

# **CRESCENT PARK NEW BUILDING**

**684 & 700 BULLOCKS POINT AVENUE  
RIVERSIDE, RHODE ISLAND**



## **PROJECT MANUAL**

**VOLUME 1 OF 1**

**Northeast Collaborative Architects LLC  
650 Ten Rod Road  
North Kingstown, RI 02852**

**October 31, 2024**

**BID # EP24/25-07**

TECHNICAL SPECIFICATIONS

Section 000101	Cover
Section 000110	Table of Contents
Section 004100	Bonds
Section 004113	Bid Form
	A305- Contractor’s Qualifications Statement
Section 007300	Supplementary Conditions

DIVISION 01 - GENERAL REQUIREMENTS

Section 010000	General Requirements – Summary of Work
----------------	--

DIVISION 02 – EXISTING CONDITIONS

Section 025119	Selective Demolition
----------------	----------------------

DIVISION 03 – CONCRETE

Section 032000	Concrete
----------------	----------

DIVISION 04 – MASONRY

Section 042000	Unit Masonry
----------------	--------------

DIVISION 05 – METALS (NOT USED)

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

Section 061053	Miscellaneous Rough Carpentry
Section 061643	Glass Reinforced Gypsum Sheathing
Section 062013	Exterior Finish Carpentry

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

Section 073113	Asphalt Shingles
Section 074643	Composite Siding
Section 076200	Sheet Metal Flashing and Trim
Section 077100	Roof Specialties
Section 079200	Joint Sealants

DIVISION 08 – OPENINGS

Section 081113	Hollow Metal Doors and Frames
Section 084113	Aluminum Framed Entrances and Storefronts
Section 087100	Door Hardware
Section 087101	Door Hardware Schedule
Section 088000	Glazing

DIVISION 09 – FINISHES

Section 093000	Tiling
Section 095113	Acoustical Panel Ceilings
Section 096723	Resinous Flooring
Section 099100	Painting

DIVISION 10 – SPECIALTIES

Section 101400	Signage
Section 102113.19	Plastic Toilet Compartments

Section 102800 Toilet and Bath Accessories  
Section 104400 Fire Protection Specialties

**DIVISION 21– FIRE SUPRESSION (NOT USED – SEE DRAWINGS)**

**DIVISION 22 – PLUMBING**

Section 220517 Sleeves And Sleeve Seals For Plumbing Piping  
Section 220519 Meters And Gauges For Plumbing Piping  
Section 220523 General-Duty Valves For Plumbing Piping  
Section 220529 Hangers And Supports For Plumbing Piping And Equipment  
Section 220553 Identification For Plumbing Piping And Equipment  
Section 220719 Plumbing Piping Insulation  
Section 221005 Plumbing Piping  
Section 223000 Plumbing Equipment  
Section 224000 Plumbing Fixtures

**DIVISION 23 – MECHANICAL**

Section 230553 Identification for HVAC Piping and Equipment  
Section 230593 Testing, Adjusting, and Balancing for HVAC  
Section 230713 Duct Insulation  
Section 230993 Sequence of Operations for HVAC Controls  
Section 232300 Refrigerant Piping  
Section 233100 HVAC Ducts and Casings  
Section 233501 Dryer-Vent Exhaust Collection Systems  
Section 233700 Air Outlets and Inlets  
Section 238129 Variable Refrigerant Flow HVAC Systems

**DIVISION 26 – ELECTRICAL**

Section 260519 Low-Voltage Electrical Power Conductors And Cables  
Section 260526 Grounding And Bonding For Electrical Systems  
Section 260529 Hangers And Supports For Electrical Systems  
Section 260533.13 Conduit For Electrical Systems  
Section 260533.16 Boxes For Electrical Systems  
Section 260553 Identification for Electrical Systems  
Section 260923 Lighting Control Devices  
Section 262100 Low-Voltage Electrical Service Entrance  
Section 262416 Panelboards  
Section 262726 Wiring Devices  
Section 264300 Surge Protective Devices  
Section 265100 Interior Lighting

