continuity test each cable after installation. Manufacturer's Representative and Contractor shall Megger test at 2500 volts each heat cable system two times. The first test shall be performed after heat cable installation, but prior to installation of insulation. The second test shall be after installation of insulation but prior to initial start-up. Contractor shall submit certificates of approval to the Architect after each test.
- B Backflow preventers shall be tested for proper operation by the backflow preventer Manufacturer's Representative. The test shall be performed prior to initial start-up. Manufacturer's Representative shall submit certificates of approval to the Architect.

**END OF SECTION**

**SECTION 221119**

**PIPING SPECIALTIES**

**PART 1 - GENERAL**

1.01 SUMMARY

- A Extent of piping specialties work required by this section is indicated on Drawings and schedules and by requirements of this section.
- B Types of piping specialties specified in this section include the following:
  - 1. Pipe Escutcheons.
  - 2. Dielectric Unions.
  - 3. Mechanical Penetration Seals.
  - 4. Fire Barrier Penetration Seals.
  - 5. Pipe Sleeves.
  - 6. Penetration Seals.

1.02 QUALITY ASSURANCE

- A Manufacturer's Qualifications: Firms regularly engaged in manufacture of piping specialties of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.03 SUBMITTALS

- A Product Data: Submit manufacturer's technical product data, including installation instructions, and dimensioned Drawings for each type of manufactured piping specialty. Include pressure drop curve or chart for each type and size of pipeline strainer. Submit schedule showing manufacturer's figure number, size, location, and features for each required piping specialty.

**PART 2 - PRODUCTS**

2.01 PIPING SPECIALTIES

- A General: Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

2.02 PIPE ESCUTCHEONS

- A General: Provide pipe escutcheons as specified herein with inside diameter tightly fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.
- B Pipe Escutcheons for Moist Areas: Exterior use and interior use including mechanical rooms and any room with water or floor type drains. For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.
- C Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.
- D Manufacturer: Subject to compliance with requirements, provide pipe escutcheons of one of the following or approved equal:
  - 1. Chicago Specialty Mfg. Co.
  - 2. Producers Specialty & Mfg. Corp.
  - 3. Sanitary-Dash Mfg. Co.

2.03 DIELECTRIC UNIONS

- A General: Provide standard products recommended by manufacturer for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action, and stop corrosion.

- B Manufacturer: Subject to compliance with requirements, provide dielectric unions of one of the following or approved equal:
1. B & K Industries, Inc.
  2. Capital Mfg. Co.; Div. of Harsco Corp.
  3. Eclipse, Inc.
  4. Epco Sales, Inc.
  5. Perfection Corp.
  6. Rockford-Eclipse Div.

#### 2.04 PENETRATION SEALS

- A Caulked Seals: Provide seals for penetrations through interior walls of one of the following:
1. Mineral Wool or Oakum: Caulked watertight between sleeve and pipe.
- B Mechanical Seals:
1. General: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.
  2. Manufacturer: Subject to compliance with requirements, provide mechanical sleeve seals of one of the following or approved equal.
    - a. Thunderline Corp.
- C Fire Barrier Seals:
1. Provide seals for any opening through smoke or fire-rated walls, and all above grade floors, used as passage for mechanical components such as piping or ductwork.
  2. Cracks, Voids, or Holes Up to 4 in. Diameter: Use putty or caulking, one-piece intumescent elastomer, non-corrosive to metal, compatible with synthetic cable jackets, and capable of expanding 10 times when exposed to flame or heat, UL-listed.
  3. Openings 4 in. or Greater: Use sealing system capable of passing 3-hour fire test in accordance with ASTM E-814, consisting of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 to 350°F UL-listed.
  4. Manufacturer: Subject to compliance with requirements, provide fire barrier penetration seals of one of the following or approved equal.
    - a. Electro Products Div./3M.
    - b. Nelson; Unit of General Signal.

#### 2.05 PIPE SLEEVES

- A Provide pipe sleeves of one of the following:
1. Sheet-Metal: Fabricate from galvanized sheet metal; round tube closed with snap lock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gauges: 3 in. and smaller, 20 gauge; 4 in. to 6 in. 16 gauge; over 6 in., 14 gauge.
  2. Steel-Pipe: Fabricate from Schedule 10 (minimum) steel pipe; remove burrs.
  3. Floor sleeves shall be provided with water stop around perimeter of sleeve.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION OF PIPING SPECIALTIES

- A Pipe Escutcheons: Install pipe escutcheons on each pipe penetration through floors, walls, partitions, and ceilings where penetration is exposed to view; and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surface.
- B VANDAL PROOF Vent Caps: Install VANDAL PROOF vent caps on each vent pipe passing through roof, and elsewhere as indicated. Locate base of vent cap 6 in. above roof surface, or higher where require by Code.
- C Dielectric Unions: Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer's installation instructions.
- D Mechanical Penetration Seals: Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.
- E Fire Barrier Penetration Seals: Fill opening with sealing compound. Adhere to manufacturer's installation instructions.

- F Pipe Penetrations: Sleeve new construction or core drill existing construction pipe penetrations as specified below where piping passes through walls, floors, and roofs. Do not penetrate structural members, except as detailed on Drawings, or as reviewed by Architect. Install penetrations accurately centered on pipe runs. Size penetrations so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than two pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide penetration with sufficient clearance for installation. When sleeves are required, install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves two inches above finished floor. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeve. Pipe penetrations shall be as follows:
1. New floors on grade: Provide sleeved penetrations for all piping except piping two inches and less and waste, drain, and vent piping. Piping not requiring sleeves shall be provided with 30 lb. asphalt saturated roofing felt wrapped around pipe through the thickness of the floor with concrete floor placed up to roofing felt.
  2. New floors above grade: Provide sleeved penetrations for all piping.
  3. Existing Floors Above Grade: Provide core-drilled penetrations for all piping.
  4. New and Existing Walls: Provide sleeved or core drilled penetrations for all piping.
  5. Floor type drains, cleanouts, and water closet waste connections do not require sleeved or core drilled penetrations. Concrete shall be placed tight to connection.
  6. Roof penetrations through metal roofs by the Plumbing or Mechanical Contractor will be required to have written approval by the Roofing Contractor.
- G Pipe Sleeves: Install in accordance with the following:
1. Install sheet metal on steel pipe sleeves in interior walls.
  2. Install steel pipe sleeves in interior floors above grade.
  3. Install galvanized steel pipe sleeves in floors on grade and in exterior walls above grade and below grade.
- H Penetration Seals:
1. Install mineral wool/oakum seals as follows:
    - a. In interior walls where piping passes from one space to another, where any one of the spaces the piping penetration is not concealed by a ceiling. Caulk penetration watertight.
  2. Install mechanical seals in accordance with manufacturer's recommendations as follows:
    - a. In interior floors on grade.
    - b. In interior floors above grade, use three-hour fire rated type only.
    - c. In exterior walls above grade and below grade.
    - d. In all roof penetrations except vent piping, flue piping, roof or overflow drain piping or any other piping as otherwise detailed on Drawing.
  3. Install fire barrier seals in accordance with manufacturer's recommendations as follows:
    - a. In all floors above grade, roofs and fire rated walls.

**END OF SECTION**

**SECTION 224001**  
**PLUMBING FIXTURES**

**PART 1 - GENERAL**

1.01 SUMMARY

- A Extent of Plumbing Fixture Work required by this section is indicated on Drawings and Schedules, and by requirements of this section.
- B Types of plumbing fixtures specified in this section include the following:
  - 1. Water closets.
  - 2. Lavatories.
  - 3. Sinks.
  - 4. Mop sinks.
  - 5. Flush Valves.
  - 6. Plumbing Brass.
  - 7. Wall Hung Fixture Carriers.

1.02 REFERENCES

- A ANSI A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.
- B ANSI A112.19.2 - Vitreous China Plumbing Fixtures.
- C ANSI A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use).
- D ANSI A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.
- E ANSI A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals.
- F ARI 1010 - Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.
- G All fixtures shall comply with ANSI/NSF STD 61.

1.03 QUALITY ASSURANCE

- A Conformance with applicable state and local codes and ordinances.
- B Fixtures: By same manufacturer throughout.
- C Trim: By same manufacturer throughout.

1.04 REGULATORY REQUIREMENTS

- A Conform to the most recent editions of the City codes and ordinances.
- B Conform to Article 7/601b. - Vernon's Texas Civil Statutes (Handicapped Accessibility Act) (Texas Accessibility Standards (TAS)).

1.05 SUBMITTALS

- A Submit product data in accordance with Division 01 and Section 220010.
- B Include fixtures, sizes, utility sizes, trim, and finishes.

1.06 WARRANTY

- A Provide one-year manufacturer's warranty for electric water cooler compressor in accordance with Division 01 and Section 220010.

**PART 2 - PRODUCTS**

2.01 PLUMBING FIXTURES

- A Provide plumbing fixtures as scheduled or approved equal.
- B Approved equals will be limited to the following manufacturers:
  - 1. Stainless Steel Sinks:
    - a. Elkay.
    - b. Just.
  - 2. Plumbing Brass:

- a. American Standard.
  - b. Chicago Faucets.
  - c. Delta.
  - d. Kohler.
  - e. Moen Commercial.
  - f. T & S Brass.
3. Floor Mounted Fixture Carriers:
- a. For All Wall Hung Fixtures:
    - 1) Josam.
    - 2) Smith.
    - 3) Watts.
    - 4) Zurn.

### **PART 3 - EXECUTION**

#### **3.01 INSPECTION**

- A Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
- B Verify adjacent construction is ready to receive rough-in work of this Section.

#### **3.02 INSTALLATION**

- A Install each fixture in accordance with the manufacturer's recommendations.
- B Piping, valves, fittings, trim, etc. shall be polished chromium plated when exposed in finished areas.
- C Piping penetrating floors, walls or ceilings shall be provided with solid polished chromium plated escutcheons.
- D Install components level, plumb, and at right angles to walls.
- E Provide floor mounted carriers for all wall mounted fixtures.
- F Install and secure fixtures in place with wall supports carriers and bolts. Exposed bolts, nuts, etc. shall be stainless steel or chrome-plated brass.
- G Seal fixtures to wall and floor surfaces with white sealant.
- H Mount fixtures to Architectural drawings interior wall elevations and to requirements of ADA and TAS.
- I Provide removable insulation covering on stops and supplies and drains and P-traps on all handicapped lavatories with hot water supply. All lavatories in rooms with handicapped water closets are considered handicapped lavatories.
- J Provide keyed stops on all water supplies to fixtures and equipment.
- K Provide water hammer arrestors on hot and cold water supplies to all plumbing fixtures. Water hammer arrestors shall be as shown on diagrams and if not shown, provide for each fixtures in accordance with Standard PDI-WH-201.
- L Provide drainage and vent piping run outs to plumbing fixtures and drains, with approved trap, of sizes indicated; but in no case smaller than required by the Plumbing Code.
- M Provide drainage piping run outs to urinals of cast iron material. Copper or brass material is not allowed.

#### **3.03 ADJUSTING AND CLEANING**

- A Adjust and balance stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.
- B At completion clean plumbing fixtures and equipment.

**END OF SECTION**



**SECTION 230010**

**BASIC MECHANICAL REQUIREMENTS**

**PART 1 - GENERAL**

**1.01 GENERAL PROVISIONS AND SUPPLEMENTAL GENERAL PROVISIONS**

- A The "General Conditions" and "Supplementary Conditions" are by reference made a part of this section and shall apply to each and every heading as though included herein.
- B In the event of conflict, the requirements of the "General Conditions" and "Supplementary Conditions" will take precedence over these "General Requirements".

**1.02 GENERAL**

- A The Contractor shall provide all plans, labor, equipment, appliances and materials, and shall perform all operations in connection with the installation of the mechanical work in accordance with the Specifications, applicable drawings, and the conditions specified above.
- B Contractor shall provide all equipment required and usually furnished in connection with such work and systems whether or not specifically mentioned or specifically indicated on the drawings.

**1.03 INSPECTION OF THE SITE**

- A The Contractor shall visit the site, verifying all existing items indicated on drawings and/or specified, and familiarize himself with the existing work conditions, hazards, grades, actual formations, soil conditions, and local requirements. The submission of bids shall be deemed evidence of such visits.
- B All proposals shall take these existing conditions into consideration, and the lack of specific information on the drawings shall not relieve the Contractor of any responsibility.
- C In the event that equipment specified and/or reviewed is not compatible with the existing conditions, the trade furnishing the equipment shall be responsible for notifying the Contractor prior to ordering it.

**1.04 PERMITS, UTILITY CONNECTIONS, AND INSPECTIONS**

- A Refer to other sections of the specifications for construction phasing and time increments.
- B The Contractor shall obtain and pay for all required utility connections, utility extensions and/or relocations and shall pay all costs and inspection fees for all work included herein.

**1.05 APPLICABLE CODES AND STANDARDS**

- A The installation shall meet the minimum standards prescribed in the latest editions of the following listed codes and standards, which are made a part of the Specifications, except as may be hereinafter modified in these Specifications and associated drawings.
- B Latest edition of the National Fire Protection Association Standards (NFPA):
  - 1. NFPA No. 70 National Electrical Code
  - 2. NFPA No. 90A Installation of Air Conditioning and Ventilating systems
  - 3. NFPA No. 91 Exhaust systems of Air Conveying of Gases, etc.
  - 4. NFPA No. 96 Ventilation control and Fire Protection of Commercial Cooking Operations
  - 5. NFPA No. 101 Safety to Life from Fire in Buildings and Structures
  - 6. NFPA No. 255 Test of Surface Burning Characteristics of Building Materials
- C United States of America Standards Institute (ASA) Standards:
  - 1. A40.8 National Plumbing Code
  - 2. B31.1 & B31.1a Code for Pressure Piping
- D American Society of Mechanical Engineers (ASME): Boiler and Pressure Vessel Codes.
- E Air Conditioning and Refrigeration Institute Standards (ARI): All standards related to refrigeration and air conditioning equipment and piping furnished under these Specifications.
- F Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) 1985: All applicable manuals and standards.
- G Air Moving and Conditioning Association (AMCA): All applicable manuals and standards.
- H American Society of Testing and Material (ASTM): All applicable manuals and standards.
- I American Water Works Association (AWWA): All applicable manuals and standards.

- J National Electrical Manufacturer's Association (NEMA): All applicable manuals and standards.
- K City Fire Department as applicable to construction of this site.
- L City and State Building Codes.
- M State of (Texas) Occupational Safety Act: Applicable safety standards.
- N Occupational Safety and Health Act (OSHA).
- O State of (Texas) Energy Conservation Construction Code.
- P All work shall be in accordance with all regulations and requirements of the State of Texas Architectural Barriers Act (TAS).
- Q Texas Department of Health (TDH) Hospital Licensing Standards.
- R Refer to Specifications sections hereinafter bound for additional codes and standards.
- S All materials and workmanship shall comply with all applicable state and national codes, specifications, and industry standards. All material shall be listed by the Underwriter's Laboratories, Inc., as conforming to its standards and so labeled in every case where such a standard has been established for the particular type of material in question.
- T All equipment provided and all installation methods shall meet all applicable requirements of the Fort Worth Energy Code.
- U The Contract Documents are intended to comply with the aforementioned rules and regulations; however, some discrepancies may occur. Where such discrepancies occur, the Contractor shall immediately apply for an interpretation. Should the discovery and notification occur after the execution of a contract, any additional work required for compliance with said regulations shall be paid for as covered by other specifications of the Contract Documents, providing no work or fabrication of materials has been accomplished in a manner of non-compliance. Should the Contractor fabricate and/or install materials and/or workmanship in such a manner that does not comply with the applicable codes, rules and regulations, the Contractor who performed such work shall bear all costs arising in correcting these deficiencies to comply with said rules and regulations.

#### 1.06 CONTRACT DOCUMENTS

- A These specifications are accompanied by drawings of the building and details of the installations indicating the locations of equipment, piping, ductwork, outlets, switch controls, circuits, lines, etc. The drawings and these specifications are complementary to each other, and what is required by one shall be as binding as if required by both.
- B If the Contractor deems any departures from the drawings necessary, details of such departures and the reasons therefore shall be submitted to the Architect for review. No departures shall be made without prior written acceptance.
- C There are intricacies of construction that are impractical to specify or indicate in detail; however, in such cases the current rules of good practice and applicable specifications shall govern.
- D It is the Contractor's responsibility to properly use all information found on the Civil, Architectural, Structural, Mechanical, Plumbing, Fire Protection, and Electrical drawings where such information affects his work.
- E All dimensional information related to new structures should be taken from the appropriate drawings. All dimensional information related to existing facilities shall be taken from actual measurements made by the Contractor on the site.
- F The interrelation of the specifications, the drawings, and the schedules is as follows: The specifications determine the nature and setting of the several materials, the drawings establish the quantities, dimensions and details, and the schedules give the performance characteristics.
- G Should the drawings or specifications disagree within themselves, or with each other, the better quality of greater quantity of work or materials shall be estimated upon, and unless otherwise directed by the Architect in writing, shall be performed or furnished. Figures indicated on drawings govern scale measurements and large-scale details govern small-scale drawings.

#### 1.07 SPACE AND EQUIPMENT ARRANGEMENT

- A The size of fire protection, plumbing, mechanical, and electrical equipment indicated on the drawings is based on the dimensions of a particular manufacturer. While other manufacturers may be acceptable, it is the responsibility of the Contractor to determine if the equipment he proposes to furnish will fit in the space. Shop drawings shall be prepared to indicate a suitable arrangement.
- B All equipment shall be installed in a manner to permit access to all surfaces. All valves, motors, drives, filters, and other accessory items shall be installed in a position to allow removal for service without disassembly of another part.
- C Maintain all code required clearances for equipment access.

#### 1.08 FABRICATION DRAWINGS

- A Contractor shall submit ductwork fabrication and hydronic piping shop drawings for review by the Architect. Fabrication drawings shall be fully coordinated with ALL other trades and with existing conditions.
- B All required shop drawings, except as hereinafter specified, shall be prepared at a scale of not less than 1/4 in. equal to 1 ft. for floor plans and 1/4 in. equal to 1 ft. for mechanical rooms.

#### 1.09 SUPERVISION

- A Each contractor shall keep a competent superintendent or foreman on the job at all times necessary for the timely and proper completion of the work.
- B It shall be the responsibility of each superintendent to study all drawings and familiarize himself with the work to be done by other trades. He shall coordinate this work with other trades, and before material is fabricated or installed, make sure that his work will not cause an interference that cannot be resolved without major changes to the drawings. If a conflict between trades arises that cannot be resolved at the jobsite, the matter shall be referred to the Architect for his ruling.

#### 1.10 EXISTING FACILITIES

- A The Contractor shall be responsible for loss or damage to the existing facilities caused by him and his workmen, and shall be responsible for repairing or replacing such loss or damage. The Contractor shall send proper notices, make necessary arrangements, and perform other services required for the care, protection and in-service maintenance of all plumbing, heating, air conditioning, and ventilating services for the new and existing facilities. The Contractor shall erect temporary barricades, with necessary safety devices, as required to protect personnel from injury, and remove all such temporary protection upon completion of the work. All barricades and safety devices shall be in compliance with OSHA.
- B The Contractor shall provide temporary or new services to all existing facilities as required to maintain their proper operation when normal services are disrupted as a result of the work being accomplished under this project.
- C Where existing construction is removed to provide working and extension access to existing utilities, Contractor shall remove doors, piping, conduit, outlet boxes, wiring, light fixtures, air conditioning ductwork and equipment, etc., to provide this access and shall reinstall same upon completion of work in the areas affected.
- D Where partitions, walls, floors, or ceilings of existing construction are indicated to be removed, all Contractors shall remove and reinstall, in locations approved by the Architect, all devices required for the operation of the various systems installed in the existing construction. This is to include, but is not limited to, temperature control system devices, electrical switches, relays, fixtures, piping, conduit, etc.
- E Outages of services, as required by the new installation, will be permitted only at a time approved by the Architect.

#### 1.11 DEMOLITION AND RELOCATION

- A The Contractor shall modify, remove and/or relocate all materials and items so indicated on the drawings or required by the installation of new facilities. Materials and/or items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to good operative condition.
- B All items that are to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The Contractor shall clean and repair and provide all new materials, fittings, and appurtenances required to complete the relocations and to restore to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved.
- C Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points indicated on the drawings, specified, or acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed and sealed, capped, or otherwise tied-off or disconnected in a safe manner acceptable to the Architect. All disconnections or connections into the existing facilities shall be done in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas of facilities, which must remain in operation during the construction period, shall not be interrupted without prior specific approval of the Architect as hereinbefore specified.
- D All equipment and materials indicated to be removed and not be re-used shall be disposed of by the Contractor.

#### 1.12 OPERATING AND MAINTENANCE INSTRUCTIONS

- A The Contractor shall prepare, in triplicate for the Owner's Manual, complete sets of operating and maintenance instructions, system piping, valving, control and interlock diagrams, manuals, parts lists, etc., for each item of equipment. Include copies of all equipment warranties.

- B In addition, the Contractor shall provide the services of a competent engineer or a technician acceptable to the Architect to instruct a representative of the Owner in the complete and detailed operation of all equipment and systems. These instructions shall be provided for a period of not less than 8 hours to fully accomplish the desired results. Upon completion of these instructions, a letter of release will be required, stating the dates of instruction and the personnel to whom instructions were given. The Contractor shall be responsible for proper maintenance until the instructions have been given to the Owner's maintenance personnel.

#### 1.13 GUARANTEE

- A All work and equipment shall be guaranteed for a period of one year from the date of substantial completion.
- B Guarantee shall be for all labor and materials.
- C Certain items for equipment shall have additional or extended warranties when so specified.

#### 1.14 MATERIALS AND WORKMANSHIP

- A All materials, unless otherwise specified, shall be of current U.S. manufacture, new, free from all defects, and of the best quality of their respective kinds. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of work involved. All work shall be executed by mechanics skilled in their respective trades, and the installations shall present a neat, workmanlike appearance. Materials, and/or equipment damaged in shipment, or otherwise damaged prior to installation, shall not be repaired at the job site, but shall be replaced with new materials and/or equipment.
- B The responsibility for furnishing the proper equipment and/or material, and to see that it is installed as intended by the manufacturer rests entirely upon the Contractor, who shall request advice and supervisory assistance from the representative of specific manufacturers during the installation.

#### 1.15 FLAME SPREAD PROPERTIES OF MATERIALS

- A Materials and adhesives incorporated in this project shall conform to NFPA 255, latest edition. The classification shall not exceed No. 2, with the range of indices between 0 to 25 for these Classifications as listed in the Federal Specifications. Modifications shall be made to insulating materials, etc., as required to comply with the Federal Specification.

#### 1.16 LARGE APPARATUS

- A Any large piece of apparatus which is to be installed in any space in the building, and which is too large to permit access through stairways, doorways, or shafts shall be brought to the job and placed in the space before the enclosing structure is completed. Following placement in the space, such apparatus shall be thoroughly, completely protected from damage as hereinafter specified.

#### 1.17 FLOOR AND CEILING PLATES

- A Except as otherwise noted, provide chrome plated brass floor and ceiling plates around all pipes, conduits, ducts, etc., passing exposed through walls, floors, or ceilings, in any spaces, except under floor and attic spaces. Plates shall be sized to fit snugly against the outside of the pipe or against the insulation on lines that are insulated and positively secured to such pipe or insulation. Plates will not be required for piping where pipe sleeves extend 3/4 in. above finished floor. All equipment rooms are classified as finished areas. Round and rectangular ducts shall have plates made to fit accurately at all floor, wall and ceiling penetrations.

#### 1.18 SLEEVES, INSERTS AND FASTENINGS

- A Proper openings through floors, walls, roofs, etc., for the passage of piping, ductwork, etc., shall be provided. All penetrations must pass through sleeves except soil pipe installed under concrete slabs on fill. Sleeves shall be set in new construction before concrete is poured, as cutting holes through any part of the concrete will not be permitted unless acceptable to the Architect.
- B Pipes passing through concrete or cinder walls and floor or other corrosive material shall be protected by a protective sheathing or wrapping or by sleeves, as required to meet the local code. Annular spaces between sleeves and pipes shall be filled or tightly caulked in an approved manner. Annular spaces between sleeves and pipes in fire-resistance-rated assemblies shall be filled or tightly caulked in accordance with the local code.
- C The minimum clearance between horizontal penetrations including insulation where applicable, and sleeves shall be 1/4 in., except that the minimum clearance shall be 2 in. where piping contacts the ground. Sleeves through walls and partitions shall be installed flush with exposed surfaces. Sleeves through floors shall be extended 2 in. above finished floor.