**DIVISION 28 – Electronic Safety and Security**

Section 284400 Refrigerant Detection and Alarm

**DIVISION 31 – EARTHWORK**

Section 310000 Earthwork Utilities  
Section 311000 Site Preparation  
Section 312060 Erosion and Sedimentation Controls  
Section 312300 Aggregate Materials

**DIVISION 32 – EXTERIOR IMPROVEMENTS**

Section 321216	Asphalt Paving
Section 321313	Concrete Paving
Section 321413	Precast Concrete Curbing
Section 321723	Pavement Markings

**DIVISION 33 – UTILITIES**

Section 331000	Water Utilities
Section 333000	Sanitary Sewerage Utilities
Section 334000	Storm Drainage Utilities
Section 334020	Underground Utility Marking Tape
Section 334100	Storm Drainage Piping

END OF SECTION 00 01 10

**SECTION 004100 – BONDS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

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

**1.2 BID BOND**

- A. AIA Document A310, Bid Bond – 2010 Edition is required as part of a bid response. Bidders are required to provide a bid surety in the form of a bid bond payable to the Town of Cumberland in an amount not less than five percent (5%) of the bid price. Certified checks may be accepted in lieu of a Bid Bond.

**1.3 PERFORMANCE AND PAYMENT BOND**

- A. AIA Document A312, Performance and Payment Bond - 2010 Edition is an integral part of the Bid Documents and issues of this form, signed and executed by the successful Bidder and Surety, will be bound into the executed Contract.

**PART 2 – PRODUCTS - NOT USED**

**PART 3 – EXECUTION - NOT USED**

END OF SECTION 004100

## BID FORM

### 1.1 BID INFORMATION

- A. Bidder Firm: \_\_\_\_\_.
- B. Bidder Address: \_\_\_\_\_.  
\_\_\_\_\_.
- C. President/Owner: \_\_\_\_\_.
- D. Project Name: CRESCENT PARK – NEW BUILDING
- E. Project Location: 684 & 700 Bullocks Point Avenue, Riverside, RI
- F. Owner: CITYOF EAST PROVIDENCE
- G. Architect: Northeast Collaborative Architects

### 1.2 CERTIFICATIONS AND BASE BID PRICE

- A. BASE BID, Single-Prime (All Trades) Contract: The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by Northeast Collaborative Architects (NCA), having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:

\$ 

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(Place figures in appropriate boxes.)

DOLLARS

\_\_\_\_\_  
(Written Amount)

1.3 BONDS

- A. The Base Bid Price *includes* the costs for all Bid and Payment and Performance Bonds required by the solicitation.

1.4 ALTERNATES

- A. Bidders shall insert values in the appropriate column below for Add and Deduct Alternates as specified in Section: 012100 “Alternates” and as shown on the Contract Documents. Failure to complete the Alternates Table may be cause for rejection of Bid.
- B. Refer to Specification Section: 012100 “Alternates,” for more information.
- C. ALTERNATES TABLE

Alternate Number		\$ Add	\$ Deduct
1.	New Concrete Tent Slab		XXXXXXXX
2.	Demolition of existing restrooms, shelter, and clam shack structures and associated site restoration.		XXXXXXXX

1.5 UNIT PRICES

- A. Bidders shall insert values in both columns for Add and Deduct Unit Prices in the table below. Failure to complete the Unit Price Table may be cause for rejection of Bid.
- B. Refer to Specification Section: 012000 “Price and Payment Procedures B. Unit Prices,” for more information.
- C. UNIT PRICE TABLE

Unit Price	Unit	\$ Add	\$ Deduct
1. Additional electrical items, ie: outlets, switches	Per item		
2. Additional material disposal	Cubic foot		
3. Additional utility trenching	Linear foot		

1.6 BID GUARANTEE

- A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within ten (10) days after a written Notice of Award, if offered

within ninety (90) days after receipt of bids, and on failure to do so agrees to forfeit to Owner the attached cash, cashier's check, certified check, U.S. money order, or bid bond, as liquidated damages for such failure, in the amount indicated on the following Bid Bond form.