- D Above grade and dry location sleeves shall be constructed from 20 to 22 gauge galvanized steel. Sleeves passing through walls or floors on or below grade and/or moist areas such as mechanical rooms shall be constructed of galvanized steel Schedule 40 pipe and shall be designed with suitable flange in the center of the floor or wall to form a waterproof passage. After the pipes have been installed in the sleeves, void space around the pipe shall be sealed with "Link-Seal" modular wall and casing seals as manufactured by Thunderline Corporation.
- E Suitable concrete inserts for pipe and equipment hangers shall be set and properly located for all pipe and equipment to be suspended from concrete construction.
- F Fastening of pipes, conduits, etc., in the building shall be as follows: To wood members - by wood screws; to masonry - by threaded metal inserts, metal expansion screws, or toggle bolts, whichever is appropriate for the particular type of masonry; to steel - machine screws or welding (when specifically permitted or directed), or bolts, and to concrete by suitable inserts anchored to reinforcing steel, and poured in place unless other means are acceptable for general use, and will only be permitted where specifically acceptable to the Architect.
- G Under no circumstances will the use of plastic anchors or plastic expansion shields be permitted for any purpose whatsoever.
- H Vermin Proofing: The open space around all ductwork, piping, etc., passing through the ground floor and/or exterior walls shall be sealed with a continuous bead of sealant.
- I The space around piping, ductwork, etc., penetrating walls, ceilings and floors that define air plenums shall be sealed airtight in an acceptable manner. Ceiling plenums used for return air are considered air plenums.

#### 1.19 ACCESS DOORS

- A This Contractor shall provide wall or ceiling access doors for unrestricted access to all concealed shutoff or service valves, strainer, unions, pressure reducing valves, trap primers, water hammer arrestors, heat trace cable junction boxes, and other items of concealed mechanical equipment. All access door locations are not shown on the drawings. It is the Contractor's responsibility to provide access doors at all locations required.
- B Access doors mounted in painted surfaces shall be equal to Milcor (Inland-Ryerson Construction Products Company) manufacture, Style K for plastered surfaces and Style M or DW for non-plastered surfaces. The Style K doors shall be set so that the finished surface of the door is even with the finished surfaces of the adjacent finishes. Access doors mounted on tile surfaces shall be stainless steel materials. Access doors shall be minimum of 18 in. x 18 in. in size.

#### 1.20 CONSTRUCTION REQUIREMENTS

- A The Civil, Architectural, Structural, Fire Protection, Mechanical, Plumbing, and Electrical plans and specifications including the General Provisions, Supplemental General Provisions, and other pertinent documents issued by the Architect, are a part of these specifications and the accompanying mechanical drawings, and shall be complied with in every respect. All the above is included in the Contract Documents, and shall be examined by all bidders. Failure to comply shall not relieve the Contractor of responsibility or be used as a basis for additional compensation due to omission of architectural, structural and electrical details from the mechanical drawings.
- B It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details or special construction may be required for work indicated or specified in this section or work specified in other sections, it shall be the responsibility of the Contractor to provide same as well as to provide material and equipment usually furnished with such systems or required to complete the installation, whether mentioned or not.
- C The Contractor shall be responsible for fitting his material and apparatus into the building and shall carefully lay out his work at the site to conform to the structural conditions, to avoid all obstructions, to conform to the details of the installation supplied by the manufacturer of the equipment to be installed and thereby to provide an integrated satisfactory operating installation.
- D The mechanical and associated drawings are necessarily diagrammatic in character and cannot show every connection in detail or every pipe or equipment in its exact location. These details are subject to the requirements of ordinances and also structural and architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. Work shall be installed to avoid crippling of structural members; therefore, inserts to accommodate pipe hangers shall be set before concrete is poured, and proper openings through floor, walls, beams, etc., shall be provided as hereinafter specified or as otherwise indicated or required. All work shall be installed parallel or perpendicular to the lines of the building unless otherwise noted.

- E When the mechanical drawings do not give exact details as to the elevation of pipe, ducts, etc., physically arrange the systems to fit in the space available at the elevations intended with the proper grades for the functioning of the system involved. Piping and duct systems are generally intended to be installed true and square to the building construction, and located as high as possible against the structure in a neat and workmanlike manner, and the plans do not show all required offsets, control lines, pilot lines and other location details. Work shall be concealed in all finished areas. Piping specified to be insulated shall be supported in a manner that will allow the insulation to be installed without gaps. Insulated piping in concealed areas shall be offset with fittings as necessary to permit installation of insulation. Bending of pipes or installing pipes in a strain in order to insulate will not be permitted.
- F All oiling devices and all parts of equipment requiring adjustment shall be easily accessible. Equipment shall be so located and installed as to permit convenient and safe maintenance and future replacement. Piping, ductwork, valve stems, etc., shall not block service space.

1.21 MECHANICAL SUBMITTALS

- A Refer to the Conditions of the Contract (General and Supplementary) and Division 01 Section: "SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES" for submittal definitions, requirements, and procedures.
- B Submittal of Shop Drawings, product data, and samples will be accepted only when submitted by The Contractor. Data submitted from Subcontractors and material suppliers directly to the Architect will not be processed.
- C Submit Shop Drawings, product data, and samples on items indicated in the individual sections.
- D Shop Drawings and submittal data shall not be used as requests or proposals for alternate equipment or materials. Refer to Item "Product Options and Substitutions" elsewhere in this section.
- E THIRD PARTY CERTIFICATION: All Packaged equipment shall be independently Third Party labeled as a system for its intended use by a Nationally Recognized Testing Laboratory (NRTL) in accordance with OSHA Federal Regulations 29CFR1910.303 and .399, as well as NFPA Pamphlet #70, National Electric Code (NEC), Article 90-7.

1.22 PRODUCT OPTIONS AND SUBSTITUTIONS

- A Refer to the Instructions to Bidders and the Division 01 Section "PRODUCTS AND SUBSTITUTION" for requirements in selecting products and requesting substitutions.
- B Standards for Materials:
  - 1. These specifications indicate a standard for all materials incorporated into the work, with manufacturer's names and catalog numbers used to establish a grade and quality of materials and equipment. The manufacturer listed on the equipment schedules, or named first in the specifications, is the one on whose equipment the layout is based. Other named manufacturers must meet the indicated performance and space requirements.
  - 2. The "approved equal" clause used in these specifications is to permit the proposal of unnamed manufacturer's products for the work, and the Architect decision concerning equal products is final.
  - 3. Considerations as to determination of equal products include, but are not limited to, the following:

Materials	Physical size
Workmanship	Weight
Gauges of Materials	Appearance
Available Local Service Personnel	Performance
Previous successful installations	Capacity
Delivery Schedules	Required Equipment Clearances

- C Requests for substitutions for equipment, materials and apparatus listed in Division 23 Sections must be submitted in writing a **MINIMUM OF 10 DAYS** prior to the scheduled bid date. Such requests must be accompanied by complete data to permit proper evaluation.
- D BIDS SHALL NOT BE BASED ON UN-APPROVED MATERIALS, EQUIPMENT, OR APPARATUS. UNAPPROVED MATERIAL, EQUIPMENT OR APPARATUS WILL NOT BE ACCEPTED.
- E Should electrical, water, drain, natural gas, structural support, or other similar requirements for alternate equipment, whether named in the specifications or approved as a substitution, be different from requirements for the products used in laying out the project, such changes shall be the responsibility of the Contractor, and shall not result in extra charges to the Owner, Architect, or Engineer.

1.23 RECORD DOCUMENTS

- A Refer to the Division 01 Section: "CLOSEOUT PROCEDURES" for requirements. The following paragraphs supplement the requirements of Division 01.

- B Mark Drawings to indicate revisions to piping and ductwork, size and location both exterior and interior; including locations of coils, dampers and other control devices, filters, boxes, and similar units requiring periodic maintenance or repair; actual equipment locations, dimensioned for column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned to column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.); Change Orders; concealed control system devices.
- C Mark Specifications to indicate approved substitutions; Change Orders; actual equipment and materials used.

1.24 PAINTING

- A Field painting of mechanical equipment, duct systems, piping systems, etc., shall be accomplished under Division 09 of these specifications.
- B Protection of Factory-applied Finishes:
  - 1. Factory-applied finishes on equipment and apparatus installed on the project shall be carefully protected.
  - 2. At the conclusion of the work, and prior to final acceptance of the project, equipment and apparatus shall be thoroughly cleaned of all construction dirt, oil and grease smears, temporary labels, debris, paint droppings, etc.
  - 3. Damaged factory finishes shall be restored to their original condition using procedures, materials and application techniques as set forth in Division 09 found elsewhere in these specifications.

1.25 CLEANING

- A Refer to the Division 01 Section: "CLOSEOUT PROCEDURES" for general requirements for final cleaning.
- B Refer to Division 23 Section: "TESTING, ADJUSTING, AND BALANCING" for requirements for cleaning filters, strainers, and mechanical systems prior to final acceptance.
- C Name Plates:
  - 1. All nameplates shall be protected from damage during the construction process.
  - 2. At the conclusion of the work, the nameplates shall be carefully cleaned and left in a fully legible condition.
- D Removal of Rubbish: Each Contractor is responsible for the timely removal of rubbish and trash generated by his work, such as empty cartons, containers, materials crates, etc. Particular attention is called to residue that may present a potential tripping or injury hazard.

1.26 MOTORS AND DRIVES

- A Motors:
  - 1. General: Motors shall be U/L-approved, with copper windings, and with a minimum Service Factor of 1.15. The nominal capacity shall exceed the brake horse-power requirements at duty schedules.
  - 2. Motors 1/2 HP and smaller shall be 120-volt, single-phase with internal overload protection.
  - 3. Motors 3/4 HP and larger shall be 208/230 or 460 -volt, 3-phase, unless scheduled or noted otherwise, and shall have thermal over-load cutouts in each phase as recommended by the motor manufacturer.
  - 4. Motors shall be as manufactured by Century, General Electric, US Motors, Wagner, Westinghouse, or approved equal.
- B Drives:
  - 1. Belts drives shall be rated for 150% of motor-rated horsepower.
  - 2. Drive assemblies up to two (2) belts shall have adjustable motor sheaves with the mid-point of the adjustment range at the RPM required for the specified performance.
  - 3. On drive assemblies with 3 or more belts, provide fixed motor sheaves for the specified RPM. Provide and install up to 2 pulley changes as necessary to achieve the required air quantities.
  - 4. All multiple-belt drives shall be factory-marked-matched sets.
- C Specific requirements:
  - 1. Provide high-efficiency motors for the following:
    - a. Air-Handling Units, as scheduled.
    - b. Ventilating Fans, as scheduled.
    - c. HVAC Pumps, as scheduled.
  - 2. Efficiency ranges shall be as follows:

	Nominal HP	Minimum Efficiency	Premium Efficiency
	3	86.5	89.5
	5	87.5	89.5
	7.5	88.5	91.7

	10	89.5	91.7
	15	91.0	92.4
	20	91.0	93.0
	25	91.7	93.6
	30	92.4	93.6
	40	93.0	94.1
	50, 60, 75	93.0, 93.6, 94.1	94.5, 95.0, 95.4
	100	94.1	95.4

3. Motor efficiency certification shall be included with Product Submittal Data in accordance with Division 01 of these specifications.
4. Variable Speed (Frequency) AC Drives:
  - a. Where scheduled on the plans, provide and install variable speed (frequency) AC drives for motors.
  - b. Variable speed (frequency) AC drives shall be as described in Section 238965 - MOTOR CONTROLLERS - of these Specifications.
5. Motor Starters and Controllers:
  - a. Motor starters and controllers for fans, pumps, air-handling units, compressors, etc., which are not provided as an integral part of a factory-assembled package, shall be provided under Division 23 of the specifications. Refer to Section 238965 "MOTOR CONTROLLERS."

## PART 2 - PRODUCTS

### 2.01 GENERAL MATERIALS AND EQUIPMENT REQUIREMENTS

- A The manufacturer's published instructions shall be followed for preparing, assembling, installing, erecting, and cleaning manufacturer's materials or equipment, unless otherwise indicated. The Contractor shall promptly notify the Architect in writing of any conflict between the requirements of the Contract Documents and the manufacturer's directions and shall obtain the Architect instructions before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturer's directions or such instructions from the Architect, he shall bear all costs arising in connection with the deficiencies.
- B The Contractor shall not receive material or equipment at the jobsite until there is suitable space provided to properly protect equipment from rust, drip, humidity, and dust damage.
- C Capacities shall be not less than those indicated but shall be such that no component or system becomes inoperative or is damaged because of start-up or other overload conditions.
- D Where materials or equipment are specified to be approved, listed, tested, or labeled by the Underwriter's Laboratories, Inc., or constructed and/or tested in accordance with the standards of the American Society of Mechanical Engineers or the Air Moving and Conditioning Association, the Contractor shall submit proof that the items furnished under these sections of the specifications conform to such requirements. The ASME stamp or the AMCA label will be acceptable as sufficient evidence that the items conform to the respective requirements.
- E Each major component of equipment shall have the manufacturer's name, address, and catalog number on a plate securely attached to the item of equipment. All data on nameplates shall be legible at the time of Final Observation.
- F Standard factory finish will be acceptable on equipment specified by model number; otherwise surfaces of ferrous metal shall be given a rust-inhibiting coating. The treatment shall withstand 200 hours in salt-spray fog test, in accordance with Method 6061 of Federal Standard No. 141. Immediately after completion of the test, the specimen shall show no signs of wrinkling or cracking, and no signs of rust creepage beyond 1/8 in. on either side of the scratch mark. Where rust-inhibitor coating is specified hereinafter, any treatment that will pass the above test is acceptable, unless a specific coating is specified, except that coal tar or asphalt type coatings will not be acceptable, unless so stated for a specific item. Where steel is specified to be hot-dip galvanized, mill-galvanized sheet steel may be used provided all raw edges are painted with a zinc-pigmented paint conforming to Military Specification MIL-P-6215.
- G Belts, pulleys, chains, gears, couplings, projecting setscrews, keys and other rotating parts located so that any person can come in close proximity thereto, shall be fully enclosed or properly guarded.



- H The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, to verify all dimensions in the field, and to advise the Architect of any discrepancy before performing any work. Adjustments to the work required, in order to facilitate a coordinated installation, shall be made at no additional cost to the Owner.

## 2.02 PROTECTION

- A The Contractor shall at all times take such precautions as may be necessary to properly protect all materials and equipment from damage from the time of delivery until the completion of the work. This shall include the erection of all required temporary shelters and supports to adequately protect any items stored in the open on the site from the weather, the ground and surrounding work; the cribbing of any items above the floor of the construction; and the covering of items in the incomplete building with tarpaulins or other protective covering. Failure on the part of the Contractor to comply with the above will be sufficient cause for the rejection of the items in question.
- B Take particular care not to damage the building structure in performing work. All finished floors, steel treads, and workmen or their tools and equipment shall cover finished surfaces to prevent any damage during the construction of the building.
- C Equipment and materials shall be protected from rust both before and after installation. Any equipment or materials found in a rusty condition at the time of final observation must be cleaned of rust and repainted as specified elsewhere in these specifications.

## 2.03 COOPERATION BETWEEN TRADES AND WITH OTHER CONTRACTORS

- A Each trade, subcontractor and/or contractor must work in harmony with the various other trades, subcontractors, and/or contractors on the job as may be required to facilitate the progress to the best advantage of the job as a whole. Each trade, subcontractor, and/or contractor must pursue his work promptly and carefully as not to delay the general progress of the job. This Contractor shall work in harmony with contractors working under other contracts on the premises.

## 2.04 PRECEDENCE OF MATERIALS

- A These specifications and the accompanying drawings are intended to cover systems which will not interfere with the structural design of the building, which will fit into the available space, and which will insure complete and satisfactory systems. Each Contractor shall be responsible for the proper fitting of his material and apparatus into the building.
- B Each Contractor shall so harmonize his work with that of the other trades so that it may be installed in the most direct and workmanlike manner without hindering or handicapping the other trades. Piping interferences shall be handled by giving precedence to pipelines that require a stated grade for proper operation. Where space requirements conflict, the following order of precedence shall, in general, be observed:
  1. Building lines
  2. Structural members
  3. Soil and drain piping
  4. Vent piping
  5. Condensate piping
  6. Refrigerant piping
  7. Supply ductwork
  8. Return ductwork
  9. Exhaust ductwork
  10. Chilled water and heating water piping
  11. Automatic Fire Protection Sprinkler Piping
  12. Domestic hot and cold water piping
  13. Electrical conduit

## 2.05 LOCATION OF OUTLETS IN ROOMS

- A All fire protection, plumbing, acoustical tile, diffusers, grilles, registers, and other devices shall be referenced to coordinated, established data points and shall be located to present symmetrical arrangements with these points and to facilitate the proper arrangements of acoustical tile panels and other similar panels with respect to the mechanical and electrical outlets and devices. Those mechanical and electrical outlets shall be referenced to such features as wall and ceiling furrings, balanced border widths, masonry joints, etc. Outlets in acoustical tile shall occur symmetrically in tile joints or in the center of whole tiles. When locations of mechanical and electrical devices shown on the Architect reflected ceiling plans need to be modified, the final determination of the exact location of each outlet and the arrangement to be followed shall be acceptable to the Architect.
- B The drawings show diagrammatically the location of the various outlets and apparatus. Exact locations of these outlets and apparatus shall be determined by reference to the general plans and to all detail drawings, equipment drawings, roughing-in drawings, etc., by measurements at the building, and in cooperation with the other trades. The Architect reserves the right to make any reasonable change in location of any outlet or apparatus before installation, without additional cost to the Owner.
- C The Contractor, by submitting a bid on this work, sets forth that he has the necessary technical training and ability, and that he will install his work in a satisfactory and workmanlike manner which is up to the best standards of the trade, complete, and in good working order. If any of the requirements of the drawings and specifications are impossible of performance, or if the installation, when made in accordance with such requirements, will not perform satisfactorily, he shall report it to the Architect for correction promptly after discovery of the discrepancy.

## 2.06 CONNECTIONS FOR OTHERS

- A This Contractor shall rough-in for and make all gas, water, steam, sewer, etc., connections to all fixtures, equipment, machinery, etc., provided by others in accordance with detailed roughing-in drawings provided by the equipment suppliers, along with actual measurements of the equipment connections, or as detailed.
- B After the equipment is set in place, this Contractor shall make all final connections and shall provide all required pipe, fittings, valves, traps, etc.
- C Provide all air gap fittings where required. In each water line serving an item of equipment or piece of machinery, provide a shut-off valve. On each drain not provided with a trap, provide a suitable trap.
- D All pipefittings, valves, traps, etc., exposed in finished areas and connected to chrome-plated lines provided by others shall be chrome plated to match.
- E Provide all sheet metal ductwork, transition pieces, etc., required for a complete installation of vent hoods, exhaust hoods, etc., provided by others.

## PART 3 - INSTALLATION

### 3.01 INSTALLATION METHODS

- A All pipes shall be concealed in pipe chases, walls, furred spaces, or above the ceiling, unless otherwise indicated.
- B Piping may be run exposed in mechanical rooms, janitors' closets, or storage spaces, but only where necessary. All exposed piping shall be run in the neatest, most inconspicuous manner, and parallel or perpendicular to the building lines.
- C All piping shall be adequately and properly supported from the building structure by means of hanger rods or clamps to walls as herein specified.
- D Where limited space is available above the ceilings and below concrete beams or other deep projections, pipe and conduit shall be sleeved through the projection where it crosses, in a manner to provide maximum above-floor clearance. Sleeves shall be as specified or as required.
- E All pipe, conduits, etc., shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. All ducts, pipes and conduits run, exposed in machinery and equipment rooms, shall be installed parallel to the building plans, except as otherwise shown. Conduits in furred ceilings and in other concealed spaces may be run at angles to the construction but shall be neatly grouped and racked indicating good workmanship. All conduit and pipe openings shall be kept closed until the systems are closed with final connections.
- F There shall be no pipe joints nearer than 12 in. to a wall, ceiling, or floor penetration, unless pipe joint is the welded type joint.

- G The Contractor shall study all construction documents and carefully lay out all work in advance of fabrication and erection in order to meet the requirements of the extremely limited spaces. Where conflicts occur, the Contractor shall meet with all involved trades and the Architect and resolve the conflict, prior to erection of any work, in the area involved.

### 3.02 CUTTING AND PATCHING

- A Cut and patch openings through walls, floors, etc., resulting from work in existing construction or by failure to provide proper openings or recesses in new construction.
- B Openings cut through concrete and masonry shall be made with masonry saws and/or core drills at locations acceptable to the Architect. Impact-type equipment will not be used, except where specifically acceptable to the Architect. Openings in Precast concrete slabs for pipes, conduits, outlet boxes, etc., shall be core drilled or cast to exact size.
- C All openings shall be restored to "as-new" condition under the appropriate Specification Section for the materials involved, and shall match remaining surrounding materials and/or finishes.
- D Where openings are cut through masonry walls, provide and install lintels or other structural supports to protect the remaining masonry. Adequate supports shall be provided during the cutting operation to prevent any damage to the masonry occasioned by the operation. All structural members, supports, etc., shall be of the proper size and shape, and shall be installed in a manner acceptable to the Architect.
- E All mechanical work in areas containing plaster shall be completed prior to the application of the finish plaster coat. Cutting of finish plaster coat will not be permitted.
- F No cutting, boring, or excavating, which will weaken the structure, shall be undertaken. NO STRUCTURAL MEMBER MAY BE CUT WITHOUT THE WRITTEN APPROVAL OF THE ARCHITECT.

### 3.03 ROOF PENETRATIONS AND FLASHING

- A Pipe and duct sleeves and flashings compatible with the roofing installation shall be provided for roof penetrations. Manufacturer of roofing materials shall approve methods and materials. Pitch pans are not acceptable.
- B Roof penetrations through metal roofs by the Plumbing or Mechanical Contractor will be required to have written approval by the Roofing Contractor.
- C Piping penetration flashings shall be specially made for metal roofs and shall be EPDM or neoprene compression molded rubber with corrosion resistant metal base. Flashings shall be by Portals Plus, Inc., Buildex Dektite, or approved equal.

### 3.04 ROOF PIPING SUPPORTS

- A Single run pipe 2-1/2 in. O.D. and less, shall have Type SS-8R as manufactured by Portable Pipe Hangers, Inc., or an approved equal, spaced at a maximum 8 ft. o.c. and installed on roof pads if required by Roofing Manufacturer. All conduits shall be held in place with clips on bars. Coordinate exact locations of supports with Roofing Contractor. Do not use wood blocking under supports.
- B Multiple parallel runs, or piping and conduits larger than 2-1/2 in. O.D. shall have Type PS-1-2, PSE-2-2, or PP-10 with channel as manufactured by Portable Pipe Hangers, Inc., spaced at a maximum 8 in. o.c. and installed on roof pads if required by Roofing Manufacturer. All conduits shall be held in place with clips on bars. Coordinate exact locations of supports with Roofing Contractor. Do not use wood blocking under supports.
- C Single run conduits 2-1/2 in. O.D. and less, shall have Type SS-8CL or SS-8C as manufactured by Portable Pipe Hangers, Inc., or an approved equal, spaced at a maximum 8 ft. o.c. and installed on roof pads if required by Roofing Manufacturer. All conduits shall be held in place with clips on bars. Coordinate exact locations of supports with Roofing Contractor. Do not use wood blocking under supports.
- D Provide adjustable height threaded rod assembly supports as manufactured by MAPA Products model MS-1/MS-1-E or equal for supporting roof mounted condensate drain piping for pipe up to 2 in. Supports shall consist of a reinforced nylon support base, clamped pipe support bracket, and an adjustable threaded rod height assembly. A neoprene pad shall be adhered to the base. Install per manufacturer's instructions. Coordinate exact locations of supports with contractor.

### 3.05 FABRICATION OF PIPE

- A All the various piping systems shall be made up straight and true and run at proper grades to permit proper flow of the contained material. Lines shall also be graded for proper drainage.
- B Piping shall follow as closely as possible the routes shown on plans, but shall take into consideration conditions to be met at the site.

- C Should any unforeseen conditions arise, lines shall be changed or rerouted as required after approval has been obtained.
- D All piping shall be installed with due regard to expansion and contraction and so as to prevent excessive strain and stress in the piping, in connections, and in equipment to which lines are connected.
- E All piping shall be clean when it is installed. Before installation it shall be checked, upended, swabbed, if necessary, and all rust or dirt from storage shall be removed. Pipe shall not be permitted to lie on the ground during storage. Pipe ends shall be sealed during storage.

### 3.06 IDENTIFICATION AND LABELING

- A The Contractor shall make it possible for the personnel operating and maintaining the equipment and systems in this project to readily identify the various pieces of equipment, valves, piping, etc., by marking them.
- B All items of mechanical and electrical equipment shall be identified by the attachment of engraved nameplates constructed from laminated phenolic plastic, at least 1/16 in. thick, 3-ply, with black surfaces and white core. Engraving shall be condensed gothic, at least 1/2 in. high, appropriately spaced. Nomenclature on the label shall include the name of the item, its mark number, area, space, or equipment served, and other pertinent information. Equipment to be labeled shall include, but not be limited to, the following:
  - 1. Rooftop units
  - 2. Air Handling Units
  - 3. Furnaces
  - 4. Exhaust Fans
  - 5. Vent Fans
  - 6. Roof mounted fans
  - 7. Condensing Units
  - 8. Heat Pumps
  - 9. Circulating Pumps
  - 10. Air conditioning control panels and switches
  - 11. Motor controllers
  - 12. Miscellaneous similar and/or related items.
- C The Contractor shall install identification tags to be affixed to those valves that have functions that are not obvious. For example, it would not be expected that valves at a pressure reducing station in a machine room would be tagged. The valve identification tags shall be brass discs, 2 in. in diameter. Each tag shall be attached to its valve with copper clad annealed iron wire or other approved material.