- B. In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return to the undersigned the cash, cashier's check, certified check, U.S. money order, or bid bond.

**1.7 SUBCONTRACTORS AND SUPPLIERS**

- A. The following bid amounts for the portions of the Work indicated:

- 1. Plumbing Work: \_\_\_\_\_
- 2. HVAC Work: \_\_\_\_\_
- 3. Electrical Work: \_\_\_\_\_
- 4. Landscape Plantings Work: \_\_\_\_\_
- 5. Fire Suppression Work: \_\_\_\_\_

**1.8 TIME OF COMPLETION**

- A. The undersigned Bidder proposes and agrees hereby to commence the Work of the Contract Documents on a date specified in a written Notice to Proceed to be issued by Owner, and shall achieve Substantial Completion by December 31, 2025, and fully complete the Work by February 1, 2026.
- B. Substantial Completion is defined, at least in part, as Beneficial Occupancy by the Owner.
- C. Liquidated Damages will be assessed at a rate of \$750.00 per day for each calendar day that the Certificate of Substantial Completion is delayed beyond the date listed above.

**1.9 ACKNOWLEDGEMENT OF ADDENDA**

- A. The undersigned Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid:
  - 1. Addendum No. 1, dated \_\_\_\_\_.
  - 2. Addendum No. 2, dated \_\_\_\_\_.
  - 3. Addendum No. 3, dated \_\_\_\_\_.
  - 4. Addendum No. 4, dated \_\_\_\_\_.
  - 5. Addendum No. 5, dated \_\_\_\_\_.

**1.10 BID SUPPLEMENTS**

- A. The following supplements are a part of this Bid Form and are attached hereto.
  - 1. Bid Form Supplement - Bid Bond Form (AIA Document A310).
  - 2. Bid Form Supplement – Performance And Payment Bond Form (AIA Document A312)



1.11 CONTRACTOR'S LICENSE

- A. The undersigned further states that it is a duly licensed contractor, for the type of work proposed, in State of Rhode Island and that all fees, permits, etc., pursuant to submitting this proposal have been paid in full.

1.12 SUBMISSION OF BID

Respectfully submitted this \_\_\_\_ day of \_\_\_\_\_, 2024.

Submitted By: \_\_\_\_\_  
(Name of bidding firm or corporation)

Authorized  
Signature: \_\_\_\_\_  
(Handwritten signature)

Signed By: \_\_\_\_\_  
(Type or print name)

Title: \_\_\_\_\_  
(Owner/Partner/President/Vice President)

Witness By: \_\_\_\_\_  
(Handwritten signature)

Attest: \_\_\_\_\_  
(Handwritten signature)

By: \_\_\_\_\_  
(Type or print name)

Title: \_\_\_\_\_  
(Corporate Secretary or Assistant Secretary)

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

City, State, Zip \_\_\_\_\_

Phone: \_\_\_\_\_

License No.: \_\_\_\_\_

Federal ID No.: \_\_\_\_\_

(Affix Corporate Seal Here)

END OF DOCUMENT 004113

# AIA<sup>®</sup> Document A305<sup>™</sup> – 1986

## **Contractor's Qualification Statement**

The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading.

**SUBMITTED TO:**

**ADDRESS:**

**SUBMITTED BY:**

**NAME:**

**ADDRESS:**

**PRINCIPAL OFFICE:**

- Corporation
- Partnership
- Individual
- Joint Venture
- Other

| **NAME OF PROJECT** (if applicable): Benefit Street Arsenal

| **TYPE OF WORK** (file separate form for each Classification of Work):

- General Construction
- HVAC
- Electrical
- Plumbing
- Other (please specify)

| **§ 1. ORGANIZATION**

§ 1.1 How many years has your organization been in business as a Contractor?