### 3.07 TESTS AND INSPECTIONS

- A The Contractor shall, during the progress of the work and upon its completion, test his work and make all tests as required by the specifications, state, municipal and other authorities having jurisdiction of the work. Piping pressure tests shall be made before pipe is concealed or covered. Tests shall be made in the presence of authorities requiring tests. The Contractor shall pay all costs, inspection charges and fees required for the tests of his work.
- B The Contractor shall provide all apparatus, temporary piping connection, etc., required for tests. The Contractor shall take all due precautions to prevent damage to the building or its contents incurred by such tests. The Contractor shall repair and make good at his own expense any damage caused by failures or leaks during the tests.
- C Leaks, defects or deficiencies shall be repaired and/or replaced, and tests shall be repeated until the test requirements are complied with fully.
- D All equipment shall be placed in operation and tested for proper automatic control before the final balancing of the system is started.
- E All tests shall have pertinent data logged by the Contractor at the time of testing. Data shall include date, time, personnel, description, and extent of system tested, test condition, test results, specified results, and any other pertinent data. Data shall be delivered to the Architect.

### 3.08 COOPERATION AND CLEANUP

- A It shall be the responsibility of each trade to cooperate fully with the other trades on the job to help keep the job site in a clean and safe condition. At the end of each day's work, each trade shall properly store all of his tools, equipment and materials and shall clean his debris from the job. Upon the completion of the job, each trade shall immediately remove all of his tools, equipment, any surplus materials and all debris caused by his portion of the work.

### 3.09 CLEANING AND PAINTING

- A All equipment, piping, ductwork, grills, insulation, etc., in finished areas furnished and installed by the Contractor shall be painted. Finished areas include mechanical rooms, boiler rooms, and outside the building as well as occupied areas inside the building. Final painting is to be done by the General Contractor. This Contractor shall thoroughly clean all part of materials and equipment of cement, plaster, and other materials, and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all cracks and corners scraped out. Exposed metal work shall be carefully brushed down with steel brushes to remove rust and other spots and left smooth and clean.
- B This Contractor shall thoroughly clean the finish on all parts of the materials and equipment with factory applied finishes. Exposed parts in equipment rooms, above crawl space slabs, and all other spaces except sealed chases and attics shall be thoroughly cleaned of cement, plaster and other materials, and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all cracks and corners scraped out. If the finish has been damaged, the Contractor shall re-paint to the satisfaction of the Architect.
- C All canvas finishes shall be painted with one sizing coat if not already sized, containing a mildew resistant additive and Arabol adhesive prior to any other specified finish paint.
- D No nameplates on equipment shall be painted, and suitable protection shall be afforded to the plates to prevent their being rendered illegible during painting operation.

### 3.10 ELECTRICAL PROVISIONS OF MECHANICAL WORK

- A The extent of electrical provisions to be provided as mechanical work is indicated in other mechanical sections of the specifications, on the drawings and as further specified in this section.
- B Starters, Controllers: In general, mechanical work includes furnishing combination starters. Controllers are specifically included as electrical work when mounted in motor control centers. Electrical work includes installation, mounting and wiring of starters and controllers that are furnished as mechanical work. Free standing, large motor controllers shall be set in place, on pads, as mechanical work.
- C Electrical heating equipment shall be furnished complete with internal or integral fusing and subdivision of loads to comply with the NEC.
- D Wherever possible, match the elements of the electrical provisions of mechanical work with similar elements of the electrical work specified in electrical sections of the specifications.
- E Standards:
  - 1. For electrical equipment and products, comply with applicable NEMA standards, and refer to NEMA standards to definitions of terminology herein.
  - 2. Comply with National Electrical Code (NFPA No. 70) for installation requirements.
  - 3. Comply with National Electrical Contractors Association (NECA) "Standard of Installation".

### 3.11 TEMPORARY FACILITIES

- A Unless noted otherwise in the Supplementary General Conditions; provide temporary facilities.

### 3.12 EQUIPMENT INSTALLATION REQUIREMENTS

- A All mechanical equipment shall be furnished and installed complete and ready for use.
- B Others shall furnish certain kitchen, lab, or Owner process equipment. Contractor shall be responsible for furnishing and installing all items as required to make kitchen equipment complete operating systems. The Contractor shall furnish and install all auxiliary piping, valves, controls, control wiring, conduit, alarms, etc., required. All necessary devices, control wiring, conduit, etc., will not necessarily be shown on the drawings.

### 3.13 OWNER FURNISHED EQUIPMENT

- A The Contractor's responsibility shall include receiving and installing all Owner-furnished equipment.

**END OF SECTION**

**SECTION 230512**

**MECHANICAL AND ELECTRICAL COORDINATION**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Refer to Section 210010 - BASIC FIRE PROTECTION REQUIREMENTS.
- C Refer to Section 220010 - BASIC PLUMBING REQUIREMENTS.
- D Refer to Section 230010 - BASIC MECHANICAL REQUIREMENTS.

1.02 SUMMARY

- A This Section describes the coordination between the Fire Protection, Plumbing, Mechanical and Electrical portions of the work.
- B This Section is included under the Division 21 portion of the Specifications as Section 210512, under the Division 22 portion of the Specifications as Section 220512, under the Division 23 portion of the Specifications as Section 230512, and under the Division 26 portion of the Specifications as Section 260512.

1.03 WORK INCLUDED

- A Responsibility: Unless otherwise indicated, motors and controls shall be furnished, set in place and wired in accordance with the following schedule. **This schedule may include equipment and systems that are not required for this project. Only the equipment and systems that are required on the drawings and/or specified elsewhere will be required by this section:**

	ITEM	FURNISHED UNDER DIVISION	INSTALLED UNDER DIVISION	WIRED AND CONNECTED UNDER DIVISION
1.	Equipment Motors	21/22/23	21/22/23	26
2.	Magnetic Motor Starters			
	a. Automatically controlled, with or without HOA switches	21/22/23	26	Notes 1,3,5
	b. Automatically controlled, with or without HOA switches and furnished as part of factory wired equipment	21/22/23	22/23	Notes 1,3,5
	c. Manually controlled	21/22/23	26	Notes 1,3,5
	d. Manually controlled and furnished as part of factory wired equipment	21/22/23	26	Notes 1,3,5
	e. Furnished in Motor Control Centers	26	26	Notes 1,3,5
3.	Variable Speed (Frequency) AC Drives	22/23	26	Notes 1,4,5
4.	Line voltage thermostats, time clocks, etc., not connected to control panel systems	23	26	23
5.	Electric thermostats, time clocks, remote bulb thermostats, motorized valves, float controls, etc. which are an integral part or directly attached to ducts, pipes, etc.	22/23	22/23	22/23
6.	Temperature control panels and	23	23	23

	ITEM	FURNISHED UNDER DIVISION	INSTALLED UNDER DIVISION	WIRED AND CONNECTED UNDER DIVISION
	time switches mounted on temperature control panels			
7.	Motorized valves, motorized dampers, solenoid valves, EP and PE switches, etc.	23	23	Note 1
8.	Alarm bells furnished with equipment installed by Division 22 or 23	22/23	22/23	22/23
9.	Wiring to obtain power for control circuits, including circuit breaker	21/22/23	21/22/23	21/22/23
10.	Low voltage controls	21/22/23	21/22/23	21/22/23
11.	Fire protection system (sprinkler) controls	21	21	Note 8
12.	Fire and smoke detectors installed on mechanical units and in ductwork	28	23	Note 8
13.	All relays required for fan shutdown, motorized dampers, smoke control devices, and other items integral with HVAC equipment to provide operation and control of HVAC equipment	23	23	Note 1
14.	Smoke dampers, and combination fire/smoke dampers	23	23	Note 7
15.	Boiler and water heater controls, boiler burner controls panels	22/23	22/23	22/23
16.	Pushbutton stations, pilot lights	22/23	22/23	22/23
17.	Heat Tape	21/22/23	21/22/23	26
18.	Disconnect switches, manual operating switches furnished as a part of the equipment	21/22/23	21/22/23	Notes 1,5
19.	Disconnect switches, manual operating switches furnished separate from equipment	26	26	26
20.	Multispeed switches	23	23	26
21.	Thermal overloads	21/22/23	21/22/23	21/22/23
22.	Control relays, transformers	21/22/23	21/22/23	21/22/23
23.	Refrigeration cycle, cooling tower and controls	23	23	23
24.	Tamper switches for fire protection (sprinkler) system	21	21	28
25.	Flow and/or pressure switches for fire protection (sprinkler) system	21	21	28
26.	Fire and jockey pump controllers and automatic transfer switch	21	21	Note 6
27.	Alarm bells or horns for fire protection (sprinkler) system	21	21	28

	ITEM	FURNISHED UNDER DIVISION	INSTALLED UNDER DIVISION	WIRED AND CONNECTED UNDER DIVISION
28.	Generator (underground) fuel tank	22	22	--
29.	Generator fuel level indicator	22	22	26
30.	Generator fuel piping from tank to generator	22	22	--
31.	Underground fuel tank leak detection and monitoring system	22	22	22
NOTES:	(1)	Power wiring as defined in Section 262913 of the specifications shall be provided under Division 26; control wiring as defined in Section 262913 of the specifications shall be provided under Division 21/22/23.		
	(2)	Wiring from alarm contacts to alarm systems provided by Division 26, wiring from auxiliary contacts to air handling system controls provided by Division 23. Division 26 shall provide power to smoke detector. Smoke detectors required for all air handling systems 2000 CFM or greater. Refer to other Division 23 specifications, Division 26 and Drawings for more specific requirements.		
	(3)	For requirements for Magnetic Motor Starters, refer to Section 238965 - MOTOR CONTROLLERS.		
	(4)	For requirements for Variable Speed (Frequency) AC drives, refer to Section 238965 - MOTOR CONTROLLERS.		
	(5)	Disconnect switches, operating switches, starters and other similar items that are factory-mounted, as a part of complete assembly, shall comply with applicable provisions of the National Electric Code. All such disconnect switches shall be fused.		
	(6)	Power wiring from energy source to controllers and automatic transfer switch shall be provided under Division 26. Interconnection power and control wiring from controllers and automatic transfer switch to pumps shall be provided under Division 21, 22 or 23 and conforming to Division 26 specifications. Control wiring from automatic transfer switch to generator starter shall be provided under Division 26.		
	(7)	Division 26 will provide power to all smoke and combination fire/smoke dampers, and Division 28 will provide control for all such dampers using area smoke detectors.		
	(8)	Wiring for sprinkler system controls to be provided by Division 21. Wiring from devices to Fire Alarm System to be provided by Division 28.		

B CONNECTIONS: Make all connections to controls that are directly attached to ducts, piping and mechanical equipment with flexible connections.

C PRECEDENCE

1. In general, piping systems that require a stated grade for proper operation shall have precedence over other systems.
2. Precedence for pipe, conduit and duct systems shall be as follows.
  - a. Building lines
  - b. Structural members
  - c. Soil and drain piping
  - d. Vent piping
  - e. Condensate piping
  - f. Refrigerant piping
  - g. Supply ductwork



- h. Return ductwork
  - i. Exhaust ductwork
  - j. Chilled water and heating water piping
  - k. Automatic Fire Protection Sprinkler Piping
  - l. Domestic hot and cold water piping
  - m. Electrical conduit
3. Lighting Fixtures shall have precedence over air grilles and diffusers.
- D FINAL INSPECTION AND REPORT
1. At the completion of the work, there shall be a meeting of the Fire Protection, Plumbing, Mechanical, Electrical Fire Alarm and Temperature Control Contractors, representatives of mechanical and electrical equipment manufactures whose equipment was actually installed on the project, and similarly-involved individuals, who shall thoroughly inspect all systems, and who shall mutually agree that all equipment has been properly wired and installed, and that all temperature and safety controls are properly functioning. A written report of this meeting, listing those in attendance, and the companies that they represent, shall be filed with the Owner and Architect or Engineer.

**END OF SECTION**

**SECTION 230593**

**MECHANICAL TESTING, ADJUSTING AND BALANCING**

**PART 1 - GENERAL**

1.01 SUMMARY

- A Adjust and balance Mechanical Air systems
- B Check each piece of operating equipment provided under Division 23.
- C Provide Balancing Report

1.02 QUALITY ASSURANCE

- A Independent Subcontractor: All testing, adjusting and balancing shall be performed by a Testing, Adjusting and Balancing firm that is independent from the HVAC systems installer.
- B Balancing Work: Under direct supervision of AABC accredited testing organization certified supervisor.

1.03 REFERENCES

- A Reference Standards: Comply with AABC National Standards for Total System Balance, latest edition.

1.04 SUBMITTALS

- A Certificate: Before beginning work, submit certification of AABC certified supervisor and AABC firm certification in accordance with Section 230010.
- B Balancing Report: At completion of work, submit balancing report in accordance with Section 230010. After adjustments have been made submit three (3) copies of a complete detailed report on mechanical systems and their operation to include:
  - 1. Blackline prints with air openings marked to correspond with data sheets and with thermometer locations clearly marked.
  - 2. Data sheets showing amount of air handled at each opening, instrument used, velocity readings and manufacturer free area factors.
  - 3. Equipment data sheets giving make, size, etc., of fans, motors and drives. Include supply fans, exhaust and recirculating fans.
  - 4. Operating data including fan RPM, measured motor current and voltage BHP and CFM (total).
  - 5. Equipment and operating data at each section of the unit and at the unit connection points including air temperatures entering and leaving coils (maximum air temperature rise), together with corresponding air flow and air pressure drop, water temperatures entering and leaving coils and water pressure drop through coil.
  - 6. Equipment and operating data as required to show performance of H&V units, fan coils, cabinet heaters, unit heaters, temperature control devices, pumps and domestic hot water circulating systems.
  - 7. Static pressure loss across variable air volume boxes and associated reheat coils.
  - 8. Prime source refrigeration equipment operating data at design conditions including temperature measurements, flow conditions and corresponding power consumption.
  - 9. A statement outlining any abnormal or notable conditions not covered in above data. Make special note of any discrepancies between tabulated data and specified conditions.

1.05 PROJECT CONDITIONS

- A Existing Conditions: Verify following conditions before proceeding with work:
  - 1. Installation of the designated system is complete and in full operation.
  - 2. Outside temperature conditions, occupant loads, lighting loads, special equipment requiring extra sensible or ventilation requirements, and solar conditions are within a reasonable range relative to design conditions.

## **PART 2 - PRODUCTS**

### **2.01 INSTRUMENTS**

- A Calibration and maintenance of instruments shall be in accordance with manufacturer's standards and recommendations and requirements of AABC.
- B Calibration histories for each instrument shall be available for examination.

## **PART 3 - EXECUTION**

### **3.01 INSPECTION**

- A Inspect preceding work in accordance with Section 230010 BASIC MECHANICAL REQUIREMENTS.

### **3.02 PREPARATION**

- A Air Systems: Check:
  - 1. Filters are clean.
  - 2. Filter leakage.
  - 3. Damper operation and leakage.
  - 4. Duct leakage.
  - 5. Fan rotation.
  - 6. Equipment vibration.

### **3.03 ADJUSTING AND BALANCING**

- A General: Check, adjust and balance air and water system to meet the design performance and tabulate results on acceptable forms. Minimum data to include amperage, voltage input, and thermal heater capacity of each motor, equipment nameplate data and operating speed, pressure drop across each filter bank, pressure rise across each fan and pump, CFM capacity each outlet, zone and fan, and heating or cooling capacity of each coil or element.
- B Belt Drives: Adjust so that when the desired speed and belt tension had been established, the variable speed pulley and the belt tension adjustment shall be at approximately the midpoint of their range.
- C Air Systems:
  - 1. Adjust dampers, diffusers, VAV boxes, registers, and sheaves for the delivery and distribution of air quantities indicated on the drawings.
  - 2. Mark balancing device at final setting.
  - 3. Replacement of adjustable pulleys, installation of additional balancing dampers or pressure taps, required to effect proper air balance shall be furnished and installed by the HVAC Contractor at no additional cost to the Owner.
  - 4. Adjust exhaust and recirculation air systems for air quantities indicated on drawings and to establish the proper relationship between supply and exhaust.
  - 5. Adjust distribution system to obtain uniform space temperature free from objectionable drafts and noise within the capabilities of the system.
  - 6. Acceptable Tolerances: Adjust fan systems, air devices, etc. as follows:
    - a. Supply air fan CFM: -5% to +5% of scheduled
    - b. Return air fan CFM: -5% to +5% of scheduled
    - c. Exhaust air fan CFM: -0% to +10% of scheduled
    - d. Supply air device CFM: -10% to +10% of scheduled
    - e. Return air device CFM: -10% to +10% of scheduled
    - f. Exhaust air device CFM: -0% to +10% of scheduled
    - g. Outside air CFM: -0% to +10% of scheduled
- D Test Run: In order to determine that the system installation is complete and will operate satisfactorily, make a test run with equipment operating per normal temperature control schedule and sequence. Run test and operate and adjust equipment as may be required during test run.

### **3.04 COMPLETION SERVICES**

- A Final Check: Make final checks and do any rebalancing as directed.

- B Report: Submit Balancing Report as specified above.
- C Acceptance: Final acceptance of the project will not be made until a satisfactory report is received. Owner reserves the right to spot check the report by field verification prior to final acceptance.

**END OF SECTION**

## SECTION 230713

### HVAC DUCT INSULATION

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A Extent of mechanical insulation required by this section is indicated on Drawings and schedules, and by requirements of this section.
- B Types of mechanical insulation specified in this section include the following:
  - 1. Ductwork System Insulation:
    - a. Fiberglass.
    - b. Flexible Unicellular.
- C Refer to Section 230529 - MECHANICAL SUPPORTS AND ANCHORS for protection saddles, protection shields, and thermal hanger shields; not work of this section.
- D Refer to Section 233113 - METAL DUCTWORK for duct linings; not work of this section.
- E Refer to Section 230553 - MECHANICAL IDENTIFICATION for installation of identification devices for piping, ductwork, and equipment; not work of this section.

##### 1.02 QUALITY ASSURANCE

- A Manufacturer's Qualifications: Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B Installer's Qualifications: Firm with at least 5 years successful installation experience on projects with mechanical insulations similar to that required for this project.
- C Flame/Smoke Ratings: Provide composite mechanical (insulating material, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.

##### 1.03 SUBMITTALS

- A Product Data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, k-value, thickness, and furnished accessories for each mechanical system requiring insulation.

##### 1.04 DELIVERY, STORAGE AND HANDLING

- A Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard indexes of products.
- B Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site.

#### PART 2 - PRODUCTS

##### 2.01 ACCEPTABLE MANUFACTURERS

- A Manufacturer: Subject to compliance with requirements, provide products of one of the following:
  - 1. Manson.
  - 2. Knauf Fiber Glass.
  - 3. Johns Manville Products Corp.
  - 4. Owens-Corning Fiberglass Corp.
  - 5. Morgan Thermal Ceramics.
  - 6. UNIFRAX.
  - 7. Vesuvins USA
  - 8. 3M

##### 2.02 DUCTWORK INSULATION MATERIALS

- A Flexible Fiberglass Ductwork Insulation: ASTM C 553, Type I, Class B-4.

- B Flexible Unicellular Ductwork Insulation: ASTM C 534, Type II.
- C Jackets for Ductwork Insulation: ASTM C 921, Type I (vapor barrier) for ductwork with temperatures below ambient; Type II for ductwork with temperatures above ambient.
  - 1. Encase exterior ductwork insulation with aluminum jacket with weatherproof construction, as specified.
- D Ductwork Insulation Accessories: Provide staples, bands, wires, tape, anchors, corner angles and similar accessories as recommended by insulation manufacturer for applications indicated.
- E Ductwork Insulation Compounds: Provide cements, adhesives, coatings, sealers, protective finishes and similar compounds as recommended by insulation manufacturer for applications indicated.

### **PART 3 - EXECUTION**

#### **3.01 INSPECTION**

- A Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- B Thickness of insulation shall be as recommended by the manufacturer for the temperatures and pipe sizes involved, and in accordance with standards of T.I.M.A.

#### **3.02 DUCTWORK SYSTEM INSULATION**

- A Insulation Omitted: Do not insulate fibrous glass ductwork or lined ductwork.
- B Dual Temperature Ductwork:
  - 1. Application Requirements: Insulate the following dual temperature ductwork:
    - a. Hot/cold supply and return ductwork between fan discharge or HVAC unit discharge and room terminal outlets; except omit insulation on return air ductwork located in return air ceiling plenums.
  - 2. Insulate each ductwork system specified above with one of the following types and thicknesses of insulation:
    - a. Flexible Fiberglass: 2 in. thick, application limited to concealed locations. Flexible insulation will not be used in machine, fan and equipment rooms.

#### **3.03 INSTALLATION OF DUCTWORK INSULATION**

- A General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
- B Install insulation materials with smooth and even surfaces.
- C Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- D Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage.
- E Extend ductwork insulation without interruption through walls, floors and similar ductwork penetrations, except where otherwise indicated.
- F Lined Ductwork: Except as otherwise indicated, omit insulation on ductwork where internal insulation or sound absorbing linings have been installed.
- G Corner Angles: Except for oven and hood exhaust duct insulation; install corner angles on external corners of insulation on ductwork in exposed finished spaces before covering with jacketing.

#### **3.04 EXISTING INSULATION REPAIR**

- A Repair damaged sections of existing mechanical insulation, both previously damaged or damaged during this construction period. Use insulation of same thickness as existing insulation, install new jacket lapping and sealed over existing.

#### **3.05 PROTECTION AND REPLACEMENT**

- A Replace damaged insulation that cannot be repaired satisfactorily, including units with vapor barrier damage and moisture-saturated units.
- B Protection: Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

**END OF SECTION**

**SECTION 233113.19**

**DUCTWORK ACCESSORIES**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A Extent of ductwork accessories work is indicated on drawings and in schedules, and by requirements of this section.
- B Types of ductwork accessories required for project include the following:
  - 1. Dampers.
    - a. Low-pressure manual dampers.
  - 2. Duct hardware.
  - 3. Duct access doors.
  - 4. Flexible connections.
  - 5. Concealed Damper Regulators.
- C Refer to other Division 23 sections for testing, adjusting, and balancing of ductwork accessories; not work of this section.

**1.02 QUALITY ASSURANCE**

- A Manufacturer's Qualifications: Firms regularly engaged in manufacture of ductwork accessories, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B Codes and Standards:
  - 1. SMACNA Compliance: Comply with applicable portions of SMACNA "HVAC Duct Construction Standards, Metal and Flexible," 2005 edition.
  - 2. Industry Standards: Comply with latest ASHRAE recommendations pertaining to construction of ductwork accessories, except as otherwise indicated.
  - 3. UL Compliance: Construct, test, and label fire dampers in accordance with UL Standard 555 "Fire Dampers and Ceiling Dampers."
  - 4. NFPA Compliance: Comply with applicable provisions of NFPA 90A latest edition "Installation of Air Conditioning and Ventilating Systems", pertaining to installation of ductwork accessories.

**1.03 SUBMITTALS**

- A Product Data: Submit manufacturer's technical product data for each type of ductwork accessory, including dimensions, capacities, and materials of construction; and installation instructions.

**PART 2 - PRODUCTS**

**2.01 DAMPERS**

- A Low Pressure Manual Dampers: Provide dampers of single blade type or multi blade type, constructed in accordance with SMACNA "HVAC Duct Construction Standards."
- B Manufacturer: Subject to compliance with requirements, provide dampers of one of the following:
  - 1. Air Balance, Inc.
  - 2. Nailor
  - 3. American Warming & Ventilating, Inc.
  - 4. Louvers & Dampers, Inc.
  - 5. Penn Ventilator Co.
  - 6. Ruskin Mfg. Co.
  - 7. Pottorff

**2.02 DUCT HARDWARE**

- A General: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:
  - 1. Test Holes: Provide in ductwork at fan inlet and outlet, and elsewhere as indicated, duct test holes, consisting of slot and cover, for instrument tests.

2. Quadrant Locks: Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12 in. Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork.

B Manufacturer: Subject to compliance with requirements, provide duct hardware of one of the following:

1. Ventfabrics, Inc.
2. Young Regulator Co.

### 2.03 DUCT ACCESS DOORS

A General: Provide where indicated, duct access doors of size indicated.

B Construction: Construct of same or greater gauge as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one side hinged, other side with one handle-type latch for doors 12 in. high and smaller, 2 handle-type latches for larger doors.

C As an option, clamping type access doors may be installed.

D Manufacturer: Subject to compliance with requirements, provide duct access doors of one of the following:

1. Air Balance Inc.
2. Ductmate Industries, Inc.
3. Duro Dyne Corp.
4. Register & Grille Mfg. Co., Inc.
5. Ruskin Mfg. Co.
6. Ventfabrics, Inc.
7. Zurn Industries, Inc; Air Systems Div.

### 2.04 FLEXIBLE CONNECTIONS

A General: Provide flexible duct connections wherever ductwork connects to vibrating equipment. Construct flexible connections of neoprene coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.

B Manufacturer: Subject to compliance with requirements, provide flexible connections of one of the following:

1. American/Elgen Co.,; Energy Div.
2. Ductmate Industries
3. Duro Dyne Corp.
4. Flexaust (The) Co.
5. Ventfabrics, Inc.

### 2.05 CONCEALED DAMPER REGULATORS: FOR VOLUME DAMPERS LOCATED ABOVE GYP BOARD, PLASTER OR OTHER HARD CEILINGS:

A Concealed damper regulators shall be designed to control volume dampers from the ceiling line. Regulators shall be imbedded so the entire unit is flush with the finished surface. The regulator cover plate shall cover the joint between the box and the ceiling. The cover shall be adjustable from 1/2 in. to 1-1/8 in. utilizing the manufacturer's spanner wrench. Coverplate to have zinc plated finish, suitable for painting. Concealed damper regulators to be Young Regulator Model 315.

B Volume dampers for concealed damper regulators shall be Young Regulator Model 5020-B (round) or Model 820A-C (rectangular), designed and installed for operation by ceiling mounted regulators.

C Where required, provide Young Regulator Model 927 Right Angle Miter Gears, or Model 1200 Right Angle Worm Gear Regulator, to allow control of a damper that has the damper shaft perpendicular to the shaft from the ceiling mounted damper regulator.

## PART 3 - EXECUTION

### 3.01 INSPECTION

A Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.



### 3.02 INSTALLATION OF DUCTWORK ACCESSORIES

- A Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.
- B Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter.
- C Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

### 3.03 FIELD QUALITY CONTROL

- A Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leak proof performance.

### 3.04 ADJUSTING AND CLEANING

- A Adjusting: Adjust ductwork accessories for proper settings, install fusible links in fire dampers and adjust for proper action.
  - 1. Final positioning of manual dampers is specified in Division 23 Section "MECHANICAL TESTING, ADJUSTING AND BALANCING".
- B Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

### 3.05 EXTRA STOCK

- A Furnish extra fusible links to Owner, one link for every 10 installed of each temperature range; obtain receipt.

**END OF SECTION**

**SECTION 233113**

**METAL DUCTWORK**

**PART 1 - GENERAL**

1.01 SUMMARY

- A Extent of metal ductwork is indicated on drawings and in schedules, and by requirements of this section.
- B All duct dimensions shown on drawings are net inside clear dimensions.

1.02 QUALITY ASSURANCE

- A Manufacturer's Qualifications: Firms regularly engaged in manufacture of metal ductwork products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with metal ductwork systems similar to that required for project.
- C Codes and Standards:
  - 1. SMACNA Standards: Comply with SMACNA's "HVAC Duct Construction Standards, Metal and Flexible", First Edition, 2005, for fabrication and installation of metal ductwork.
  - 2. ASHRAE Standards: Comply with ASHRAE Handbook latest edition, HVAC Systems and Equipment volume, Chapter 16 "Duct Construction", for fabrication and installation of metal ductwork.
  - 3. NFPA Compliance: Comply with latest editions of NFPA 90A "Installation of Air Conditioning and Ventilating Systems" and NFPA 90B "Installation of Warm Air Heating and Air Conditioning Systems".
- D Field Reference Manual: Have available for reference at project field office, copy of SMACNA "HVAC Duct Construction Standards, Metal and Flexible".
- E Flame/Smoke Ratings: Provide composite mechanical system (insulating material, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.

1.03 SUBMITTALS

- A Product Data: Submit manufacturer's technical product data and installation instructions for metal ductwork materials and products.
- B Shop Drawings: Submit scaled layout drawings of metal ductwork and fittings including, but not limited to, duct sizes, locations, elevations, and slopes of horizontal runs, wall and floor penetrations, and connections. Show interface and spatial relationship between ductwork and proximate equipment. Show modifications of indicated requirements, made to conform to local shop practice, and how those modifications ensure that free area, materials and rigidity are not reduced.
- C Record Drawings: At project closeout, submit record drawings of installed metal ductwork and ductwork products, in accordance with requirements of Division 01.

1.04 DELIVERY, STORAGE, AND HANDLING

- A Protection: Protect shop fabricated and factory fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling. Prevent end damage and prevent dirt and moisture from entering ducts and fittings.
- B Storage: Where possible, store ductwork inside and protect from weather. Where necessary to store outside, store above grade and enclose with waterproof wrapping.

**PART 2 - PRODUCTS**

2.01 DUCTWORK MATERIALS

- A Sheet Metal: All interior ducts shall be constructed with G-60 or better galvanized steel (ASTM A 653/A 653M) LFQ, chem treat. Exterior ductwork or duct exposed to high humidity conditions (i.e. moisture laden exhausts not specified to be stainless steel) shall be G-90 or better galvanized steel LFQ, chem treat.
- B Aluminum Sheet: Where indicated, provide aluminum sheet complying with ASTM B209, Alloy 3003, Temper H14.

## 2.02 MISCELLANEOUS DUCTWORK MATERIALS

- A General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.
- B Fittings: Provide radius type fittings fabricated of multiple sections with maximum 15° change of direction per section. Unless specifically detailed otherwise, use 45° laterals and 45° elbows for branch takeoff connections. Where 90° branches are indicated, provide conical type tees.
- C Duct Sealant:
  - 1. Duct sealer shall be flexible, water-based, adhesive sealant designed for use in all pressure duct systems. After curing, it shall be resistant to ultraviolet light and shall seal out water, air, and moisture. Sealer shall be UL listed and conform to ASTM E 84.
  - 2. Comply with requirements of SMACNA Table 1-2.
  - 3. Manufacturers:
    - a. Benjamin-Foster
    - b. Ductmate - PROseal.
    - c. Duro Dyne S2.
    - d. Hardcast.
    - e. United Sheet Metal.
- D Duct Cement:
  - 1. Non-hardening, non-migrating mastic or liquid elastic sealant of type applicable for fabrication/installation detail as compounded and recommended by manufacturer specifically for cementing fitting components, or longitudinal seams in ductwork.
  - 2. Comply with requirements of SMACNA Table 1-2.
  - 3. Manufacturers:
    - a. Benjamin-Foster.
    - b. Duro Dyne S2.
    - c. Hardcast.
    - d. United Sheet Metal.
- E Ductwork Support Materials:
  - 1. General:
    - a. Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.
    - b. Comply with applicable provisions of SMACNA 2005 Standards, Figures 4-1 through 4-8, and Tables 4-1 through 4-3.
  - 2. Except where space is indicated as "High Humidity" area, interior support materials of not less than 1/4 in. diameter or 3/16 in. thickness may be plain (not galvanized).
  - 3. For exposed stainless steel ductwork, provide matching stainless steel support materials. For copper ductwork, provide copper, bronze or brass support materials.
  - 4. For aluminum ductwork, provide aluminum support materials except where materials are electrolytically separated from ductwork.

## 2.03 FLEXIBLE DUCTS

- A General:
  - 1. Spiral wound spring steel with flameproof metallized polyester sheathing, complying with UL181.
  - 2. Comply with applicable provisions of SMACNA 2005 Standards, pages 3-13 through 3-20.
  - 3. Installation shall conform to conditions under which UL listing was granted.
  - 4. Flexible Ductwork runouts shall be limited to 6' - 0" extended length.
- B Insulation:
  - 1. Insulate all flexible ducts, both supply and return, with a minimum R-Value of 6.0, per International Energy Conservation Code – latest edition. Duct shall have a continuous flexible fiberglass sheath with UL approved metallized polyester barrier jacket.
- C Flexible Ductwork shall be equal to ATCO #036
- D Manufacturers: Subject to compliance with requirements, provide flexible ducts manufactured by one of the following:
  - 1. ATCO.

2. Thermaflex.
3. Quietflex.

#### 2.04 FABRICATION

- A Shop-fabricate ductwork in 4,8,10, or 12 ft. lengths, unless otherwise indicated or required to complete runs. Preassemble work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match mark sections for reassembly and coordinated installation.
- B All duct dimensions shown on drawings are net inside clear dimensions.
- C Shop-fabricate ductwork of gauges and reinforcement complying with SMACNA 2005 Standards as follows:
1. Rectangular, Steel:
    - a. Tables 1-1 through 1-13.
    - b. Figures 1-2 through 1-18.
    - c. Fittings and Construction, Section II.
  2. Rectangular, aluminum: Pages 1-31 through 1-33.
  3. Round, Oval and Flexible Duct: Section III.
- D Shop fabricate ductwork of gauges and reinforcement complying with ASHRAE Handbook, HVAC Systems and Equipment Volume, Chapter 16 "Duct Construction".
- E Longitudinal Seams: Pittsburgh lock shall be used on all longitudinal seams. All longitudinal seams will be sealed with mastic sealant. Snaplock is not acceptable.
- F Ductmate or W.D.C.I. proprietary duct connection systems will be acceptable. Duct constructed using these systems will refer to the manufacturers guidelines for sheet gauge, intermediate reinforcement size and spacing, and joint reinforcements.
- G Formed on flanges (T.D.C./T.D.F./T-25A/T-25B) will only be acceptable when submitted for approval prior to installation of any ductwork. Formed on flanges will be constructed as SMACNA T-25 flanges, whose limits are defined on Page 1.36 of the 2005 SMACNA Manual, First Edition. No other construction pertaining to form on flanges will be acceptable. Formed on flanges shall be acceptable for use on ductwork 42 in. wide or less, with 2 in. positive pressure static or less, and must include the use of corners, bolts and cleat.
- H Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center line radius equal to associated duct width; and fabricate to include turning vanes in elbows where shorter radius is necessary. Limit angular tapers to 30° for contracting tapers and 20° for expanding tapers.
- I Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Refer to Division 23 Section "Ductwork Accessories" for accessory requirements.
- J Fabricate ductwork with duct liner in each section of duct where indicated. Laminate liner to internal surfaces of duct in accordance with instructions by manufacturers of lining and adhesive, and fasten with mechanical fasteners. Comply with previous paragraph 2.2.
- K Round Duct Joints:
1. 0 in. - 20 in. diameter, interior slip coupling beaded at center, fastened to duct with sealing compound applied continuously around joint before assembling and after fastening. Wrap joints with 3 in. wide duct tape.
  2. 21 in. - 72 in. diameter, use 3 piece, gasketed, flanged joints consisting of 2 internal flanges (with integral mastic sealant) split to accommodate minor differences in duct diameter, and one external closure band designed to compress gasketing between internal flanges. Example: Ductmate Spiralmate or equal.
  3. 73 in. diameter and up, use companion angle flanged joints only as defined on page 3-6 of the SMACNA Manual. Refer to manual for proper sizing and construction details. Ductwall to be welded longitudinal seams.
- L Pressure Classifications:
1. Static pressure ratings for ductwork systems shall be as noted on the drawings, and/or shall conform to requirements of 2005 SMACNA Standards, Table 1-1.
  2. In no case shall the pressure rating of the duct be less than that indicated in Table 1-1 for the apparent duct velocity.
  3. Gauges of metal and reinforcing methods shall conform to SMACNA requirements as follows:
    - a. Rectangular Steel: Table 1-3 through 1-13.
    - b. Rectangular Aluminum: Tables 1-14 through 1-16.
    - c. Round, or Flat Oval, Steel: Table 3-2.

d. Round Aluminum: Table 3-3.

2.05 FACTORY-FABRICATED DUCTWORK

- A At Contractor's option, factory-fabricated ductwork sections, fittings, etc., may be substituted for shop-made items.
- B Factory-fabricated items shall comply in every respect with SMACNA requirements listed previously in this Section, or show proof from a recognized, approved independent laboratory, prior to bidding, that the proposed construction methods produce products that equal, or exceed, the SMACNA 2005 Standards.
- C Comply with applicable provisions of Fort Worth Mechanical Code.
- D Manufacturers: Subject to compliance with requirements, provide factory-fabricated ductwork and/or fittings of one of the following:
  - 1. Ductmate, Inc., Monongahela, PA.
  - 2. Semco Mfg., Inc.
  - 3. United Sheet Metal Div., United McGill, Inc.

**PART 3 - EXECUTION**

3.01 INSPECTION

- A General: Examine areas and conditions under which metal ductwork is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 INSTALLATION OF METAL DUCTWORK

- A General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air tight (5% leakage for systems rated 3 in. and under; 1% for systems rated over 3 in.) and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately at connections, within 1/8 in. misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type that will hold ducts true to shape and to prevent buckling. Support vertical ducts at every floor. Seal all longitudinal and transverse duct joints and seams with non-hardening duct mastic.
- B Inserts: Install concrete inserts for support of ductwork in coordination with formwork, as required to avoid delays in work.
- C Field Fabrication: Complete fabrication of work at project as necessary to match shop fabricated work and accommodates installation requirements.
- D Routing: Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct useable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Where possible, locate insulated ductwork for 1 in. clearance outside of insulation. Limit clearance to 1/2 in. where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with structural members, suspended ceiling, lighting layouts, sprinkler piping, plumbing systems and similar finished work.
- E Electrical Equipment Spaces: Do not route ductwork through Electric Rooms, transformer vaults, and other electrical equipment spaces and enclosures.
- F Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gauge as duct. Overlap opening on 4 sides by at least 1-1/2 in. Fasten to duct and substrate.
  - 1. Where ducts pass through fire rated floors, walls, or partitions, provide fire stopping between duct and substrate, in accordance with requirements of Division 07 Section "FIRE STOPPING".
- G Coordination: Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.
- H Installation: Install metal ductwork in accordance with SMACNA HVAC Duct Construction Standards.

3.03 INSTALLATION OF FLEXIBLE DUCTS

- A Maximum Length: For any duct run using flexible ductwork, do not exceed 6 ft. 0 in. extended length.

- B Installation: Install in accordance with Section III of SMACNA's, HVAC Duct Construction Standards, Metal and Flexible".

#### 3.04 FIELD QUALITY CONTROL

- A Leakage Tests: After installation of each duct system that is constructed for duct classes over 3 in. is completed, test for duct leakage. Repair leaks and repeat tests until total leakage is less than 1% of system design airflow.
- B The testing shall be performed as follows:
  1. Perform testing in accordance with HVAC Air Duct Leakage Test Manual.
  2. Use a certified orifice tube for measuring the leakage.
  3. Define section of system to be tested and blank off.
  4. Determine the percentage of the system being tested.
  5. Using that percentage, determine the allowable leakage (CFM) for that section being tested.
  6. Pressurize to operating pressure and repair any significant or audible leaks.
  7. Re-pressurize and measure leakage.
  8. Repeat steps 6 and 7 until the leakage measured is less than the allowable defined in step 5.

#### 3.05 EQUIPMENT CONNECTIONS

- A General: Connect metal ductwork to equipment as indicated; provide flexible connection for each ductwork connection to equipment mounted on vibration isolators, and/or equipment containing rotating machinery. Provide access doors as indicated.

#### 3.06 ADJUSTING AND CLEANING

- A Clean ductwork internally, unit by unit as it is installed, of dust and debris. Clean external surfaces of foreign substances that might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.
- B Strip protective paper from stainless ductwork surfaces, and repair finish wherever it has been damaged.
- C Temporary Closure: At ends of ducts that are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering that will prevent entrance of dust and debris until time connections are to be completed.
- D Balancing: Refer to Division 23 Section "TESTING, ADJUSTING AND BALANCING" for air distribution balancing of metal ductwork; not work of this section. Seal any leaks in ductwork that become apparent in balancing process.

**END OF SECTION**

## SECTION 233713

### AIR OUTLETS AND INLETS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A Extent of air outlets and inlets work is indicated by Drawings and schedules, and by requirements of this section.
- B Types of air outlets and inlets required for project include the following:
  - 1. Ceiling return air grilles.
  - 2. Ceiling air diffusers.

##### 1.02 QUALITY ASSURANCE

- A Manufacturer's Qualifications: Firms regularly engaged in manufacture of air outlets and inlets of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B Codes and Standards:
  - 1. ARI Compliance: Test and rate air outlets and inlets in accordance with ARI 650 "Standard for Air Outlets and Inlets".
  - 2. ASHRAE Compliance: Test and rate air outlets and inlets in accordance with ASHRAE 70 "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets", latest edition.
  - 3. ADC Compliance: Test and rate air outlets and inlets in certified laboratories under requirements of ADC 1062 "Certification, Rating and Test Manual".
  - 4. ADC Seal: Provide air outlets and inlets bearing ADC Certified Rating Seal.
  - 5. AMCA Compliance: Test and rate louvers in accordance with AMCA 500 "Test Method for Louvers, Dampers and Shutters".
  - 6. AMCA Seal: Provide louvers bearing AMCA Certified Rating Seal.
  - 7. NFPA Compliance: Install air outlets and inlets in accordance with NFPA 90A "Installation of Air Conditioning and Ventilating Systems" latest edition.

##### 1.03 SUBMITTALS

- A Product Data: Submit manufacturer's technical product data for air outlets and inlets including the following:
  - 1. Schedule of air outlets and inlets indicating drawing designation, room location, number furnished, model number, size, and accessories furnished.
  - 2. Data sheet for each type of air outlet and inlet, and accessory furnished; indicating construction, finish, and mounting details.
  - 3. Performance data for each type of air outlet and inlet furnished, including aspiration ability, temperature and velocity traverses, throw and drop, and noise criteria ratings. Indicate selections on data.

##### 1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A Deliver air outlets and inlets wrapped in factory-fabricated fiber-board type containers. Identify on outside of container type of outlet or inlet and location to be installed. Avoid crushing or bending and prevent dirt and debris from entering and settling in devices.
- B Store air outlets and inlets in original cartons and protect from weather and construction work traffic. Where possible, store indoors; when necessary to store outdoors, store above grade and enclose with waterproof wrapping.

#### PART 2 - PRODUCTS

##### 2.01 CEILING AIR DIFFUSERS

- A General: Except as otherwise indicated, provide manufacturer's standard ceiling air diffusers where shown; of size, shape, capacity and type indicated; constructed of aluminum or steel, and as required for complete installation.
- B Performance: Provide ceiling air diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.

- C Ceiling Compatibility: Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction Drawings and specifications for types of ceiling systems that will contain each type of ceiling air diffuser. All air devices installed in plaster, gyp board or other hard ceilings or walls shall be provided with a separate mounting frame.
- D Types: Provide ceiling diffusers of type, capacity, and with accessories and finishes as listed on the air device schedule.
- E Diffuser Finishes:
  - 1. Finish shall be off-white baked enamel.
  - 2. Color selection shall be from manufacturer's standard color chips, unless otherwise noted.
- F Manufacturer: Subject to compliance with requirements, provide diffusers of one of the following:
  - 1. Metalaire,
  - 2. Krueger,
  - 3. Nailor,
  - 4. Price,
  - 5. Titus,
  - 6. No Substitutions.

## 2.02 CEILING GRILLE

- A General: Except as otherwise indicated, provide manufacturer's standard grilles where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B Performance: Provide grilles that have, as minimum, noise criteria ratings for each size device as listed in manufacturer's current data.
- C Ceiling Compatibility: Provide grilles with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling construction with accurate fit and adequate support. Refer to general construction Drawings and specifications for types of ceiling construction that will contain each type of ceiling grille.
- D Types: Provide ceiling grilles of type and with accessories as listed on the air device schedule.
- E Grille Finishes:
  - 1. Finish shall be off-white baked enamel.
  - 2. Color selection shall be from manufacturer's standard color chips, unless otherwise noted.
- F Manufacturer: Subject to compliance with requirements, provide grilles of one of the following:
  - 1. Metalaire,
  - 2. Krueger,
  - 3. Nailor,
  - 4. Price,
  - 5. Titus,
  - 6. No Substitutions.

## 2.03 OPPOSED BLADE DAMPER

- A Provide opposed blade dampers for all air devices unless where otherwise indicated on the plans.
- B Square damper frames shall be heavy duty extruded aluminum and interlocked to prevent corner separation. The blades shall be heavy gauge extruded aluminum, webbed to prevent bowing in large sizes and tapered to ensure tight closure. Blades shall be assembled on 1 in. centers and pivot on nylon bushings to ensure jam-free operation. Square neck opposed blade dampers shall be Metalaire Model D7 or approved equal.
- C Radial opposed blade dampers shall provide full radial volume control and manufactured of corrosion resistant aluminum material. Radial dampers shall provide durable, jam-free operation for the life of the air handling system. Radial dampers shall have overlapping blade design that insures positive shut-off when required. Radial damper operator shall be accessible through an opening located in the diffuser center cone. Radial opposed blade damper shall be Metalaire Model D3 or approved equal.
- D Radial slide dampers are not acceptable.



### **PART 3 - EXECUTION**

#### **3.01 INSPECTION**

- A Examine areas and conditions under which air outlets and inlets are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

#### **3.02 INSTALLATION**

- A General: Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended functions.
- B Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.
- C Locate ceiling air diffusers, registers, and grilles, as indicated on general construction "Reflected Ceiling Plans". Unless otherwise indicated, locate units in center of acoustical ceiling modules.

#### **3.03 SPARE PARTS**

- A Furnish to Owner, with receipt, 3 operating keys for each type of air outlet and inlet that require them.

**END OF SECTION**

**SECTION 238965**

**MOTOR CONTROLLERS**

**PART 1 - GENERAL**

1.01 SUMMARY

- A Manufacturer's Data: Submit manufacturer's data and installation instructions on motor controllers.

1.02 QUALITY ASSURANCE

- A Comply with applicable requirements of NEC as applicable to installation, and construction of motor controllers.
- B Comply with applicable requirements of NFPA 70E, "Electrical Safety Requirements for Employee Workplaces," latest edition.
- C Comply with applicable requirements of UL 486A and B, and UL 508, pertaining to installation of motor controllers. Provide controllers and components that are UL-listed and labeled.
- D Comply with applicable requirements of NEMA Standards ICS 2, "Industrial Control Devices, Controllers and Assemblies", and Pub. No. 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)", pertaining to motor controllers and enclosures.

**PART 2 - PRODUCTS**

2.01 MANUFACTURERS

- A Manufacturers: Subject to compliance with requirements, provide motor controllers of one of the following (for each type and rating of motor controller):
  - 1. Allen-Bradley Co.
  - 2. Cerus Industrial.
  - 3. Cutler Hammer Products, Eaton Corp.
  - 4. General Electric Co.
  - 5. Square D Co.
  - 6. Danfoss-Graham.
  - 7. Reliance.
  - 8. Cutler-Hammer
- B Manufacturers: Subject to compliance with requirements, provide variable speed (frequency) drives of one of the following:
  - 1. ABB.
  - 2. Yaskawa.

2.02 MOTOR CONTROLLERS

- A Except as otherwise indicated, provide motor controllers and ancillary components which comply with manufacturer's standard materials, design and construction in accordance with published information, and as required for a complete installation.
- B Fractional HP Manual Controllers: Provide single-phase fractional HP manual motor controllers, of sizes and ratings required to operate the motors shown on the contract documents. Equip with manually operated quick-make, quick-break toggle mechanisms; and with one-piece melting alloy type thermal units. Controller to become inoperative when thermal unit is removed. Provide controllers with double break silver alloy contacts, visible from both sides of controller; green pilot lights, and switch capable of being padlocked OFF. Enclose controller unit in NEMA Type 1 general-purpose enclosure suitable for flush mounting; coat with manufacturer's standard color finish for indoor installation. Enclose controller unit in weatherproof general-purpose enclosure coated with manufacturer's standard color finish for outdoor installation and where device is exposed to moisture.
- C Magnetic Starter, Across-The-Line:
  - 1. Motor starters shall be across-the-line magnetic type rated in accordance with NEMA Standards, sizes and horsepower ratings as required for the motor controlled. Starters shall be mounted in general-purpose enclosures unless otherwise indicated on plans.