§ 1.2 How many years has your organization been in business under its present business name?

§ 1.2.1 Under what other or former names has your organization operated?

§ 1.3 If your organization is a corporation, answer the following:

§ 1.3.1 Date of incorporation:

§ 1.3.2 State of incorporation:

§ 1.3.3 President's name:

**ADDITIONS AND DELETIONS:**

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This form is approved and recommended by the American Institute of Architects (AIA) and The Associated General Contractors of America (AGC) for use in evaluating the qualifications of contractors. No endorsement of the submitting party or verification of the information is made by AIA or AGC.

§ 1.3.4 Vice-president's name(s)

§ 1.3.5 Secretary's name:

§ 1.3.6 Treasurer's name:

§ 1.4 If your organization is a partnership, answer the following:

§ 1.4.1 Date of organization:

§ 1.4.2 Type of partnership (if applicable):

§ 1.4.3 Name(s) of general partner(s)

§ 1.5 If your organization is individually owned, answer the following:

§ 1.5.1 Date of organization:

§ 1.5.2 Name of owner:

§ 1.6 If the form of your organization is other than those listed above, describe it and name the principals:

## § 2. LICENSING

§ 2.1 List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable.

§ 2.2 List jurisdictions in which your organization's partnership or trade name is filed.

## § 3. EXPERIENCE

§ 3.1 List the categories of work that your organization normally performs with its own forces.

§ 3.1.1 Does your organization have an approved Rhode Island Department of Labor apprenticeship program as to each category of such work.

§ 3.2 Claims and Suits. (If the answer to any of the questions below is yes, please attach details.)

§ 3.2.1 Has your organization ever failed to complete any work awarded to it?

§ 3.2.2 Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers?

§ 3.2.3 Has your organization filed any law suits or requested arbitration with regard to construction contracts within the last five years?

§ 3.2.4 State whether your organization, or any owner, stockholder, officer, director, member, partner, or principal

thereof, or any subsidiary or affiliated company:

(i) has been subject to suspension or debarment by any federal, state or municipal government agency, or the subject of criminal prosecution, or convicted of a criminal offense within the previous five years. If yes, please attach details.

(ii) has had any contracts with a federal, state or municipal government agency terminated for any reason within the previous five years. If yes, please attach details.

(iii) has been fined more than \$5,000 for violation(s) of Rhode Island environmental laws by the Rhode Island Department of Environmental Management within the previous five years. If yes, please attach details.

§ 3.3 Within the last five years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract? (If the answer is yes, please attach details.)

§ 3.4 On a separate sheet, list major construction projects your organization has in progress, giving the name of project, owner, architect, contract amount, percent complete and scheduled completion date.

§ 3.4.1 State total worth of work in progress and under contract:

§ 3.5 On a separate sheet, list the major projects your organization has completed in the past five years, giving the name of project, owner, architect, contract amount, date of completion and percentage of the cost of the work performed with your own forces.

§ 3.5.1 State average annual amount of construction work performed during the past five years:

§ 3.6 On a separate sheet, list the construction experience and present commitments of the key individuals of your organization.

| Include resumes of Superintendants and Project Managers intended to run this project.

## | § 4. REFERENCES

§ 4.1 Trade References:

§ 4.2 Bank References:

§ 4.3 Surety:

§ 4.3.1 Name of bonding company:

§ 4.3.2 Name and address of agent:

§ 5. FINANCING

§ 5.1 Financial Statement.

§ 5.1.1 Attach a financial statement, preferably audited, including your organization's latest balance sheet and income statement showing the following items:

Current Assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory and prepaid expenses);

Net Fixed Assets;

Other Assets;

Current Liabilities (e.g., accounts payable, notes payable, accrued expenses, provision for income taxes, advances, accrued salaries and accrued payroll taxes);

Other Liabilities (e.g., capital, capital stock, authorized and outstanding shares par values, earned surplus and retained earnings).