2. Across-the-line magnetic starters through NEMA size seven shall be equipped with double break silver alloy contacts. Single break contacts shall be supplied on size eight starters. All contacts shall be replaceable without removing power wiring or removing starter from panel. The starter shall have straight-through wiring.
  3. Coils shall be of molded construction through NEMA size seven. Coils on size eight starters shall be form wound, taped, varnished and baked. All coils shall be replaceable from the front without removing the starter from the panel.
  4. Overload relays shall be the melting alloy type with a replaceable control circuit module. Thermal units shall be of one-piece construction and interchangeable. The starter shall be inoperative if the thermal unit is removed. Provide overload heaters to protect the motor to be controlled.
  5. Provide one spare normally-open contact and one spare normally-closed contact in each NEMA size 0 through size 7 starters.
  6. Magnetic starters with "Hand-Off-Auto" selector switch and Form C contact, as manufactured by Square D, or acceptable substitute, three-pole, three-phase of NEMA size applicable with three melting alloy overload relays and three-position H-O-A switch in cover of general purpose enclosure.
  7. Provide starters of the proper NEMA size to control each motor. Do not provide starters smaller than NEMA size 0.
  8. Provide starters with low voltage transformers.
- D Variable Speed (Frequency) Drives:
1. Each variable speed drive shall convert 3 phase, 60-hertz utility power to variable voltage and frequency, 3 phase, AC power for stepless motor control from 10% to 110% of base speed. The variable speed drive shall be a variable voltage or current source type with a six-step output utilizing power and semiconductors. The variable speed drive, together with all options and modifications, shall install within a standard NEMA I enclosure suitable for continuous operation at a maximum ambient temperature of 40°C. All high voltage components within the enclosure shall be isolated with steel covers. Circuits shall provide DV/DT and DI/DT protection for semi-conductors. Protective circuits shall cause instantaneous trip should any of the following faults occur:
    - a. 110% of controller maximum sine wave current rating is exceeded.
    - b. Output phase-to-phase short circuit condition.
    - c. High input line voltage.
    - d. Low input line voltage.
    - e. Loss of input phase.
    - f. External Fault: This protective circuit shall permit, by means of the terminal strip, wiring of remote normally closed safety contacts such as high static, fire stat, etc., to shut down the device.
  2. The following adjustments shall be available to the controllers:
    - a. Maximum frequency (55 to 60 Hz).
    - b. Minimum frequency (6 to 35 Hz).
    - c. Acceleration (2 to 20 seconds).
    - d. Deceleration (2 to 20 seconds).
    - e. Volts/Hertz ratio.
    - f. Voltage offset or boost.
    - g. Current limit (50% to 110% sine wave current rating).
  3. The variable speed drive shall be furnished with door mounted operator controls consisting of auto/manual switch, start/stop (reset) switch and manual speed control. In automatic mode, the controller shall follow an external signal and respond to remote start/stop contact wired to terminal strip. While in the auto mode, the controller shall automatically restart after the power outage.
  4. Input disconnect shall provide a positive disconnect between the controller and all phases of the incoming AC line. This disconnect shall be designed to mount inside the controller enclosure and include a mounting bracket and through-the-door interlocking handle with provisions for pad locking. The basic switch shall be magnet only molded case breaker.
  5. Manual contactor bypass with fused disconnect switch to allow the motor to run across the line in the event of VFD shutdown. Includes drive output contactor, full voltage starter with input disconnect switch with motor overload protection. Bypass shall be separated from the VFD by a metal barrier.
  6. Motor overload shall contain a thermal overload relay designed to protect one AC motor operated on variable speed drive output from extended overload operation.

7. The variable speed drive shall follow in manual mode a set point frequency from a speed potentiometer. In automatic mode, the variable speed drive shall receive and follow a DC voltage signal from the microprocessor controller for full range operation.
8. Provide plug-in tester to provide a quick means for monitoring the different signals within the variable speed drive for startup and troubleshooting.

### **PART 3 - EXECUTION**

#### **3.01 COORDINATION WITH DIVISION 26**

- A Portions of the work will be provided under Division 26. Refer to Section 230512 for coordination of the work with Division 26.

#### **3.02 EXAMINATION**

- A Examine areas and conditions under which motor controllers are to be installed, and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

#### **3.03 INSTALLATION OF MOTOR CONTROLLERS**

- A Install motor controllers for each motor, in accordance with equipment manufacturer's written instructions and with recognized industry practices; complying with applicable requirements of NEC, UL and NEMA standards, to insure that products fulfill requirements.
- B Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and B, and the National Electrical Code.

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

- A Prior to energization of motor controller equipment, check with ground resistance tester, phase-to-phase and phase-to-ground insulation resistance levels to insure requirements are fulfilled.
- B Prior to energization, check circuitry for electrical continuity, and for short-circuits.
- C Ensure that direction of rotation of each motor fulfills requirements.
- D Ensure that motor overloads are properly sized and installed.

#### **3.05 GROUNDING**

- A Provide equipment-grounding connections for motor controller equipment as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounding.

#### **3.06 ADJUSTING AND CLEANING**

- A Adjust operating mechanisms, where necessary, for free mechanical movement.

#### **3.07 DEMONSTRATION**

- A Upon completion of installation of motor controller equipment and electrical circuitry, energize controller circuitry and demonstrate functioning of equipment in accordance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and retest to demonstrate compliance.

**END OF SECTION**

**SECTION 260510**

**GENERAL REQUIREMENTS FOR ELECTRICAL WORK**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A Provide all labor, materials, supervision, tools, services, equipment and incidentals necessary for complete and operational systems as specified under this division and as shown on the Contract Drawings.
- B Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Division.

**1.02 DRAWINGS AND SPECIFICATIONS**

- A Prior to submitting a bid:
  - 1. Examine the Drawings.
  - 2. Read the Specifications and other Contract Documents, including Addenda and referenced material.
  - 3. Visit the site of the work.
  - 4. Become informed prior to bidding as to existing conditions and limitations of the project.
- B Bring exceptions and inconsistencies in Drawings, specifications, addenda, referenced material, other Contract Documents and site conditions to the attention of the Architect in writing seven days before the bid opening; otherwise be responsible for changes and additions that become necessary during construction.
- C Interpretation or correction of the Contract Documents will be made by Addendum and will be mailed or delivered to each Contract Bidder of Record.
- D Location of material, equipment, devices and appliances shown in the Contract Drawings are approximate and are subject to such revisions as may be necessary or desirable at the time the work is installed. Install the work in relation to existing conditions and be responsible for the correctness of the work with reference to finish elevations and surrounding conditions.
- E The Contract Documents show the general arrangements of the work. Should project conditions require any rearrangement, or if equipment or accessories can be installed to better advantage in a different manner, the Contractor may, before proceeding with the work, prepare and submit five copies of shop drawings of the proposed rearrangement for the Architect's review.
- F If the Contractor proposes to install equipment requiring space conditions other than those shown, he shall assume responsibility for the rearrangement of the space and shall have the Architect review the change before proceeding with the work. The request for such changes shall be accompanied by shop drawings of the space affected.
- G The accompanying Drawings do not indicate the existing electrical installations other than to identify modifications and extensions thereto. Visit the site and ascertain the conditions to be met and the work to be accomplished in removing and modifying the existing work, and installing the new work. Failure to comply with this shall not constitute grounds for any additional payment in connection with removing or modifying any part of the existing installations and/or installing any new or temporary work under this Division.

**1.03 CODES AND STANDARDS**

- A Execute the work in accordance with local, state and national codes, ordinances and regulations having jurisdiction or authority over the work. Make any and all adjustments required by these agencies without further cost to the Owner. In addition, conform to the applicable provisions and recommendations of the following standards:
  - 1. National Electrical Manufacturer Association (NEMA)
  - 2. American Society for Testing and Materials (ASTM)
  - 3. National Fire Protection Association (NFPA)
  - 4. National Electrical Safety Code (NESC)
  - 5. Institute of Electrical and Electronic Engineers (IEEE)
  - 6. National Electrical Code (NEC)
  - 7. Underwriters' Laboratories (UL)
  - 8. American National Standards Institute (ANSI)
  - 9. International Building Code (IBC)
  - 10. Occupational Safety and Health Administration (OSHA)
  - 11. Americans with Disabilities Act (ADA)

12. Applicable utility companies
  13. Texas Accessibility Standards (TAS)
  14. International Energy Conservation Code (IECC)
- B Execute the work in accordance with the most current codes and standards in effect at the time of bidding.
- C In the event standards and codes conflict with each other, the most stringent shall apply.
- D Conform to National Electrical Code rules. Provide material and equipment, which is approved by Underwriter's Laboratories, bears UL label and is acceptable to Factory Mutual.
- E It is specifically understood, however, that in those instances where capacities, sizes, etc., of electrical equipment, devices or material as designated in these Specifications or on the Drawings are in excess of the minimum requirements of the National Electrical Code, such designated capacities shall prevail.

## PART 2 - PRODUCTS

### 2.01 SHOP DRAWINGS AND SUBMITTALS

- A Submit Shop Drawings for all material furnished under this division of the work. Refer to the General Requirements for additional requirements. In addition to the quantity of Shop Drawing copies required by the General Requirements, furnish one additional copy for the Electrical Engineer's file. No material shall be fabricated, delivered to the jobsite, or installed which the Architect through Shop Drawing submittals has not approved.
- B The submittals shall include sufficient descriptive material, such as catalog cuts, diagrams, and other data published by the manufacturer, as well as evidence of compliance with safety and performance standards, to demonstrate conformance to the specification requirements; catalog numbers alone will not be acceptable. The data shall include the name and address of the nearest service and maintenance organization that regularly stocks repair parts.
- C Deliver Shop Drawings to the Architect in sufficient time to avoid delay of the project. Group Division 26 submittals as identified below, submit sections not included in these groupings separately. The Electrical Contractor shall acknowledge receipt of all Division 23 mechanical equipment submittals and confirm the overcurrent protection requirements of the project specific HVAC equipment has been coordinated with the distribution equipment prior to submitting for approval. All proposed changes to the overcurrent protection devices shall be clearly identified in the distribution equipment submittal.
1. Distribution Equipment – Low Voltage
    - a. Section 262213 - DRY TYPE TRANSFORMERS
    - b. Section 262416 - PANELBOARDS
    - c. Section 262417 - DISTRIBUTION PANELBOARDS
    - d. Section 262716 - CABINETS
    - e. Section 262816 - OVERCURRENT PROTECTIVE DEVICES
    - f. Section 262817 - DISCONNECT SWITCHES
    - g. Section 262913 - MOTORS, MOTOR STARTERS AND CONTROLS
  2. Lighting
    - a. Section 260924 - OCCUPANCY SENSORS
    - b. Section 265113 - LIGHTING
- D Submit samples for approval when requested by the Architect.
- E Before submitting Shop Drawings for review, examine them and verify that they correctly represent the material or equipment intended for this project. The Contractor's review of Shop Drawings is not intended to take the place of the review of the Architect, and Shop Drawings which have not been reviewed by the Architect shall not be used in fabricating or installing any work.
- F List deviations and exceptions from the specified equipment in writing. Failure to do so will be cause for rejection of submittals. Contractor agrees that if deviations, discrepancies, or conflicts between Shop Drawing submittals and the Contract Documents are discovered either prior to or after Shop Drawing submittals are reviewed by the Architect, the Contract Documents shall control and shall be followed, unless deviations have been specifically approved by the Architect.

- G The review of Shop Drawings or catalog data by the Architect shall not relieve the Contractor from responsibility for deviations from plans and specifications unless he has, in writing, specifically called attention to such deviations at the time of submission and has obtained the permission of the Architect thereon; nor shall it relieve him from responsibility for error of any kind in Shop Drawings. When the Contractor does call such deviations to the attention of the Architect, he shall state in his letter whether or not such deviations involve any extra cost. If this is not mentioned, it will be assumed that no extra cost is involved for making the change.
- H Contractor agrees that Shop Drawing submittals reviewed by the Architect are not change orders; that the purpose of Shop Drawing submittals by the Contractor is to demonstrate to the Architect that the Contractor understands the design concept, that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use.

## 2.02 STANDARDS FOR MATERIALS

- A It is the intention of these specifications to indicate a standard of quality for all materials incorporated in this work. Manufacturer's names and catalog numbers are used to designate the item of equipment or material as a means of establishing grade and quality. Where several manufacturers are named, only the named manufacturer's products will be considered and the Contractor's bid shall be based on their product.
- B Where the phrase 'or approved equivalent' or 'or equivalent' or 'equivalent to' or 'accepted substitute' is used in these specifications, the names or name mentioned are to be used as a basis of quality. Other manufacturers will be considered if the quality of the proposed material is equivalent to that of materials named, in the opinion of the Architect. Such unnamed manufacturers' products will, however, be considered as substitutions and shall not be used as a basis for bidding.
- C Basis of quality shall include material, workmanship, weight, finishes, and gauges of material, appearances, capacity and performance. Manufacturer's representation as to availability of equipment, replacement parts and service personnel in the area will be a factor in consideration of submittals.
- D All materials shall be fully warranted.
- E Furnish standard products and manufacturers regularly engaged in production of such equipment.
- F Furnish manufacturer's latest standard design.
- G All equipment shall conform with applicable IEEE, UL, ANSI and/or NEMA Standards.
- H Obtain manufacturer's recommendations and instructions for all installed equipment including installation instructions, preparation cleaning, tests and preservice checks, and then ensure all have been performed prior to completion of work.

## 2.03 SUBSTITUTIONS

- A The Architect prior to installation shall approve substitutions of equipment. Substitution of equipment shall be in accordance with Division 01 of the specifications.
- B When alternate or substitute materials and equipment are used, the Contractor shall be responsible for space requirements, configurations, performance, changes in bases, supports, structural members and openings in structure, and other apparatus and trades that may be affected by their use.
- C Contractor shall bear all additional costs resulting from the use of substituted materials. Such changes shall be at no additional cost to the Owner.

## PART 3 - EXECUTION

### 3.01 COORDINATION

- A Coordinate and direct the work under this division of the specifications with the work under other divisions of the specifications. Examine the Contract Documents and report any discrepancies between divisions of the work to the Architect and obtain written instructions for changes necessary in the work.
- B Before installation, make proper provisions to avoid interferences with the work under other divisions of the specifications. Changes required in the work of the Contractor caused by his neglect to do so shall be made by him at his own expense.
- C Harmonize the work under this division with the work under other divisions of the specifications such that it may be installed in the most direct and workmanlike manner without hindering, handicapping, or conflicting with the work under other divisions of the specifications. Piping interferences shall be handled by giving precedence to pipelines that require a stated grade for proper operation.

### 3.02 PERMITS AND FEES

- A Secure and pay for all necessary permits, licenses and inspections required by law for the completion of the Work. Secure and pay for all certificates of approval that are required and deliver them to the Architect before final acceptance of the Work.
- B If a utility company in connection with the work under this division makes any charges, the Contractor shall advise the Owner, so that the Owner can pay these charges. Advise the Owner of these charges in a timely manner, so as not to delay construction of the project.

### 3.03 QUALITY ASSURANCE

- A Use adequate quantities of skilled workmen who are trained and experienced in their crafts and who are familiar with the specified requirements and methods needed to perform the work in this division.
- B Install materials and equipment based upon actual dimensions and conditions at the project site. Field measure for materials or equipment requiring exact fit.
- C Be responsible for the proper location and sizes of all slots, holes or openings in the building structure pertaining to the work in this division, and for the correct location of pipe sleeves.
- D Perform work in accordance with good commercial practice. The good appearance of the finished work shall be of equivalent importance with its operation.
- E Isolate all conduit, transformers and motors to insure an acceptable noise level free from objectionable vibration for all systems.

### 3.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A Follow the manufacturer's directions in the delivery, storage and handling of equipment and materials.
- B Equipment and materials shall be tightly covered and protected against dirt, water, chemical or mechanical injury and theft. Damaged equipment will not be accepted.
- C After materials are installed, protect the installation until the work is completed and accepted by the Owner.

### 3.05 CLEANING UP

- A Remove all shipping labels, dirt, paint, grease and stains from all equipment under this division of the Work. Remove debris as it accumulates. Upon completion of the Work, clean all electrical equipment and the entire electrical installation in order to present a first class electrical installation suitable for occupancy. No loose parts, scraps, tools nor debris shall be left on the premises.

### 3.06 ELECTRICAL SERVICE FOR TESTING

- A Construct sufficient temporary electric service and connect to refrigeration machines, related pumps, fans, fan coil units, elevators and other equipment furnished under other divisions of the specifications such that the equipment installers may begin testing 30 workdays before job completion deadline.
- B Notify the electric utility company with sufficient time in advance so they can construct their portion of the permanent electric service entrance to this project. If the electric utility company indicates that permanent service will not be installed when needed, notify the Architect in writing immediately.

### 3.07 CUTTING AND PATCHING

- A Be responsible for the cost of cutting and patching required in connection with the work under this division of the specifications.
- B Coordinate the work to eliminate unnecessary cutting of construction. Where it becomes necessary to cut through walls, floors, ceilings and other construction to permit installation of the work, or to repair defective work under this division, the costs for such cutting and patching shall be included in this division of the work. Comply with other applicable divisions of the specifications concerning the quality of cutting and patching.
- C Where openings are cut through masonry walls, provide lintels or structural supports to protect the remaining masonry. Provide adequate support during the cutting operation to prevent any damage to the affected masonry.
- D Cutting of structural members is not permitted unless the Architect grants specific written permission.

### 3.08 FLASHINGS, SLEEVES, INSERTS

- A Be responsible for maintaining the integrity of the waterproofing of conduit penetrations through roofs, exterior walls and floors.
- B Be responsible for the installation of counterflashing of roof penetrations to provide a weatherproof installation.



- C Install 22 gauge galvanized sheet iron sleeves for each conduit passing through floors. Extend sleeves 1-1/2 in. above the floor slab and cement watertight. The sizes of sleeves shall be installed to permit the subsequent insertion of the proper size conduits or raceways.
- D Install galvanized wrought iron pipe sleeves around conduits and raceways that pass through concrete beams or walls and masonry exterior walls. The inside diameter of these sleeves shall be at least 1/2 in. greater than the outside diameters of the service pipes. After the pipes are installed in these sleeves, fill the annular space between pipes and sleeves with mastic. The completed installation shall be watertight.
- E Be responsible for maintaining the fire rating of penetrations through walls, floors and ceilings.
- F Waterproofing and fireproofing work shall conform to the requirements of other applicable sections of the specifications.

### 3.09 FOUNDATIONS

- A Be responsible for the installation of steel reinforced concrete foundations below all floor-mounted switchboards, panelboards, motor control centers, transformers and other floor mounted electrical equipment.
- B Concrete foundations shall not be less than 4 in. high. All top edges shall be neatly chamfered.
- C Concrete foundations shall be 3 in. wider and 3 in. longer than the base of the equipment being installed.
- D All concrete work shall be steel reinforced with a minimum of 6 in. by 6 in., No. 6 mesh and shall conform entirely to the requirements of the other sections of the specifications describing this class of work.

### 3.10 PAINTING

- A Maintain original factory finish on all material and equipment installed under this division of the work unless specifically noted otherwise within the Contract Documents. Should the finish be marred in transit or during installation, it shall be re-finished to present a neat, workmanlike appearance. Leave equipment clean and free from any grease, dirt and rust and in a suitable condition for painting.

### 3.11 IDENTIFICATION OF ELECTRICAL EQUIPMENT

- A Identify electrical equipment in accordance with the NEC, local authorities and in accordance with the requirements of the Contract Documents.
- B Use laminated three-ply, engraved plastic nameplates with black surface and white interior core, at least 1/16 in. thick. Engraved lettering shall be condensed gothic at least 1/4 in. high and properly spaced for legible and easy reading. Attach plates to equipment with chromium-plated screws. Adhesive attachment is not acceptable. Identify the following items with engraved nameplates, located as follows:
  1. Each switch/fuse unit or circuit breaker in each main panel and each distribution panel - adjacent to switch/fuse unit or circuit breaker.
  2. Spares shall be labeled 'Spare'.
  3. Each branch circuit panel - on panel trim cover immediately above panel door.
  4. Each safety switch, relay cabinet, time clock - on outside of cover. Include the power source on safety switches.
  5. Each exhaust fan switch - custom engraved on outside of switch coverplate (high and low if required).
  6. Each motor starter - on outside of cover.
  7. Each motor starter in motor control center on outside of cover.
  8. Outside light switches - custom engraved on outside of switch coverplate.
  9. Any switch for load that cannot be seen from the control point - custom engraved on outside of switch coverplate.
  10. Engrave coverplates for wiring devices served by emergency power systems with panel designation and circuit number(s) connected to the devices. Fill engraving with indelible black ink.
- C Custom engraving on cover plates for items noted above shall be equivalent to custom engraving as performed by Hubbell, or accepted substitute.
- D Install adhesive arc flash warning labels on all equipment as required by the latest NFPA 70E. Each label shall show specific and correct information for specific equipment based on its arc flash calculations. Labels shall show the followings:
  1. Nominal system voltage.
  2. Equipment/bus name, date prepared, and preparer's name and address.
  3. Arc flash boundary.
  4. Available arc flash incident energy and the corresponding working distance.
  5. Minimum arc rating of clothing.
  6. Site-specific level of PPE.

- E Branch circuit panelboard directories shall be completely and properly typewritten, including room numbers. Room numbers and names shall be as finally designated at the jobsite.
- F Refer to other sections of the specifications for conductor color-coding requirements.

### 3.12 BALANCING OF PANELS

- A At the completion of the installation of the electrical system, check each phase of all panels under full load and arrange loads such that all phases carry the proper proportion of load. Submit load readings to Engineer for review as part of project close out documentation.

### 3.13 LOCKING OF ELECTRICAL FACILITIES

- A Provide padlocks for exterior electrical facilities subject to unauthorized entry.
- B Furnish locks to match Owner's locking system. Key all locks alike.
- C Furnish Owner with two keys per lock up to a quantity of ten keys.
- D Install locks immediately upon installation of electrical facility.

### 3.14 ACCESS DOORS

- A Wherever access is required in walls, ceilings, or soffits to concealed junction boxes, pull boxes or other electrical equipment installed under this division, provide and install access doors as indicated herein.
- B Furnish and install hinged access door and frame with flush latch handle as follows:
  - 1. Plaster surfaces - Milcor Style K, or accepted substitute.
  - 2. Ceramic tile or drywall surface - Milcor Style M (with 'B' label where required), or accepted substitute.
  - 3. Install panels in locations approved by the Architect and paint as directed.

### 3.15 RECORD DOCUMENTS

- A Job set: Promptly following receipt of the Owner's Notice to Proceed, secure from the Architect at no charge to the Contractor, one complete set of all Documents comprising the Contract.
- B Final Record Documents: At a time nearing the completion of the work, secure from the Architect at no charge to the Contractor one complete set of sepia transparencies of all Drawings in the Contract.
- C Maintenance of Job Set: Immediately upon receipt of the job set described in paragraph above, identify each of the Documents with the title, "RECORD DOCUMENTS - JOB SET".
- D Preservation:
  - 1. Considering the Contract completion time, the probable number of occasions upon which the job set must be taken out for the new entries and for examination, and the conditions under which these activities will be performed, devise a suitable method for protecting the job set to the approval of the Architect.
  - 2. Do not use the job set for any purpose except entry of new data and for review by the Architect, from start of transfer of data to final Project Record Documents.
  - 3. Maintain the job set at the site of Work where the Architect designates that site.
- E Making Entries on Drawings:
  - 1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe the change by graphic line and note as required.
  - 2. Date all entries.
  - 3. Call attention to the entry by a 'cloud' drawn around the area or areas affected.
  - 4. In the event of overlapping changes, use different colors for the overlapping changes.
  - 5. All equipment shall be clearly indicated in its installed location. Exposed items or those easily accessible, as above lay-in ceilings, may be located to scale. Concealed items not readily accessible, such as underground piping, shall be located by dimension.
- F Transfer of Data to Final Project Documents:
  - 1. Approval of recorded data prior to transfer:
    - a. Following receipt of the transparencies described above, and prior to beginning transfer of recorded data thereto, secure the Architect's approval of all recorded data.
    - b. Make required revisions.
  - 2. Transfer of Data to Drawings:
    - a. Carefully transfer change data shown on the job set of Record Drawings to the corresponding transparencies, coordinating the changes as required.
    - b. Clearly indicate at each affected detail and other drawing a full description of changes made during construction, and the actual location of items described above.

- c. Call attention to each entry by drawing a 'cloud' around the area or areas affected.
- d. Make changes neatly, consistently, and with the proper media to assure longevity and clear reproduction.

G Review and Submittal:

1. Submit the completed set of Project Record Documents to the Architect as described above.
2. Participate in review meetings as required.
3. Make required changes and promptly deliver the final Project Record Documents to the Architect.

3.16 OPERATIONS AND MAINTENANCE DATA

- A Accumulate, as the job progresses, the following data, in duplicate, prepared in a neat brochure or packet folder, and deliver to the Architect for checking and subsequent delivery to the Owner.
1. Manufacturers' warranties, guarantees, service manuals, and operating instructions for equipment and materials covered by this division of the specifications.
  2. Copies of approved Shop Drawings.
  3. Any and all other data and/or Drawings required during construction.
  4. Repair parts list of all major items and equipment including name, address, and telephone number of local supplier and agent.