§ 5.1.2 Name and address of firm preparing attached financial statement, and date thereof:

§ 5.1.3 Is the attached financial statement for the identical organization named on page one?

§ 5.1.4 If not, explain the relationship and financial responsibility of the organization whose financial statement is provided (e.g., parent-subsidiary).

§ 5.2 Will the organization whose financial statement is attached act as guarantor of the contract for construction?

§ 6. SIGNATURE

§ 6.1 Dated at this day of

Name of Organization:

By:

Title:

§ 6.2

M being duly sworn deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading.

Subscribed and sworn before me this    day of

Notary Public:

My Commission Expires:

1. GENERAL CONDITIONS

A. Except as supplemented herein, the "General Conditions of the Contract for Construction", AIA Document A201, 2007 Edition, Articles 1 through 15 inclusive, is a part of this contract and is incorporated herein as fully as if here set forth at length.

1.1 OTHER CONDITIONS

A. Other conditions, in addition to those which supplement the General Conditions, are included in that portion of this section entitled "Other Conditions" and with their inclusion become a part of this contract.

1.1 SUPPLEMENTS

A. The following supplements, modify, delete and/or add to the General Conditions. Where any article, paragraph or subparagraph in the General Conditions is supplemented by one of the following paragraphs, the remaining provisions of such article, paragraph, or sub-paragraph shall stand and the supplemental provisions shall be considered as added thereto. Where any article, paragraph, or sub-paragraph in the General Conditions is amended, voided or superseded by any of the following paragraphs, the provisions of such article, paragraph, sub-paragraph not so amended, voided, or superseded shall remain in effect.

ARTICLES 1-15

"Architect" shall mean Northeast Collaborative Architects.

"Awarding Authority" shall mean the Department of Administration, Division of Purchases.

The term "Owner" and "Awarding Authority" shall be considered synonymous.

ARTICLE 1 - GENERAL PROVISIONS

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

1.2.3 Add the following:

These specifications and drawing notes are of the abbreviated type: in places "Streamlining" occurs through the omission of phrases such as "The Contractor Shall", "In Conformity Therewith", or "Shall Be Furnished", and the words "A", "The", "An", and "All". They shall be implied where omitted. Architect/Engineer is abbreviated "A/E".

In addition, the following words shall be interpreted as follows:

"Indicated", where used in specifications, means indicated on the drawings.

"Provide", where used in the specifications, means to both furnish and install the item referenced.

"Furnish", where used in the specifications, means to deliver to job site in state specified and under terms and conditions specified.



"Similar" and "Typical", where used on the drawings, refer to the general sense, rather than the strictly identical. "Similar", where used in the specifications, means a close proximity, as close as possible within the performance requirements.

1.2.4 Add the following:

The Contractor and all Subcontractors shall refer to all of the drawings, including those showing primarily the work of the mechanical, electrical and other specialized trades, and to all of the sections of the specifications, and shall perform all work reasonably inferable there from as being necessary to produce the indicated results.

1.2.5 Add the following:

Where codes, standards, requirements and publications of public and private bodies are referred to in the specifications, references shall be understood to be to the latest revision prior to the date receiving bids, except where specifically indicated otherwise.

1.2.6 Add the following:

In case of discrepancies between contract documents, specifications shall take precedence over drawings, larger scale shall govern smaller scale, and contractual agreement shall take precedence over drawings and specifications.

1.2.7 Add the following:

In the event of conflict between referenced specifications and this project specification, the more restrictive or more costly specification shall govern. The more time consuming task will take precedent over less time consuming task.

1.2.8 Add the following:

Where drawings indicate partial hachures or detail, and remainder is in outline form, parts or materials so indicated shall apply also to other similar portions of work. Where ornament or other detail is indicated by starting only, such detail shall be continued, and shall apply to other similar parts unless otherwise stated.