3.17 INSTRUCTION OF OWNER'S PERSONNEL

- A Provide the services of competent engineers or technicians acceptable to the Architect to instruct representatives of the Owner in the complete and detailed operation of each item of equipment, and each system. These instructions shall be provided for whatever periods may be necessary to accomplish the desired results. Upon completion of these instructions, the Contractor shall obtain a Letter of Release, acknowledged by the Owner or his Authorized Representative, stating the dates on which the various kinds of instruction were given, and the personnel to whom the instructions were given.
- B Be responsible for proper maintenance of equipment and systems until the instructions have been given to the Owner's personnel and the letter of release acknowledged.
- C In providing the instructions to the Owner's personnel, follow the written operating and maintenance manuals in all instances, and familiarize the Owner's personnel with such manuals. Operating and maintenance manuals used for instructions shall include wiring diagrams, manufacturers' operation and maintenance manuals, parts lists (with sources identified), and other data as appropriate for each system, and as required elsewhere in the Specifications to be furnished to the Owner prior to final acceptance of the project.

3.18 LOCAL PARTS AND SERVICE

- A Each item of equipment furnished on this project shall have local representation, factory-authorized service, and an adequate stock of repair parts. "Local" shall be defined, for this purpose, as "within 150 miles of the project site".

3.19 INSTALLATION INSPECTIONS AND CERTIFICATIONS

- A Obtain timely inspections of the installation by the constituted authorities. Remedy any deficiencies to the satisfaction of the inspection authority.
- B Upon final completion of the Work, obtain certificates of acceptance from the constituted authorities. Deliver the certificates to the Architect for transmission to the Owner.

3.20 OPERATION PRIOR TO ACCEPTANCE

- A When any equipment is operable, and it is to the advantage of the Contractor to operate the equipment, he may do so provided that he properly supervises the operation and retains full responsibility for the equipment operated. Regardless of whether or not the equipment has or has not been operated, clean the equipment properly; make required adjustments, and complete punch list items before final acceptance by the Owner.
- B The date of acceptance by the Architect, for beneficial use by the Owner, shall be the beginning date of the warranty period.

3.21 ACCEPTANCE OF THE WORK

- A The Work, when completed, will be accepted in a finished, perfect and undamaged state only. Provide for protection of the Work during its progress, and if damaged, do all patching or replacing necessary to its full and satisfactory completion.

3.22 WARRANTY

- A Furnish a written certificate, guaranteeing all materials, equipment and labor to be free of all defects for a period of one year from the date of final acceptance by the Owner of the Work, and guarantee that if any defects appear within the stipulated guarantee period, such work shall be replaced without charge.
- B This guarantee shall be extended to include the capacity and integrated performance of all component parts of the various systems.
- C Lamps for light fixtures shall be excluded from the guarantee requirements of this section.

3.23 FINALLY

- A It is the intention that this Specification provide a complete installation. Include all accessory construction and apparatus necessary to the operation and testing of the work under this division. The omission of specific reference to any part of the work necessary for such complete installation shall not relieve this Contractor from furnishing and installing such parts.

**END OF SECTION**

**SECTION 260511**

**WORK IN EXISTING BUILDING**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Furnish all labor, materials, services, equipment, and appliances required in conjunction with the work in existing buildings as indicated in the Contract Documents.

**PART 2 - PRODUCTS**

2.01 MATERIALS

- A Use materials to match existing construction unless specified elsewhere in these Contract Documents. Materials shall comply with local codes, be UL listed, and be properly applied for their intended function.

**PART 3 - EXECUTION**

3.01 EXISTING CONDITIONS

- A Inspect the jobsite prior to bidding and be familiar with all existing conditions. Include the cost of the work required to accommodate the existing conditions in the bid proposal.
- B Obtain data related to existing facilities from existing documents, measurements, notations, photographs, surveys and other observations at the site.
- C Relocate existing items as required to accommodate the new construction. Remove, relocate and reconnect equipment and accessories that are to be reused.
- D Coordinate the Work with other divisions of the specifications. Determine which items and equipment are to remain, to be relocated or be removed, and perform all work consistent with the Scope of Work.
- E Loads that exist and are to remain shall be connected to the new distribution system as shown on the Drawings or as required to maintain their proper operation.
- F Refer to other divisions of the specifications and determine equipment that requires power to be disconnected, or power to be relocated and disconnect power and relocate power to this equipment.
- G Remove all conductors and exposed conduit rendered unused back to the source of supply.
- H Perform splices as required to maintain circuit continuity to existing devices or equipment to remain in service.

3.02 DISRUPTION OF EXISTING FUNCTIONS

- A Access: Access to and use of the existing facilities and site will be restricted, and shall be under the direction and control of the Owner.
- B Disruptions: Maintain existing electrical, communications, alarm, and other existing systems, and maintain existing functions in service except for scheduled disruptions. Where existing functions to remain in use are disrupted, they shall be fully restored after disruption, in full compliance with this division of the specifications for new work.
- C Scheduling of Disruptions: Seek and obtain approval two weeks in advance of the event date. Indicate date of event, starting time, and duration of each required disruption.
- D Notice of Disruption: Date, time and duration of each disruption shall be subject to the Owner's prior approval, and shall include the following information in the form of a memorandum submitted by the Contractor to the Architect for approval by the Owner:

		STARTING		
	FACILITY/SYSTEM	DATE	TIME	DURATION

- E Emergency Disruptions: When circumstances preclude obtaining advance approval as specified above, make request immediately upon knowledge of the requirement, and perform work so as to cause the minimum amount of disruption, for the minimum duration.
- F Notification: Notify the Architect and the Owner immediately by telephone and then in writing, as changes and additions to the scheduled disruption requirements become known.

- G Duration: Complete as large a portion of the work as possible before initiating disruption and perform only that work necessary so as to minimize duration of disruption. Maintain adequate personnel, supplies, materials, equipment, tools, and other resources at job site to avoid unnecessary delay in resumption of normal service.

### 3.03 SALVAGE, DEMOLITION AND RELOCATION

#### A General

1. Modify, remove, or relocate materials and items indicated in the Contract Documents and required by the installation of new facilities.
2. Working jointly with the work under other divisions of the specifications establish and mark salvage and demolition items before commencing work; report items scheduled for relocation, reinstallation or reuse, which are found to be in damaged condition; await further instructions from the Owner's Representative and/or the Architect before commencing with work.
3. Owner shall have first right of refusal for all material and equipment. Deliver salvaged material accepted by the Owner to destinations on the premises as directed and remove material rejected by the Owner from the site.

#### B Relocations

1. Make minor relocations necessitated by the conditions at the site or as directed by the Architect, without additional cost to the Owner.
2. Repair and restore to good functional condition equipment, materials and items scheduled for relocation, which are damaged during dismantling or reassembly operations.
3. New materials and items of similar design and quality may be substituted for materials and items indicated to be relocated upon approval of shop drawings, product data, and samples.
4. Remove carefully, in reverse order to original assembly or placement, items that are to be relocated.
5. Protect items until relocation is complete.
6. Clean and repair items to be relocated, and provide new materials, fittings, and appurtenances required to complete the relocations and to restore items to good operating order.
7. Perform the relocation work in accordance with applicable sections of these specifications, utilizing skilled workers.

- C Relocating Devices: Remove and reinstall, in locations designated by the Owner's Representative and the Architect, temperature control system devices, relays, wire, conduit, fixtures, equipment and other devices required for the operation of the various systems that are installed in existing-to-be-removed construction.

### 3.04 EXISTING RACEWAYS

- A Reuse raceways where possible and where permitted by local codes. Rework raceways to meet code requirements. Secure all raceways that are not properly supported. Paint raceways when exposed to view to match surroundings if existing finish is damaged or soiled.
- B Fasten existing boxes and raceways securely to provide proper support.

### 3.05 NEW RACEWAYS

- A Provide new raceways where required to provide wiring as indicated in the Contract Documents.
- B Where raceways must be exposed to view, use wiremold, securely fastened, and painted to match surroundings. Provide number of coats of paint as required to cover prime coat of original finish of wiremold.

### 3.06 EXISTING CEILINGS

- A Provide a typewritten list of existing damaged ceilings and ceiling tiles. Disregard rooms in which ceilings are to be repaired and replaced. Correlate list to room numbers indicated on drawings.
- B Mark damaged ceilings and ceiling tiles with easily removable red "stick-on" labels, minimum size two square in.
- C Submit list prior to commencing work. Do not start work until Architect and Owner review list; otherwise repair and replace damaged ceilings and ceiling tiles.

### 3.07 EXISTING PANELBOARDS

- A Service existing panelboards to be reused as follows:
  1. Clean interiors and exteriors.
  2. Touch-up damaged finishes with manufacturer's matching touch-up paint.
  3. Inspect for component damage and repair or replace as necessary.
  4. Tighten conduit and wire terminations.

5. Verify panelboards and panelboard feeders are of adequate capacity for loads to be served as follows:
  - a. Activate loads connected to panelboards to simulate 100 percent demand.
  - b. Measure and record amperage readings of phase and neutral conductors of panelboards feeders.
  - c. Provide typewritten record of recorded measurements to the Engineer for review.
6. Rebalance loads as specified in other sections of the specifications to provide for evenly balanced phases.
7. Provide new typewritten circuit directories.
8. Provide new panelboard identification labels if panelboard designation changes or if no labels exist.

### 3.08 EXISTING WIRING

- A Inspect existing wiring to be reused for damage. Repair or replace damaged wiring.
- B Assure integrity of existing wiring insulation as follows:
  1. Megger wiring phase-to-phase, phase to neutral, phase to ground, and neutral to ground.
  2. Record megger results. Provide typewritten record of results to the Architect for review.
  3. Repair defective insulation to a dielectric value equivalent to that of wire of the same type.
  4. Existing wiring may be replaced with new wiring if, in the Contractor's opinion, costs to the Owner would be lower.
- C Secure and label existing wiring that is to be disturbed.
- D Tighten existing wiring terminations and connections.

### 3.09 EXISTING FOUNDATIONS AND FLOORS

- A Prior to coring, penetrating or cutting of existing foundations or floors, the Contractor shall notify the Architect in writing and request all as-built and building record drawings showing the location of post tension cables in slabs and subsequent floors. In the event post tension cables do exist in the building, the Contractor shall X-ray the area to be cut, cored or penetrated. Two copies of the X-ray shall be forwarded to the Architect and written approval issued to the Contractor prior to proceeding with the work.
- B If no as-built or record building drawings are available, then the Contractor shall X-ray the area to be cut, cored or penetrated. Two copies of the X-ray shall be forwarded to the Architect and written approval issued to the Contractor prior to proceeding with the work.

**END OF SECTION**

**SECTION 260512**

**MECHANICAL AND ELECTRICAL COORDINATION**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A Refer to Section 26 05 10 - General Requirements for Electrical Work.
- B Refer to Section 21 00 10 - General Requirements for Fire Protection Work
- C Refer to Section 22 00 10 - Basic Plumbing Requirements.
- D Refer to Section 23 00 10 - Basic Mechanical Requirements.

1.02 SUMMARY

- A This Section describes the coordination between the Fire Protection, Plumbing, Mechanical and Electrical portions of the work.
- B This Section is included under the Division 21 portion of the Specifications as Section 21 05 12, under the Division 22 portion of the Specifications as Section 22 05 12, under the Division 23 portion of the Specifications as Section 23 05 12, and under the Division 26 portion of the Specifications as Section 26 05 12.

1.03 WORK INCLUDED

- A Responsibility: Unless otherwise indicated, motors and controls shall be furnished, set in place and wired in accordance with the following schedule. This schedule may include equipment and systems that are not required for this project. Only the equipment and systems that are required on the drawings and/or specified elsewhere will be required by this section:

	ITEM	FURNISHED UNDER DIVISION	INSTALLED UNDER DIVISION	WIRED AND CONNECTED UNDER DIVISION
1.	Equipment Motors	21/22/23	21/22/23	26
2.	Magnetic Motor Starters			
	a. Automatically controlled, with or without HOA switches	21/22/23	26	Notes 1,3,5
	b. Automatically controlled, with or without HOA switches and furnished as part of factory wired equipment	21/22/23	22/23	Notes 1,3,5
	c. Manually controlled	21/22/23	26	Notes 1,3,5
	d. Manually controlled and furnished as part of factory wired equipment	21/22/23	26	Notes 1,3,5
	e. Furnished in Motor Control Centers	26	26	Notes 1,3,5
3.	Variable Speed (Frequency) AC Drives	22/23	26	Notes 1,4,5
4.	Line voltage thermostats, time clocks, etc., not connected to control panel systems	23	26	23
5.	Electric thermostats, time clocks, remote bulb thermostats, motorized valves, float controls, etc. which are an integral part or directly attached to ducts, pipes, etc.	22/23	22/23	22/23
6.	Temperature control panels and	23	23	23



	ITEM	FURNISHED UNDER DIVISION	INSTALLED UNDER DIVISION	WIRED AND CONNECTED UNDER DIVISION
	time switches mounted on temperature control panels			
7.	Motorized valves, motorized dampers, solenoid valves, EP and PE switches, etc.	23	23	Note 1
8.	Alarm bells furnished with equipment installed by Division 22 or 23	22/23	22/23	22/23
9.	Wiring to obtain power for control circuits, including circuit breaker	21/22/23	21/22/23	21/22/23
10.	Low voltage controls	21/22/23	21/22/23	21/22/23
11.	Fire protection system (sprinkler) controls	21	21	Note 8
12.	Fire and smoke detectors installed on mechanical units and in ductwork	28	23	Note 8
13.	All relays required for fan shutdown, motorized dampers, smoke control devices, and other items integral with HVAC equipment to provide operation and control of HVAC equipment	23	23	Note 1
14.	Smoke dampers, and combination fire/smoke dampers	23	23	Note 7
15.	Boiler and water heater controls, boiler burner controls panels	22/23	22/23	22/23
16.	Pushbutton stations, pilot lights	22/23	22/23	22/23
17.	Heat Tape	21/22/23	21/22/23	26
18.	Disconnect switches, manual operating switches furnished as a part of the equipment	21/22/23	21/22/23	Notes 1,5
19.	Disconnect switches, manual operating switches furnished separate from equipment	26	26	26
20.	Multispeed switches	23	23	26
21.	Thermal overloads	21/22/23	21/22/23	21/22/23
22.	Control relays, transformers	21/22/23	21/22/23	21/22/23
23.	Refrigeration cycle, cooling tower and controls	23	23	23
24.	Tamper switches for fire protection (sprinkler) system	21	21	28
25.	Flow and/or pressure switches for fire protection (sprinkler) system	21	21	28
26.	Fire and jockey pump controllers and automatic transfer switch	21	21	Note 6
27.	Alarm bells or horns for fire protection (sprinkler) system	21	21	28

	ITEM	FURNISHED UNDER DIVISION	INSTALLED UNDER DIVISION	WIRED AND CONNECTED UNDER DIVISION
28.	Generator (underground) fuel tank	22	22	--
29.	Generator fuel level indicator	22	22	26
30.	Generator fuel piping from tank to generator	22	22	--
31.	Underground fuel tank leak detection and monitoring system	22	22	22
NOTES:	(1)	Power wiring as defined in Section 26 29 13 of the specifications shall be provided under Division 26; control wiring as defined in Section 26 29 13 of the specifications shall be provided under Division 21/22/23.		
	(2)	Wiring from alarm contacts to alarm systems provided by Division 26, wiring from auxiliary contacts to air handling system controls provided by Division 23. Division 26 shall provide power to smoke detector. Smoke detectors required for all air handling systems 2000 CFM or greater. Refer to other Division 23 specifications, Division 26 and Drawings for more specific requirements.		
	(3)	For requirements for Magnetic Motor Starters, refer to Section 23 89 65 - MOTOR CONTROLLERS.		
	(4)	For requirements for Variable Speed (Frequency) AC drives, refer to Section 23 89 65 - MOTOR CONTROLLERS.		
	(5)	Disconnect switches, operating switches, starters and other similar items that are factory-mounted, as a part of complete assembly, shall comply with applicable provisions of the National Electric Code. All such disconnect switches shall be fused.		
	(6)	Power wiring from energy source to controllers and automatic transfer switch shall be provided under Division 26. Interconnection power and control wiring from controllers and automatic transfer switch to pumps shall be provided under Division 21, 22 or 23 and conforming to Division 26 specifications. Control wiring from automatic transfer switch to generator starter shall be provided under Division 26.		
	(7)	Division 26 will provide power to all smoke and combination fire/smoke dampers, and Division 28 will provide control for all such dampers using area smoke detectors.		
	(8)	Wiring for sprinkler system controls to be provided by Division 21. Wiring from devices to Fire Alarm System to be provided by Division 28.		

B CONNECTIONS: Make all connections to controls that are directly attached to ducts, piping and mechanical equipment with flexible connections.

C PRECEDENCE

1. In general, piping systems that require a stated grade for proper operation shall have precedence over other systems.
2. Precedence for pipe, conduit and duct systems shall be as follows.
  - a. Building lines
  - b. Structural members
  - c. Soil and drain piping
  - d. Vent piping
  - e. Steam piping
  - f. Condensate piping
  - g. Refrigerant piping

- h. Electrical bus duct
  - i. Supply ductwork
  - j. Return ductwork
  - k. Exhaust ductwork
  - l. Chilled water and heating water piping
  - m. Automatic Fire Protection Sprinkler Piping
  - n. Natural gas piping
  - o. Domestic hot and cold water piping
  - p. Electrical conduit
3. Lighting Fixtures shall have precedence over air grilles and diffusers.
- D FINAL INSPECTION AND REPORT
1. At the completion of the work, there shall be a meeting of the Fire Protection, Plumbing, Mechanical, Electrical Fire Alarm and Temperature Control Contractors, representatives of mechanical and electrical equipment manufactures whose equipment was actually installed on the project, and similarly-involved individuals, who shall thoroughly inspect all systems, and who shall mutually agree that all equipment has been properly wired and installed, and that all temperature and safety controls are properly functioning. A written report of this meeting, listing those in attendance, and the companies that they represent, shall be filed with the Owner and Architect or Engineer.

**END OF SECTION**

## SECTION 260519

### WIRES AND CABLES

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Provide labor, materials, services, equipment and appliances required in conjunction with the installation of wire and cable systems as indicated in the Contract Documents.

##### 1.02 SUBMITTALS

- A Manufacturer's Data: Submit copies of manufacturer's specifications for products to be used.

#### PART 2 - PRODUCTS

##### 2.01 MATERIALS

- A Provide conductors made of soft-drawn-annealed copper with conductivity not less than that of 98 percent pure copper. Conductors #12 gauge and smaller shall be solid. Conductors No. 10 gauge and larger shall be stranded.
- B Utilize conductors with insulation rated at 600 volts and insulated with type 'THHN' insulation in dry locations and type "THWN" in wet locations for conductors #1 gauge and smaller. Utilize conductors with insulation rated at 600 volts and insulated with type 'XHHW' insulation for conductors #1/0 gauge and larger. Wire in fixture channels and other special locations shall be as specifically rated for temperature in Article 300 in the NEC.
- C Minimum wire sizes shall be in accordance with other requirements of the specifications and as follows: For 20 ampere branch circuits #12 gauge, except that home runs greater than 50 ft. from the panel to the first outlet box on 120/208 volt shall be #10 gauge. Where home runs are greater than 100 ft. from the panel to the first outlet box, on 277-volt circuits wire shall be #10 gauge.
- D All wire shall be color-coded. Mark conductors on each end with a 1 in. band of colored pressure-sensitive plastic tape or by the use of brilliant waterproof lacquer, applied according to manufacturer's instructions. Colors for each phase and the neutral shall be consistent throughout the system in accordance with the requirements of this section.
- E Conductor sizes shown on the Contract Documents are selected based upon use with 75 degrees C terminations. Furnish terminations, which are UL listed for 75°C, or derate conductors for use at 60°C. Use of 90°C terminations is acceptable, but conductor must be sized at the 75°C rating. Do not use 90°C rating for conductors.
- F Armored cable types AC and BX are specifically not allowed.
- G Armored cable type MC is specifically not allowed.

#### PART 3 - EXECUTION

##### 3.01 GENERAL WIRING METHODS

- A Place an equivalent number of conductors for each phase, neutral and ground of a circuit in same raceway or cable.
- B Do not share neutral conductors between branch circuits connected to single pole circuit breakers unless shown otherwise on drawings.
- C Splice only in junction or outlet boxes.
- D Neatly train and lace wiring inside boxes, equipment, and panelboards.
- E Make conductor lengths equal for parallel circuits.
- F Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricant for pulling #4 gauge and larger wires.
- G When inserting conductors in raceways, comply with the following:
  - 1. Raceways shall first be installed as a complete raceway system without conductors.
  - 2. Do not install pull wires and conductors until the raceway system is in place.
  - 3. Do not use cleaning agents and lubricants that have a deleterious effect on the conductors.

4. Completely and thoroughly swab raceway system before installing conductors.

### 3.02 PHASING

- A Identify wire and cable for feeders and branch circuits for general power and lighting with a visible color code in accordance with the requirements of this section as follows:

	<u>120/208 Volt</u>	<u>277/480 Volt</u>
	Phase A - Black	Phase A - Brown
	Phase B - Red	Phase B - Orange
	Phase C - Blue	Phase C - Yellow
	Neutral - White	Neutral - Gray
	Ground - Green	

- B Provide green or bare grounding conductor identification for grounding conductors. Identification of all ungrounded conductors at junction boxes, wireways, and/or terminations may be by means of colored tape or painting when color-coded conductors as specified above are not available.
- C Phasing of the complete electrical installation shall be connected and maintained the same throughout the power distribution system. Where the project is an addition or modification to an existing facility, the electrical distribution system phasing shall be made the same as the existing.
- D Switchgear, safety switches, motor starters, plug-in type bus duct, lighting and power panels and power receptacles shall have all the same phase arrangements throughout the facility.

### 3.03 INSTALLATION

- A Install conductors in a neat and workmanlike manner to meet code requirements and make runs continuous without weld, splice, or joint between boxes. Do not install wires in conduit unless the entire system of conduit and outlet boxes is permanently in place. Pull conductors using a UL approved wire lubricant.
- B Provide conductors continuous from outlet to outlet with no splices except at outlets. Leave sufficient wire at all outlets to make connections without straining.
- C Deliver cable and wire to the project in original packages. Conductors with insulation showing deterioration within one year after final completion and acceptance of the Work shall be removed and replaced at no cost to Owner.
- D Thoroughly clean wires before installing lugs and connectors.
- E Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.
- F Terminate spare conductors with electrical tape.
- G Torque test conductor connections and terminations to manufacturer's recommended values.
- H Where outlets only are indicated, leave 48-in. leads of conductors, for connection to equipment. Identify all conductors' circuit numbers with Brady tape at terminals and junctions.
- I Where more than three current-carrying conductors are installed in a raceway, use larger size conductor and appropriate larger size raceway to comply with Article 310 of the National Electrical Code.
- J Where conductor is installed in an environment where the ambient temperature will exceed 86°F, use larger size conductor and appropriate larger size raceway to comply with Article 310 of the National Electrical Code.
- K Test all circuits for grounds. Light and test each lamp. Prove and test energy available at the load side of disconnect switches and at the final point of connection to driven equipment. Make all necessary and reasonable tests as required by the Architect to prove the integrity of work and leave the complete electrical installation ready for operation.

**END OF SECTION**

## SECTION 260520

### WIRE CONNECTION AND DEVICES

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Provide labor, materials, services, equipment and appliances required in conjunction with the installation of wire connections and devices systems as indicated in the Contract Documents.

##### 1.02 SUBMITTALS

- A Manufacturer's Data: Submit copies of manufacturer's specifications for products to be used.

#### PART 2 - PRODUCTS

##### 2.01 MATERIALS

- A Make cable and wire connections for splicing or terminating with compression deforming type connectors as manufactured by Burndy Corp., Thomas & Betts Co., Inc., Dossert Manufacturing Corp., Ilasco Corp., or accepted substitute. Connectors for cable sizes 250 Kcmil and larger shall be the long barrel type for double indentation. Soldered connections will not be permitted. Twist-on insulated connectors, of proper size, and resistant to vibration, may be used. Use twist-on connectors as manufactured by Minnesota Mining and Manufacturing Co., Thomas & Betts Co., Inc., Ideal Industries, Inc., or approved equivalent.
- B Provide terminal connectors with the hole sizes and spacing in accordance with NEMA standards. Provide terminal connectors with two holes in tongue for use on conductor sizes 250 Kcmil and larger. Terminal connectors are not required for connections to the circuit breakers in the lighting and/or receptacle panels.
- C Insulate connections made with non-insulated connectors with three layers of plastic tape, each layer being half-lapped. Use No. 35+ plastic tape as manufactured by Minnesota Mining and Manufacturing Co., or similar and equivalent plastic tape as manufactured by Plymouth Rubber Co.

#### PART 3 - EXECUTION

##### 3.01 INSTALLATION

- A Make all electrical power and control connections to equipment furnished under other divisions of the specifications and furnish wiring, conduit, outlet boxes, disconnect switches, etc., as required for same. Check General Construction, Controls, Plumbing, Heating, and Air Conditioning, etc. plans and specifications to determine the amount of such wiring required and include cost of same in bid. Verify locations, horsepower, voltages, etc., of all equipment as the job progresses. If a conflict arises in wiring, ask the Engineer immediately for clarification.
- B Provide branch circuits and connections to all motors furnished to this project. Provide all disconnect switches as shown and where required by national or local codes. In general, all wiring shall be in conduit, with a short section of flexible conduit at each motor. Securely attach conduit to flexible conduit. When the motor is an integral part of equipment, isolate with a short section of flexible metal conduit to prevent vibration and/or noise amplification to the building structure. If the motor is adjustable, an additional length of flexible metal conduit shall be installed at the motor. Connect a ground wire from the conduit termination to the motor frame on the inside of the flexible conduit. Use approved grounding lugs or clamps on the conduit connection.
- C Branch circuits and connections to all electrically operated equipment are included in this contract, whether or not specifically mentioned. Check, on the job, for further details on Plumbing, Heating, and Air Conditioning equipment as project progresses. Ground equipment in an approved manner.
- D Major equipment furnished under the mechanical and other sections of the specifications may require different rough-in requirements than indicated on the plans due to the 'or equivalent' equipment clause. Secure detailed drawings from the trade furnishing the equipment to determine actual rough-in locations, conduit and conductor requirements.

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- E Before connecting equipment, check the nameplate data against the information shown on the Drawings. Call any discrepancies to the attention of the Architect.

**END OF SECTION**

## SECTION 260526

### GROUNDING

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Furnish all labor, materials, services, equipment and appliances required in conjunction with the installation of a grounding system as indicated in the Contract Documents.

##### 1.02 SUBMITTALS

- A Manufacturer's Data: Submit copies of manufacturer's specifications for products used.

##### 1.03 TESTS

- A Measure ground grid resistance with earth test megger and install additional ground rods and conductors as required until resistance to ground complies with Code requirements.

#### PART 2 - PRODUCTS

##### 2.01 MATERIALS

- A Provide a grounding system that includes all connections and testing of ground rods, ground cables, ground buses, conduits, fittings, anchors, supports, thermite process materials and equipment, and other materials as required for a complete installation.
- B Provide ground cables composed of stranded bare copper of 98 percent conductivity encased in conduits above grade, or buried to a depth not less than 12 in. below grade. Install as required to provide sufficient mechanical protection.
- C Provide Thomas & Betts Co., Inc., Catalog No. 3951, or approved equivalent, ground fittings for bonding ground cable to its encasing conduit.

#### PART 3 - EXECUTION

##### 3.01 INSTALLATION

- A Ground electrical work in accordance with NEC Article 250, local codes as specified herein, and as shown on the Drawings.
- B Install ground cables continuous between connections. Splices will not be allowed except where indicated on the Drawings. Where ground cables pass through floor slabs, building walls, etc., and are not in metallic enclosures, provide with sleeves of approved nonmetallic material.
- C Install grounding conductor in all raceways and under floor ducts.
- D Ground interior lighting fixtures with grounding conductor to rigid metal raceways serving them. Flexible metal conduit in lengths less than 6 ft. 0 in. may be used as grounding conductors when terminated with approved fittings on circuits of 20 amperes or less.
- E Where connections are made to motors or equipment with flexible metal conduit, grounding conductor shall be stranded copper conductor within the conduit, bonded to the equipment and to the rigid metal raceway system. Size conductor in accordance with NEC, Article 250.
- F At each convenience outlet, install a grounding clip attached to the outlet box and leave a sufficient length of No. 12 wire with green colored insulation to connect to the grounding terminal of the receptacle. Grounding clip shall be equivalent to Steel City Type G. This requirement may be deleted if automatic grounding clip receptacle meeting NEC Article 250.

##### 3.02 COMMUNICATION GROUNDING

- A Telephone:



1. Provide one No. 4 THW to main service ground bus from each telephone equipment room. Leave 12 in. pigtail at telephone board.
- B Fire Alarm and Detection:
  1. Provide one No. 6 THW in 1/2 in. conduit to nearest ground bus.
- C Television Distribution System:
  1. Provide one No. 6 THW in 1/2 in. conduit to nearest ground bus.
- D Public Address System:
  1. Provide one No. 6 THW in 1/2 in. conduit to nearest ground bus.

3.03 COORDINATION

- A Coordinate the work under this section with the work under other divisions of the specifications.

**END OF SECTION**

**SECTION 260527**

**SEALING OF PENETRATIONS**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Provide labor, materials, services, equipment and appliances required in conjunction with sealing of penetrations as indicated in the Contract Documents.

1.02 SUBMITTALS

- A Samples: Provide samples upon written request.
- B Product Data: Manufacturer's specifications and installation instructions.

**PART 2 - PRODUCTS**

2.01 MATERIALS

- A Acceptable Manufacturers:
  - 1. Caulk and Putty: 3M's No. CP-25 and No. CP-303 synthetic elastomers.
  - 2. Wrap/Strip: 3M's No. FS-195 organic/inorganic, fire resistive sheet with aluminum foil on one side.
  - 3. Composite Sheet: 3M's No. CS-195 organic/inorganic fire resistive elastomeric sheet, bonded on one side with 28-gauge galvanized steel and the other side with reinforced hexagonal shaped steel wire mesh and covered with aluminum foil.
  - 4. Thunderline Model "LS/Link-Seal" seals, of the required size and number of links, shall be used on all conduit penetrations of exterior walls. Similar fittings by O.Z./Gedney shall be considered approved equivalents.

2.02 ROOF PENETRATION SYSTEMS

- A General: Construct roof penetration systems utilizing the "Alumi-Flash" system by Portals Plus, Inc., or equal by Thy-Curb.
- B Each roof penetration shall include a spun aluminum base ("High" size if required due to the existing roof construction and any insulation thickness) and an EPDM rubber cap. Each rubber cap shall have a pre-molded pipe opening and shall be selected based on the actual pipe or conduit size required at each location. Secure each rubber cap to each pipe or conduit with the manufacturer's recommended stainless steel gear clamp.
- C Manufacturer: Subject to compliance with requirements, provide roof penetration systems of one of the following:
  - 1. Portals Plus, Inc.
  - 2. Thycurb Div.; Thybar Corp.

**PART 3 - EXECUTION**

3.01 INSTALLATION

- A Review the detailed requirements of the UL through penetration fire stop assembly to be used and verify dimensional requirements such as maximum conduit size, conduit spacing, maximum opening size, minimum length of sleeve, etc.
- B For sealing of sleeves on or below grade and in wet locations, install link seals around all conduit penetrations properly sealing the annular space between the sleeve and the conduit to provide a waterproof seal.
- C For sealing of sleeves above grade and in dry/damp locations, use specified fire stop material and install per manufacturer's instructions and in conformance with UL requirements.
- D Attach an adhesive warning label identifying the fire stop assembly and warning against removal without proper resealing.

- E Seal floor, wall and ceiling penetrations or fire rated assemblies in above grade and in dry/ damp locations, both horizontal and vertical, utilizing intumescent (expand when heated) materials designed to be applied as a fire, cold smoke, noxious gas, and water sealant. Penetrations shall meet the requirements of ANSI/UL 1479 "Fire Tests of Through-Penetration Firestops".

**END OF SECTION**

**SECTION 260529**

**SUPPORTING DEVICES**

**PART 1 - GENERAL**

1.01 SUMMARY

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Furnish all labor, materials, services, equipment and appliances required in conjunction with installation of supporting devices as indicated in the Contract Documents.

1.02 SUBMITTALS

- A Product Data:
  - 1. Manufacturer's engineering brochures.

**PART 2 - PRODUCTS**

2.01 ACCEPTABLE MANUFACTURERS

- A Kindorf
- B Unistrut
- C Superstrut
- D Powerstrut

2.02 MATERIALS

- A Continuous slotted channel: 12 gauge steel with electro-galvanizing and gold zinc dichromate barrier bases and dimensions as required for application.
- B Hanger rods: Continuous thread, electro-galvanized, steel, with gold zinc dichromate barrier, sizes as required for loads imposed.
- C Hex head cap screws and nuts: No. H-113 and No. 114, respectively.
- D One-hole pipe straps: Series HS-100, galvanized steel.
- E Single bolt channel pipe straps: Steel, with machine screw and nut, Series C-105 and Series C-106.
- F Lay-in pipe hanger: Series C-149.
- G Conduit and pipe hanger: Series 6H.
- H Beam clamps: Series 500, RC, EC and PC as applicable.
- I Concrete inserts, spot: Series D-256 or D-255.
- J Concrete inserts, channel: Series D-980 or Series D-986.
- K Riser clamps: Series C-210.
- L Cable supports: O.Z./Gedney Type S.

**PART 3 - EXECUTION**

3.01 INSTALLATION

- A Carefully lay out supporting devices to coordinate with the work under other divisions of the specifications.
- B Securely fasten and support conduits and raceways to the building structure.
- C Suspend horizontal runs of conduits and raceways from the floor and roof construction by rod hangers spaced 10 ft. or less on centers for sizes 2-1/2 in. and greater, and 9 ft. or less on centers for 2 in. and smaller.
- D Fasten single runs of conduit to the structure with one-hole pipe straps and beam clamps or hang on rod hangers.
- E Support multiple runs of conduit and raceways from continuous channel inserts or from trapeze hangers constructed of rod hangers and channels.
- F Fasten single conduits to rod hangers with adjustable lay-in pipe hangers or for conduits of sizes 2 in. and smaller with Series 6H pipe hangers.
- G Fasten conduits to channels with pipe channel straps.

- H Support conduits and raceways within 3 ft. of each bend, of each termination, and at other intervals to maintain horizontal and vertical alignment without sag and deformation.
- I Do not use cable, strap, or wire hangers and fasteners.
- J Provide riser clamps for conduits at floor lines. Provide wire and cable supports in pull boxes for risers in accordance with NEC.
- K Install supports to permit equivalently distributed expansion and contraction of conduits and raceways with expansion joints. Use guides consisting of saddles, U-bolts and anchors designed for equivalent effectiveness for both longitudinal and transverse thrusts. Submit complete details for review.
- L Do not support conduits and raceways from equipment connections.
- M Provide special supports with vibration dampers to minimize transmission of vibrations and noises, where required.
- N Provide hangers, racks, cable cleats, and supports for wires and cables in cable chambers and other locations to make a neat and substantial installation.
- O Provide steel angle and channel supports to the floor and structure for panelboards, cabinets, pull and junction boxes. Provide independent support from entering conduits and raceways.
- P Provide supports as specified for conduits and raceways for outlet boxes and pull boxes 100 cubic in. and smaller.
- Q Paint all cuts, breaks, welds and other points where the rust inhibiting coating of supports is damaged.
- R Provide supports sized for the ultimate loads to be imposed.
- S Anchor supporting devices with:
  - 1. Wood screws on wood.
  - 2. Toggle bolts on hollow masonry.
  - 3. Bolts and expansion anchors in concrete or brick.
  - 4. Machine screws, threaded rods and clamps on steel.
- T Provide supports with hot-dipped galvanized finish in outdoor and wet locations.
- U Pipe and conduit supports:
  - 1. Single run pipe and conduits, 2-1/2 in. O.D. and less, shall have Type SS-8R/SS-8C as manufactured by Portable Pipe Hangers, Inc., or approved equivalent, spaced at maximum eight ft. on center and installed on roof pads if required by the roofing manufacturer.
  - 2. Multiple run pipe and conduits larger than 2-1/2 in. O.D. shall have Type PS, PSE, PP-10 with Roller, or PP-10 with Bar, as manufactured by Portable Pipe Hangers, Inc., or approved equivalent, spaced at maximum eight ft. on center and installed on roof pads if required by the roofing manufacturer. All conduits shall be held in place with clips on bars.

**END OF SECTION**

**SECTION 260532**

**PULL AND JUNCTION BOXES**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Provide labor, materials, services, equipment and appliances required in conjunction with the installation of pull and junction boxes as indicated in the Contract Documents.

1.02 SUBMITTALS

- A Manufacturer's Data: Submit copies of manufacturer's specifications for products to be used.

**PART 2 - PRODUCTS**

2.01 MATERIALS

- A Pull boxes and junction boxes used on concealed runs of conduit in walls and over ceilings shall be of code gauge galvanized steel with sheet steel covers. Pull boxes in floors shall be of galvanized malleable cast iron, with gasketed covers. Exposed pull boxes or junction boxes installed outdoors shall be weatherproof and shall be provided with watertight gasketed covers fastened with corrosion resistant screws.
- B Pull Boxes and Junction Boxes: Metal construction conforming to National Electrical Code, with screw-on or hinged cover. Use hinged cover for boxes larger than 12 in. in any dimension.
- C Flush-Mounted Pull Boxes: Provide overlapping covers with flush-head cover retaining screws, prime coated.

**PART 3 - EXECUTION**

3.01 INSTALLATION

- A Use separate pull boxes and junction boxes for electric power, control, lighting, computer and communication systems.
- B Install pull boxes and junction boxes where required by the National Electrical Code and wherever required to overcome mechanical difficulties.
- C Install pull boxes in interior conduit at not more than 100 ft. apart when junction or outlet boxes do not break conduit runs.
- D Size pull boxes and junction boxes to best meet the needs of the particular situation and/or location and to comply with the National Electrical Code.
- E Coordinate the work in this section with the work under other divisions of this specification.

**END OF SECTION**

**SECTION 260533**

**CONDUITS**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Provide labor, materials, services, equipment, and appliances required in conjunction with the installation of conduit systems as indicated in the Contract Documents.

1.02 SUBMITTALS

- A Manufacturer's Data: Submit copies of manufacturer's specifications and product data for products to be used.

**PART 2 - PRODUCTS**

2.01 MATERIALS

- A Rigid Metal Conduit: Heavy-wall, mild steel tube with metallic corrosion-resistant coating on interior and exterior, hot-dipped galvanized, free from defects and manufactured in accordance with ANSI standards, and UL listed.
- B Electric Metallic Tubing (EMT): Welded steel tubing formed of low carbon steel, electro-galvanized exterior, inside coated with a thick, baked, tough elastic low-friction coating of enamel, and UL approved.
- C Intermediate Metal Conduit (IMC): Manufactured in accordance with UL 1242 with interior coating of silicone epoxy ester lubricant.
- D Flexible Metal Conduit: Single strip helically wound interlocking galvanized steel, UL listed; provide liquid tight with extruded polyvinyl jacket in damp and wet locations and in kitchens.
- E Elbows and Bends:
  - 1. Same material as the conduit with which they are installed.
- F Bushings:
  - 1. 1-1/4 in. and smaller - high-impact thermosetting phenolic insulation, 150°C, O-Z/Gedney Type A.
  - 2. 1-1/2 in. and larger - hot-dipped galvanized with thermosetting phenolic insulation, 150°C, O-Z/Gedney Type B.
- G Locknuts:
  - 1. 1-1/4 in. and smaller - zinc-plated heavy stock steel, O-Z/Gedney.
  - 2. 1-1/2 in. and larger - cadmium-plated malleable iron, O-Z/Gedney.
- H Hubs: Cadmium-plated malleable iron, tapered threads, neoprene 'O' ring, insulated throat, O-Z/Gedney.
- I EMT Connectors: Compression type, zinc-plated steel body, cadmium-plated malleable iron nut, insulated throat, O-Z/Gedney.
- J EMT Couplings: Compression type, zinc-plated steel body, O-Z/Gedney.
- K Liquid tight Conduit Connectors: Cadmium-plated malleable iron body and nut, cadmium plated steel ferrule, insulated throat, integrally-cast external ground lug, O-Z/Gedney Type 4QL.
- L Through-Wall and Floor Seals: Malleable iron body, oversize sleeves, sealing rings, pressure clamps and hex-head cap screws, O-Z/Gedney Type FSK.
- M End Bells: Hot-dipped galvanized, threaded, malleable iron, O-Z/Gedney Type TNS.
- N Expansion Fittings: Hot-dipped galvanized, malleable iron with bonding jumpers.
  - 1. Linear - O-Z/Gedney Type AX or TX.
  - 2. Linear with deflection - O-Z/Gedney Type AXDX.
- O Escutcheons: Chrome-plated sectional floor and ceiling plates, Crane No. 10.
- P Accessories: Reducers, bushings, washers, etc., shall be cadmium-plated, malleable iron of the forms and dimensions best suited for the application.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A Size conduits as indicated on the Contract Drawings and as required by the National Electrical Code for the quantity and sizes of wires to be installed in the conduit. Do not use conduit sized less than 3/4 in. unless specified otherwise.
- B No more than one, three-phase circuit or three, single phase circuits may be placed in a single conduit, unless specifically noted on the drawings as such.
- C Conceal conduits from view in all areas except mechanical and electrical rooms and crawl spaces. Should it appear necessary to expose any conduit:
  - 1. Bring it to the attention of the Architect immediately and obtain Architect's approval for location of exposed conduit.
  - 2. Rearrange the work to facilitate an approved installation.
- D Install conduits at elevations to maintain headroom and at locations to avoid interference with other work requiring grading of piping, the structure, finished ceiling, walls, access panels, etc. Avoid crossing other work.
- E To prevent displacement, securely support conduits to be concealed in the building structure and installed in advance of other work. Carefully lay out conduits installed within the structure, such as floors, beams, and walls to avoid densities excessive for the construction.
- F Ream, remove burrs, and swab inside conduits before pulling in conductors.
- G Cap or plug conduits with standard manufactured accessories as soon as the conduits have been permanently installed in place.
- H Make bends and offsets in 1 in. and smaller conduits with approved bending devices. Do not install conduits, which have had their walls crushed, deformed or their surface finish damaged due to bending.
- I Where space conditions prohibit the use of standard ells, elbows, and conduits, use cast ferrous alloy fittings of such forms and dimensions as best suited for the application.
- J Make conduit joints mechanically tight, electrically continuous, and watertight. Pitch conduits in areas where moisture may subsequently be present in a manner to avoid creating moisture traps; where unavoidable, provide junction box with drain fitting at conduit low point.
- K Install insulated throat threaded hubs on conduits entering enclosures without threaded hubs in wet and damp locations.
- L Install and neatly rack exposed conduits parallel with and perpendicular to building walls. Provide space for 25% additional conduit. Do not install exposed diagonal conduit runs.
- M Route and suspend conduits crossing expansion joints to permit expansion, contraction, and deflection utilizing approved fittings to prevent damage to the building, conduits, and supporting devices.
- N Do not install conduits exposed on the roof unless approval is obtained prior to installation.
- O Route conduit through roof openings for piping and duct-work where possible; otherwise, route through roof penetration system as specified in Section 260527 - SEALING OF PENETRATIONS.
- P Do not place conduits in close proximity to equipment, systems and service lines, such as hot water supply and return lines, steam pipes, which could be detrimental to the conduit and its contents. Maintain a minimum of 3 in. separation, except in crossing, which shall be a minimum 1 in.
- Q Connect motors, equipment containing motors, equipment mounted on isolated foundations, transformers and other equipment and devices which are subject to vibration and which require adjustment, with flexible metallic conduit from the device to the conduit serving it. Restrict length of flexible conduit to 6 ft. maximum unless specifically instructed in writing otherwise by the Architect. Provide secure supports at the points of attachment on each side of the connection. Use bonding jumpers as directed by the National Electrical Code and other sections of these specifications.
- R Install escutcheons on sight exposed conduits passing through interior floors, walls, and ceilings in finished spaces
- S Install fire seals on conduits passing through fire-rated partitions, floors and ceiling.
- T Install through-wall seals on conduits passing through exterior walls or use standard galvanized steel pipe sleeves, diameters 1/2 in. greater than the outside diameter of the sleeved conduit and fill the annular space with mastic.
- U Install sleeves for conduits passing through interior floors.
- V Install insulated throat grounding bushings on conduits stubbed through slabs and foundations into electrical enclosures.
- W Provide grounding of conduits, fittings and accessories. Refer to grounding section of specifications.
- X Feeder Circuits:



1. Install rigid metal conduit in damp and wet locations and where exposed in mechanical and electrical equipment rooms and crawl spaces.
2. Install flexible metal conduit where specified above and where permitted by the authorities having jurisdiction. Use liquid tight flexible metal conduit in damp and wet locations, and where exposed in mechanical and electrical equipment rooms.

Y Branch Circuits:

1. Install rigid metal conduit in damp and wet locations and where exposed in crawl space.
2. Install electrical metallic tubing where concealed by building structure and where exposed in mechanical and electrical equipment rooms.
3. Install flexible metal conduit where specified above and where permitted by the authorities having jurisdiction. Use liquid tight flexible metal conduit in damp and wet locations, where exposed in mechanical and electrical equipment rooms, and in kitchen and shop areas. Limit flexible conduit to a length of 6 ft. maximum unless specifically instructed otherwise, in writing, by the Architect.

**END OF SECTION**

## SECTION 260534

### OUTLET BOXES

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Provide labor, materials, services, equipment and appliances required in conjunction with the installation of outlet boxes as indicated in the Contract Documents.

##### 1.02 SUBMITTALS

- A Manufacturer's Data: Submit copies of manufacturer's specifications for products to be used.

#### PART 2 - PRODUCTS

##### 2.01 OUTLET BOXES

- A Sheet Metal Outlet Boxes: ANSI/NEMA OS 1; galvanized steel, with 1/2 in. male fixture studs where required.
- B Cast Boxes: Cast metal, deep type, gasketed cover, threaded hubs. Use cast boxes for damp and outdoor installation.
- C Provide boxes with plaster ring where required. Boxes for installation in masonry walls shall be special square corner masonry type.
- D Furnish boxes with proper covers and device plates.
- E Cast Metal Boxes for Outdoor and Wet Location Installations: NEMA 250; Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as rain tight. Cast metal box and cover with ground flange, neoprene gasket, and stainless steel cover screws.

##### 2.02 FLOOR BOXES

- A Single Service (Power, data, telephone, etc.)
  - 1. Ground level and below: round, cast iron, fully adjustable, Hubbell #B2537 with brass cover and threaded outlets #S3725 for flush outlets and #SC3099/98 series pedestal for surface receptacles. Use #SC309D for single duplex receptacle and #SC309B for back or blank face. Use SB3182 brass carpet flange in areas that have carpet.
  - 2. Above ground level: round, galvanized steel, fully adjustable, Hubbell #B2529 with covers and fittings as described in 2.2.A.1 above.
  - 3. Ground level and below; telephone and other communication outlets: round, cast iron, fully adjustable, Hubbell #B2536 with brass cover and threaded outlet #S2525 cover for flush outlet and #SC3099/98 series pedestal and SS309T for telephone single outlet. Use #SB3182 brass carpet flange in areas that have carpet.
  - 4. Above ground level; telephone and other communication outlets: round, galvanized steel, fully adjustable, Hubbell #B2529 with covers and fittings described in 2.2.A.3 above.
- B Multiple Service (Power, data, telephone, etc.)
  - 1. Rectangular, cast iron, fully adjustable with number of gangs as shown on plans, Hubbell #B4000 series with brass cover and threaded outlets #S3625. Use SB308X series brass carpet flange in areas that have carpet.

#### PART 3 - EXECUTION

##### 3.01 COORDINATION OF BOX LOCATIONS

- A Provide electrical boxes as shown on the Drawings, and as required for splices, taps, wire pulling, equipment connections and code compliance.

- B Determine from dimensions shown on the Contract Documents and by actual measurements on the site, the exact location of each outlet. Outlet locations shall be modified from those shown on the plans to accommodate changes in door swings, space changes or to clear other interferences that arise or from job modifications. Make such modifications at no cost to the Owner as a matter of job coordination. Coordinate job conditions and notify the Architect of discrepancies before proceeding with the installation of the work. Set wall boxes in advance of wall construction blocked in place, and secure. Set wall boxes flush with the finish. Install extension sleeves as required to extend boxes to finished surfaces.
- C The locations of equipment and outlets shown on the Contract Documents are approximate. Check and verify exact locations in the field. Coordinate installation with the Architect and with the work under other divisions of the specifications.
- D Unless otherwise noted, location of outlet boxes, measured to centerline of box, shall be as follows:

EQUIPMENT OR OUTLETS	ELEVATION (ABOVE FINISHED FLOOR)
Toggle Switches	3 feet - 10 inches
Fire Alarm Pull Stations	3 feet - 10 inches
Receptacles	1 foot - 6 inches
Clock and Clock Outlets	7 feet - 6 inches
Fire Alarm Audible or Audible/Visual Devices	6 feet - 8 inches to bottom of device
Combination motor starters	5 feet - 0 inches
Control stations	3 feet - 10 inches
Manual starters	5 feet - 0 inches
Thermostats in office	3 feet - 10 inches
Telephone/data outlets	1 foot - 6 inches
Circuit protective devices	6 feet - 6 inches to top of enclosure

- E Locate and install boxes to allow access. Where installation is inaccessible, coordinate locations and sizes of required access doors in accordance with other sections of the specifications.
- F Locate and install to maintain headroom and to present a neat appearance.