1.2.9 Add the following:

The mechanical and electrical drawings are diagrammatic only, and not intended to show the exact physical locations or configurations of work. Such work shall be installed to clear all obstruction, permit proper clearances for the work of other trades, and present an orderly appearance where exposed. Exact location of fixtures and outlets shall be obtained from the A/E as provided in subparagraph 4.2.2 before the work is roughed in; work installed without such information from the A/E may be relocated at the A/E's direction and the Contractor's expense.

1.5 OWNERSHIP AND USE OF INSTRUMENTS OF SERVICE

1.5.2 In first line of this subparagraph delete "and owners" and in second line of the paragraph insert before "will" the words "and either the Architect or the Owner"

At the end of this subparagraph, add the following:

The A/E shall be held harmless and free of any liability and legal costs arising from use of the drawings and specifications for any purpose other than for this project. Furthermore, any release of Ownership of the drawings and specifications by the A/E to the Owner and re-use of these documents for any other project, and/or modifications of these documents for this or any other project, shall void all contractual requirements of the A/E to the Owner and shall further remove and void any expressed or implied liabilities, Warranties, guarantees, etc., of the A/E.

ARTICLE 2 – OWNER

2.1.2 Delete this subparagraph in its entirety and substitute the following:

The Benefit Street Arsenal, being owned by the State of Rhode Island, is a so-called “Public Works Project” and pursuant to Rhode Island General Laws Section 34-28-31 no mechanic’s lien may be placed upon the building by any party.

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.4 Delete this subparagraph in its entirety and substitute the following:

2.2.4 Information or services under the Owner's control will be furnished by the Owner with reasonable promptness only after receipt from the Contractor of a written request for such information or services.

2.2.5 Delete this subparagraph in its entirety and substitute the following:

2.2.5 The Contractor will be furnished copies of drawings and specifications as outlined in paragraph 1.5.3.

ARTICLE 3 - CONTRACTOR

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.5. Add the following:

The Contractor shall give the A/E one week notice of any additional design drawings, specifications, or instructions required to define the work in greater detail, or to permit the proper progress of the work. If detailed information is lacking and the Contractor fails to request from the A/E the required information, no excuse will be thereafter entertained for failure to carry out work in a manner satisfactory to the A/E. Should conflict be evident between contract documents, the Contractor is deemed to have estimated the more expensive way of doing the work unless he shall have asked for, and obtained, a written decision prior to submittal of bid as to which method or materials will be required.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.1 Add the following:

The Contractor shall not commit, nor permit, any act that would interfere with performance of work by other Contractors or suppliers (including those hired by the Owner outside this contract). He / she shall be responsible for job site safety and providing a safe place to work.

Contractor shall coordinate and organize with Owner and A/E biweekly scheduled meetings for prompt resolution of any outstanding issues and for Owner to maintain a fully informed position on renovation activities.

### 3.5 WARRANTY

Add the following:

3.5.1 The contractor shall be responsible for determining that all materials furnished for the work meet the requirements of the contract documents. The A/E may require the Contractor to produce reasonable evidence that a material meets such requirements, such certified reports of past tests by qualified laboratories, reports of studies by qualified experts, or other evidence which, in the opinion of the A/E, would lead to a reasonable certainty that any material used, or proposed to be used in the work, meets the requirements of the contract documents. All such data shall be furnished at the Contractor's expense. This provision shall not require the Contractor to pay for periodic testing of different lots of the same material, unless such testing is specifically required by the contract documents to be performed at the Contractor's expense.

3.5.2 The warranty provided in these paragraphs 3.5 shall be in addition to and not in limitation of any other warranty required by the contract documents or otherwise prescribed by law.

3.5.3 The Contractor shall procure and deliver to the A/E, no later than the date claimed by the Contractor as the date of substantial completion, all special warranties required by the contract documents. Delivery by the Contractor shall constitute the Contractor's guarantee to the Owner that the warranty will be performed in accordance with its terms and conditions. All warrantee periods shall begin at the date of "Substantial Completion" (not shipping date, installation date, etc...) and end one (1) year later, unless specified otherwise elsewhere, and shall be written in the name of the Owner.