3.02 OUTLET BOX INSTALLATION

- A Do not install boxes back-to-back in walls. Provide a minimum 6 in. separation in common wall cavity, except provide minimum 24 in. separation in acoustic rated walls. Refer to architectural drawings for locations of acoustic walls.
- B Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes.
- C Provide knockout closures for unused openings.
- D Use multiple-gang boxes where multiple devices are shown to be installed together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.
- E Install boxes in walls without damaging wall insulation.
- F Coordinate mounting heights and locations of outlets mounted above counters, benches and back splashes.
- G Position outlets to coordinate luminaire locations with ceilings.
- H In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed luminaire, to be accessible through luminaire ceiling opening.
- I Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.
- J Align wall-mounted outlet boxes for switches, thermostats and similar devices.

**END OF SECTION**

## **SECTION 260535**

### **WIREWAY**

#### **PART 1 - GENERAL**

##### 1.01 DESCRIPTION

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Provide labor, materials, services, equipment and appliances required in conjunction with the installation of wireway systems as indicated in the Contract Requirements.

##### 1.02 SUBMITTALS

- A Submit copies of manufacturer's specifications for products used.

#### **PART 2 - PRODUCTS**

##### 2.01 MATERIALS

- A Provide wireway as manufactured by Square D, Hoffman, B-Line or accepted substitute.
- B General-purpose wireway: Square D Square Duct Series LD.
- C Wireway end closures, supports and associated fittings: Square D, of best forms and dimensions for applications.

#### **PART 3 - EXECUTION**

##### 3.01 INSTALLATION

- A Provide systems of wireway of sufficient size where indicated. Provide for equipment racks or cabinets mounted in close proximity.
- B Size wireway cross-sectional area and length based upon conductor fill and equipment served as required by the NEC and local codes.
- C Install types based on environmental conditions to which exposed.
- D Coordinate the work in this section with the work under other divisions of this specification.

**END OF SECTION**

## **SECTION 262716**

### **CABINETS**

#### **PART 1 - GENERAL**

##### 1.01 DESCRIPTION

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Provide labor, materials, services, equipment and appliances required in conjunction with the installation of cabinets as indicated in the Contract Documents.

##### 1.02 SUBMITTALS

- A Manufacturer's Data: Submit copies of manufacturer's specifications for products to be used.

#### **PART 2 - PRODUCTS**

##### 2.01 MATERIALS

- A Interior: Provide galvanized code gauge steel cabinets with over-lapped-welded corners with front edges turned over to receive trim. Provide adjustable trim fastened to the cabinets with captive hardware, continuous hinge doors, and a circuit directory on inside of door. The door shall have cylinder tumbler type lock. Provide combination three-point catch and lock for doors more than 48 in. high.

#### **PART 3 - EXECUTION**

##### 3.01 INSTALLATION

- A Provide cabinets for flush or surface mounting for all lighting panels, power panels and elsewhere as indicated.
- B Verify wall thickness prior to installation of flush-mounted cabinets to determine adequate space for cabinet to be flush mounted. If wall is not deep enough to install cabinet flush with wall, consult Architect for direction.
- C Install three one-inch empty conduits from each flush-mounted cabinet to nearest accessible ceiling space for future use. Turn conduits horizontal at accessible ceiling space.
- D Coordinate the work under this section with the work of other divisions of this specification.

**END OF SECTION**

**SECTION 262726**

**WIRING DEVICES**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Provide labor, materials, services, equipment and appliances required in conjunction with the installation of wiring devices as indicated in the Contract Documents.

1.02 SUBMITTALS

- A Manufacturer's Data: Submit copies of manufacturer's specifications for products to be used. Manufacturer's catalog numbers listed are used to set the standard.
- B Acceptable Manufacturers: Hubbell, Leviton and Pass & Seymour. All wiring devices for the project shall be of one manufacturer.

**PART 2 - PRODUCTS**

2.01 SWITCHES

- A
  - 1. Single pole, 20 amp  
Hubbell HBL1221; Leviton 1221-2; Pass & Seymour PS20AC1
- B
  - 1. Double pole, 20 amp  
Hubbell HBL1222; Leviton 1222-2; Pass & Seymour PS20AC2
- C
  - 1. Three way, 20 amp  
Hubbell HBL1223; Leviton 1223-2; Pass & Seymour PS20AC3
- D
  - 1. Four way, 20 amp  
Hubbell HBL1224; Leviton 1224-2; Pass & Seymour PS20AC4
- E Key switches - Hubbell 1221RKL; Leviton 1221-2KL; Pass & Seymour PS20AC1KL series, with two keys. Prong keys will not be acceptable.
- F Provide 20 amp switches for loads exceeding 10 amps.
- G Use HP rated switches approved for motor control or disconnect service when controlling or disconnecting motor loads in excess of 1/4 HP.
- H Door switch on when door is open, equivalent to Pass & Seymour 1200.
- I Door switch on when door is closed, equivalent to Pass & Seymour 1201.
- J Switch with pilot light, equivalent to Hubbell 1221PL with red polycarbonate toggle.

2.02 WALL BOX PRESET DIMMERS

- A Provide Leviton "Renoir II" Series dimmers with linear slide and on/off switch or equivalent, sized for 150 percent of the load, unless larger size is indicated. Provide LED, incandescent, fluorescent, or low voltage type dimmer to match the load application shown on the drawings. Provide single-pole or three-way dimmers as indicated on plans. Provide gang dimmers as required in accordance with manufacturer's directions. Provide dimmers with white plastic coverplate.

2.03 RECEPTACLES

- A
  - 1. Duplex receptacle, 20 amp  
Hubbell HBL5362; Leviton 5362; Pass & Seymour PS5362
- B
  - 1. Ground fault circuit interrupting (GFCI), tamper resistant, type receptacle, equivalent to Hubbell GFST83W.  
Provide weather resistant GFCI receptacle for exterior locations. Do not use feed-through feature. Install GFCI device at each location.
- C Patient Care Areas:
  - 1. Duplex receptacle, 15 ampequivalent to Hubbell HBL8200
  - 2. Duplex receptacle, 20 ampequivalent to Hubbell HBL8300
  - 3. GFCI receptacle, 20 amp equivalent to Hubbell GFR8300TR

#### 2.04 WIRING DEVICES

- A All wiring devices shall be white wiring devices for normal power circuits. Provide red wiring devices for emergency power circuits.

#### 2.05 COVERPLATES

- A Interior - white, smooth nylon equivalent to Leviton 80000 Series standard size, 0.220 inch thick. Screw heads shall have color to match plate. Provide red, smooth nylon coverplates for devices connected to emergency power circuits.
- B Provide blank telephone and data coverplates same as above.
- C Exterior - extra heavy duty, die cast aluminum, weatherproof while-in-use cover equivalent to Hubbell WP26E series.

### **PART 3 - EXECUTION**

#### 3.01 COORDINATION

- A Determine from dimensions shown in the Contract Documents and by actual measurements on the site the exact location of each wiring device. The wiring device locations shall be modified from those shown on the plans to accommodate changes in door swings, space changes or to clear other interferences that arise, or from other job modifications. Make such modifications at no cost to the Owner as a matter of job coordination. Notify the Architect of discrepancies before proceeding with the installation of the work.

#### 3.02 INSTALLATION OF WIRING DEVICES

- A Install receptacles and switches only in electrical boxes that are clean, free from excess building materials, debris, etc.
- B Switches installed at one location shall be ganged together under one coverplate.
- C Install receptacles for electric water coolers out of sight where possible.

#### 3.03 TESTING

- A Test wiring devices to insure electrical continuity of grounding then energize circuit to demonstrate compliance with requirements.

**END OF SECTION**

## SECTION 262816

### OVERCURRENT PROTECTIVE DEVICES

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Furnish all labor, materials, services, equipment appliances required in conjunction with installation of overcurrent protective devices as indicated in the Contract Documents.

##### 1.02 SUBMITTALS

- A Manufacturer's Data: Submit copies of manufacturer's specifications for products to be used.

#### PART 2 - PRODUCTS

##### 2.01 FUSES

- A Fuses shall be current-limiting, with 200,000 RMS symmetrical amperes interrupting rating and shall be UL listed. All fuses shall be of same manufacturer.
- B Fuses in motor circuits shall be changed, if necessary, as follows: Fuses for not less than 1.15 service factor motors shall have an ampere rating 125 percent of motor full load current or next higher fuse rating. Fuses for 1.0 service factor motors shall have an ampere rating 115 percent of motor full load current or next higher fuse rating. Use special fusing sizing considerations where motors are subjected to high ambient temperatures, where the motor drives an inertia load causing starting current to be prolonged, where on-off cycles less than 30 minutes, or where special hermetically sealed motors have unusual starting characteristics. When a physically smaller fuse is required in a switch, then the fuse clips must be changed.

##### 2.02 MOLDED CASE CIRCUIT BREAKERS

- A Molded Case Circuit Breaker Characteristics – General
  1. 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.
  2. Circuit breakers shall have an over center, trip free, toggle operating mechanism which will provide quick-make, quick-break contact action. The circuit breaker shall have common tripping of all poles.
  3. The circuit breaker handle shall 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.
  4. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker.
  5. Circuit breakers shall be equipped with UL Listed electrical accessories as noted in these specifications. Circuit breaker handle accessories shall provide provisions for locking handle in the ON and OFF position.
  6. All circuit breakers shall be UL Listed for reverse connection without restrictive line and load markings and be suitable for mounting in any position.
  7. Circuit breakers shall be equipped with factory installed mechanical lugs. All circuit breakers shall be UL Listed to accept field installable/removable mechanical type lugs (except Square D type Q2, Q2H and Q2-H or equivalent). Lug body shall be bolted in place; snap in design not acceptable. All lugs shall be UL Listed to accept solid (not larger than #8 AWG) and/or stranded copper and aluminum conductors. Lugs shall be suitable for 90°C rated wire, sized according to the 75°C temperature rating in the National Electrical Code. Provide lugs as required to accept feeder conductor sizes and quantities as shown on drawings.
  8. All circuit breakers shall be capable of accepting bus connections.
  9. Circuit breakers shall be fully rated and capable of interrupting the fault current available to them. Series connected ratings with upstream devices is not acceptable to meet this requirement.
  10. Manufacturer shall provide electronic and hard copy time/current characteristic trip curves (and  $I_p$  &  $I_t$  let through curves for current limiting circuit breakers) for each type of circuit breaker.
- B Thermal-Magnetic Circuit Breakers



1. Circuit breakers shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole.
  2. Thermal trip elements shall be factory preset and sealed. Circuit breakers shall be true RMS sensing and thermally responsive to protect circuit conductor(s) in a 40°C ambient temperature.
  3. Circuit breaker frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the circuit breaker except type Square D, Q2, Q2H and Q2-H or equivalent.
  4. Standard two- and three-pole circuit breakers up to 250 amperes at 600 VAC shall be UL Listed as HACR type.
- C
- Equipment Ground Fault Protection (Thermal Magnetic Circuit Breakers)
1. Circuit breakers 250 amperes and less shall be equipped with a Ground Fault Module.
  2. Ground fault sensing system shall be modified zero sequence sensing type.
  3. The ground fault system shall require no external power to trip the circuit breaker.
  4. Companion circuit breaker shall be equipped with a ground-fault shunt trip.
  5. The ground fault sensing system shall be suitable for use on grounded systems. The ground fault sensing system shall be suitable for use on three-phase, three-wire circuits where the system neutral is grounded but not carried through the system or on three-phase, four-wire systems.
  6. Ground fault pickup current setting and time delay shall be field adjustable. A switch shall be provided for setting ground fault pickup point. A means to seal the pickup and delay adjustments shall be provided.
  7. The ground fault sensing system shall include a ground fault memory circuit to sum the time increments of intermittent arcing ground faults above the pickup point.
  8. A means of testing the ground fault system to meet the on-site testing requirements of NEC Section 230-95(c) shall be provided.
  9. Local visual ground fault trip indication shall be provided.
  10. The ground fault sensing system shall be provided with Zone Selective Interlocking (ZSI) communication capabilities compatible with other thermal magnetic circuit breakers equipped with ground fault sensing, electronic trip circuit breakers with integral ground fault sensing and external ground fault sensing systems as noted on the drawings.
  11. The companion circuit breaker shall be capable of being group mounted.
  12. The ground fault sensing system shall not affect interrupting rating of the companion circuit breaker.
- D
- Electronic Trip Circuit Breaker With Full Function Trip System
1. Circuit breaker trip system shall be a microprocessor-based true rms sensing design with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the associated schedules.
  2. The integral trip system shall be independent of any external power source and shall contain no less than industrial grade electronic components.
  3. The ampere rating of the circuit breaker shall be determined by the combination of an interchangeable rating plug, the sensor size and the long-time pickup adjustment on the circuit breaker. The sensor size, rating plug and switch adjustments shall be clearly marked on the face of the circuit breaker. Circuit breakers shall be UL Listed to carry 100% of their ampere rating continuously.
  4. The following time/current response adjustments shall be provided. Each adjustment shall have discrete settings and shall be independent of all other adjustments.
    - a. Long Time Pickup Instantaneous Pickup
    - b. Long Time Delay Ground Fault Alarm Only Pickup
    - c. Short Time Pickup Ground Fault Pickup
    - d. Short Time Delay ( $I^2t$  IN and  $I^2t$  OUT) Ground Fault Delay ( $I^2t$  IN and  $I^2t$  OUT)
  5. Circuit breakers with adjustable short-time function shall be provided with defeatable instantaneous adjustment and 30 cycles short time withstand ratings. Short time withstand ratings shall be specified in RMS symmetrical amperes, as shown on the drawings.
  6. A means to seal the rating plug and trip unit adjustments in accordance with NEC Section 240-6(b) shall be provided.
  7. Local visual trip indication for overload, short circuit and ground fault trip occurrences shall be provided.
  8. An ammeter to individually display all phase currents flowing through the circuit breaker shall be provided. Indication of inherent ground fault current flowing in the system shall be provided on circuit breakers with integral ground fault protection. All current values shall be displayed in True RMS with 2% accuracy.
  9. Long Time Pickup indication to signal when loading approaches or exceeds the adjusted ampere rating of the circuit breaker shall be provided.

10. The trip system shall include a Long Time memory circuit to protect against intermittent overcurrent conditions above the long time pickup point. Means shall be provided to reset Long Time memory circuit during primary injection testing.
  11. Circuit breaker trip system shall be equipped with an externally accessible test port for use with a Universal Test Set. Disassembly of the circuit breaker shall not be required for testing. Test set shall be capable of verifying the operation of all trip functions with or without tripping the circuit breaker.
  12. Communications capabilities for remote monitoring of circuit breaker trip system, to include phase and ground fault currents, pre-trip alarm indication, switch settings, and trip history information shall be provided.
  13. Circuit breakers shall be provided with Zone Selective Interlocking (ZSI) communications capabilities on the short-time and ground fault functions compatible with all other electronic trip circuit breakers and external ground fault sensing systems .
- E Equipment Ground Fault Protection (Electronic Trip Circuit Breakers)
1. Circuit breakers shall be provided with integral equipment ground fault protection for grounded systems. The circuit breaker shall be suitable for use on three-phase, three-wire circuits where the system neutral is grounded but not carried through the system or on three-phase, four-wire systems.
  2. A separate neutral current transformer shall be provided for three-phase four-wire systems as indicated on schedules and drawings.
  3. Ground fault sensing system shall be residual sensing type.
  4. The trip system shall include a ground fault memory circuit to sum the time increments of intermittent ground faults above the pickup point.
  5. A means of testing the ground fault system to meet the on-site testing requirements of NEC Section 230-95(c) shall be provided.
  6. Local visual trip indication for a ground fault trip occurrence shall be provided.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A Install overcurrent devices in accordance with the National Electrical Code. Coordinate the work under this section with the work under other divisions of the specifications.
- B Fuses shall be installed in all switches as scheduled or noted on the Drawings, and shall be Bussman, Mersen, Littelfuse, Inc., or an approved equivalent.
- C Unless otherwise indicated, protective devices shall be mounted with top of cabinet or enclosure 6 ft. 6 in. above finished floor, properly aligned, and adequately supported independently of the connecting raceways. All steel shapes, etc., necessary for the support of the equipment shall be furnished and installed where the building structure is not suitable for mounting the equipment directly thereon.
- D A fuse identification label showing type and size shall be placed inside the door of each fused switch.
- E Circuit breaker pick-up level and time delay settings shall be adjusted to values as instructed by the Engineer.

**END OF SECTION**

**SECTION 262817**

**DISCONNECT SWITCHES**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Furnish all labor, materials, services, equipment and appliances required in conjunction with installation of disconnect switches as indicated in the Contract Documents.

1.02 SUBMITTALS

- A Manufacturer's Data: Submit copies of manufacturer's specifications for products to be used.

**PART 2 - PRODUCTS**

2.01 MATERIALS

- A Furnish fusible Class 'R' or non-fusible disconnect switches of ampere rating as required, or as indicated on the Drawings. Furnish heavy-duty, quick-make, quick-break, three-phase, three-pole switches, unless otherwise noted. Use NEMA 1 enclosures where installed indoors. Use NEMA 3R for outdoor enclosures. Provide enclosures with interlocking covers, externally front operated flange mounted switch levers, and provisions for use of three safety padlocks in the 'Off' position. Provide horsepower rated switches for motor circuits. Disconnect switches shall be of the same manufacturer as the panelboards.

**PART 3 - EXECUTION**

3.01 INSTALLATION

- A See Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK paragraph: Identification of Electrical Equipment.
- B Install switches to comply with National Electrical Code and coordinate the work with the work under other divisions of the specifications.

**END OF SECTION**

**SECTION 262913**

**MOTORS, MOTOR STARTERS AND CONTROLS**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Furnish all labor, materials, services, equipment and appliances required in conjunction with installation of motors, motor starters and controls as indicated in the Contract Documents.

1.02 SUBMITTALS

- A Manufacturer's Data: Submit copies of manufacturer's specifications for products to be used.

1.03 ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT

- A Electrical wiring for mechanical equipment is separated into two main wiring Divisions: "Power Wiring" and "Control Wiring".
- B Power wiring is wiring and conduit from the primary energy source and includes circuit protective devices, motor starters or controllers, conduit, wiring and safety disconnects beginning at the power supply and terminating at the motor terminals on equipment.
- C Control wiring is wiring and conduit not included in "Power Wiring", including automatic temperature control wiring, interlock wiring, pilot light, signal wiring, etc., that is included for proper operation or safety of the equipment.
- D Provide power wiring under Division 26 of this specification.
- E Control wiring will be provided under Division 23 of this specification.
- F Refer to Section 260512 - MECHANICAL AND ELECTRICAL COORDINATION, for directions concerning coordination of the work between Divisions 23 and 26. Coordinate the work under this section with the work under other divisions of the specifications.
- G Install power and control wiring in compliance with National Electrical Code and this Division.
- H Disconnect switches, except where furnished factory mounted, shall be supplied and installed by the Electrical Contractor.

**PART 2 - PRODUCTS**

2.01 MATERIALS

- A Unless otherwise specified or required, control conductors with a potential of 120 volts or higher shall be a minimum of #14 THWN stranded, and control conductors with a potential of less than 120 volts may be #16 TFFN, unless larger conductors are required to compensate for voltage drop.
- B Install control wiring in a separate conduit raceway system.
- C Color code conductors to coordinate with wiring schematics and diagrams.
- D Other materials shall be as specified in other sections of the specifications.

**PART 3 - EXECUTION**

3.01 INSTALLATION

- A Note that the electrical design and drawings are based upon equipment furnished under other divisions of the specifications as indicated in the Contract Documents. Should any equipment change dictate changes to the electrical design the required changes shall be made at no additional cost to the Owner.
- B Verify the electrical capacities of all motors and electrical equipment furnished by other Divisions and install wiring and equipment as required to completely connect all equipment.
- C Where possible, terminate conduits in conduit boxes on motors. Where motors are not provided with conduit boxes, terminate the conduits in conduit fittings at the motors.

- D Where disconnect switches are not provided integral with the control equipment for motors, provide disconnect switches required by these Specifications and the NEC. Generally, disconnect switches shall be heavy-duty, enclosed, externally operable, horsepower-rated switches. Each disconnect switch shall be installed where shown on the Drawings or as close as possible to the motor. Each disconnect switch shall be within sight of its associated controller.

### 3.02 OVERCURRENT PROTECTION

- A Prior to providing power to equipment, obtain manufacturer's engineering and electrical data.
- B Provide overcurrent protection of equipment in strict accordance with manufacturer's maximum recommendations and specifications. Provide HACR circuit breakers and fuses in accordance with manufacturer's recommendations and specifications.
- C Install wiring in a separate conduit raceway system in harmony with other raceway systems on the project.
- D Install starters, not furnished within a motor control center on a 3/4 in. thick marine plywood backboard painted to match the surrounding area. Apply a minimum of two coats of paint. Install control and/or accessory devices on the backboard also, in mechanical equipment areas.

### 3.03 ELECTRICAL CONNECTIONS

- A Provide electrical connections to each item of equipment requiring such connections.

### 3.04 EQUIPMENT IDENTIFICATION

- A Identify starters, switches, pushbuttons and other control devices by the attachment of nameplates constructed from laminated phenolic engraved plastic three-ply with black surface and white interior core at least 1/16 in. thick. Engraved lettering shall use an Arial bold font at least 1/4 in. high and properly spaced for legible and easy reading. Attach plates to equipment with chromium-plated screws. Adhesive attachment is not acceptable.

**END OF SECTION**

## SECTION 265113

### LIGHTING

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Furnish all labor, materials, services, equipment and appliances required in conjunction with the installation of a lighting system as indicated in the Contract Documents.

##### 1.02 SUBMITTALS

- A Manufacturer's Data: Submit copies of fixture, ballast and lamp manufacturer's specifications for products used. Identify the total input watts including ballast losses for each fixture type.
- B Submit lighting facts documentation for all LED fixtures.
- C If required by Architect, submit samples of lighting fixtures for approval.

#### PART 2 - PRODUCTS

##### 2.01 MATERIALS

- A Lighting Fixtures: See Schedule in Contract Documents.
- B Where fixtures are subject to moisture, provide damp location (DL) or wet location (WL) label on fixtures as required for the location.

##### 2.02 LED FIXTURES

- A Shall be tested for adherence to IESNA LM79 standards for lumen output and depreciation.
- B Shall be tested to IESNA LM80 standards and shall be rated to deliver LM80 performance for 50,000 hours.
- C Shall be DLC (DesignLight Consortium) certified.
- D Shall be equipped with 0-10 volt dimming driver.
- E Shall carry a 5 year all-inclusive component warranty for defects.

##### 2.03 EXIT LIGHTS

- A Furnish and install exit lights as indicated in the Contract Documents.
- B Provide single or double face unit as required for each location with arrows as required to clearly define the path of egress, whether shown on the drawings or not. Provide battery powered exit lights, for ninety minute duration, if exit lights are not served with an emergency power source.
- C Locate fixtures on the ceiling or wall as required by the Architect.

#### PART 3 - EXECUTION

##### 3.01 INSTALLATION

- A Provide lighting fixtures as specified and scheduled in the Contract Documents. Provide in accordance with the type designation shown in the Contract Documents. If a type designation is omitted, verify fixture selection with Architect prior to installation.
- B Check the architectural finishes, and provide fixtures with proper trim, frames, supports hangers, and other hardware as required to coordinate with proper finishes, regardless of specified or scheduled catalog number, prefixes and suffixes.
- C Coordinate with Division 23 and other divisions of the specifications to avoid conflicts between lighting fixtures, supports and fittings and mechanical equipment and other work.
- D Fixtures, which are tandem mounted and recessed in gyboard or plaster ceilings shall be yoke mounted.
- E Immediately before final inspection, clean all fixtures, inside and out, including plastics and glassware, adjust all trim to properly fit adjacent surface, replace broken or damaged parts. Test all fixtures for electrical as well as mechanical operation.

**END OF SECTION**

**SECTION 270528**

**EMPTY CONDUIT SYSTEMS**

**PART 1 - GENERAL**

1.01 SUMMARY

- A Refer to Section 260510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK.
- B Furnish all labor, materials, services, equipment and appliances required in conjunction with the installation of empty conduit systems for telephone, computer communication and other systems as indicated in the Contract Documents.

1.02 SUBMITTALS

- A Manufacturer's Data: Submit copies of manufacturer's specifications for products used.

**PART 2 - PRODUCT**

2.01 MATERIAL

- A Provide cabinets as specified elsewhere in the specifications. Furnish total metal unit with enclosure, hinged door, lock with two keys and installed with 3/4 in. thick plywood in back.
- B Provide 3/4 in. thick marine plywood painted with one coat of primer and two coats of latex enamel to match surroundings.

**PART 3 - EXECUTION**

3.01 INSTALLATION

- A Provide a 1 in. conduit from each telephone, data or combination telephone/data outlet to the accessible ceiling space above unless noted otherwise. Turn the conduit horizontal, provide a pull string in the conduit and a plastic bushing on the conduit end.
- B Install pull wire in all empty conduits or conduit systems. Label pull wire indicating the location of the other end.
- C Coordinate the work in this section with the work under other divisions of the specifications.

**END OF SECTION**