### 3.6 TAXES

Delete this subparagraph in its entirety and substitute the following:

3.6.1 Owner is exempt from sales tax on products permanently incorporated in work. Contractor shall obtain sales tax exemption certificate number from Owner.

3.6.2 Contractor shall furnish copies of all invoices for material incorporated in work to Owner. Upon completion of work, Contractor shall file with Owner a notarized statement that all purchases made were entitled to be exempt. Contractor shall pay legally assessed penalties for improper use of Owner's tax exemption status.

3.7.1 At the end of this subparagraph add the following sentence:

A photocopy of the various building permits shall be delivered to Architect and Owner as soon as they are obtained. As a condition to Final Payment hereunder, Contractor shall deliver all original permits, licenses and certificates to Owner and photocopies to Architect.

3.7.2. At the end of the subparagraph add the following sentence:

If any of the Work is required to be inspected or approved by any public authority, the Contractor shall cause such inspection or approval to be performed.

3.9.1 Add the following:

Contractor shall designate a superintendent at commencement of work. This superintendent shall be assigned to this Project only, unless agreement otherwise in writing is given by the A/E and Owner.

This superintendent shall remain assigned to this project only for the duration of this project unless otherwise agreed to in writing by A/E and Owner.

3.10.1 Delete this subparagraph in its entirety and substitute the following:

3.10.1 Within 5 days after work is commenced, prepare and submit to the A/E, for his review, a practicable and feasible schedule, indicating order in which the work shall be carried out and dates on which salient features, including procurement of the various materials, plant and equipment, shall be commenced. Include contemplated dates for completing work. Schedule shall be in form of a progress chart of suitable scale to appropriately indicate percentage of work scheduled and completed. Copy of sample chart will be available from A/E. Contractor shall enter on chart actual progress at end of each week, or at such intervals as directed by A/E, and shall thereafter deliver two copies to the A/E, with each periodic application for payment.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

Delete this subparagraph in its entirety and substitute the following:

The Contractor shall maintain at the site for the Owner one record copy of all drawings, specifications, addenda, change orders and other modifications, in good order and marked currently to record all changes made during construction and reviewed shop drawings, product data and samples.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

3.12.6 Delete this subparagraph in its entirety and substitute the following:

3.12.6 All submittals shall bear the approval stamp and signature of the Contractor before submission to the A/E. By approving and submitting shop drawings, product data, and samples, the Contractor thereby represents that he has determined and verified all dimensions, quantities, field dimensions, relations to existing work, coordination with work to be installed later, coordination with information on previously accepted shop drawings, product data, or samples and verification of compliance with all the requirements of the contract documents. The accuracy of all such information is the responsibility of the Contractor. In reviewing shop drawings, product data, and samples, the A/E shall be entitled to rely upon the Contractor's representation that such information is correct and accurate.

3.13 USE OF THE SITE

Delete this subparagraph in its entirety and substitute the following:

3.13 The right of possession of the premises and the improvements made thereon by the Contractor shall remain at all times with the Owner. The Contractor's right to entry and use thereof arises solely from the permission granted by the Owner under the contract documents. The Contractor shall confine his apparatus, the storage of materials and the operations of his workmen to limits indicated by law, ordinances, the contract documents and permits and directions of the A/E and Owner. The Contractor shall not unreasonably encumber the premises with his materials.

3.18 Change the title of paragraph 3.18 to "INDEMNIFICATION AND COVENANT NOT TO SUE"

At the end of the first line of this paragraph after "Owner," insert "the State of Rhode Island,"

After this paragraph, add the following:

3.19 CERTIFICATES

3.19.1 Contractor, if required by specifications or A/E's request, shall furnish an affidavit from manufacturer certifying that materials or products delivered to project meet the requirements specified. Such certifications shall not relieve Contractor from responsibility of complying with requirements in the contract documents.

ARTICLE 4 - ARCHITECT

4.2.4 Delete the subparagraph in its entirety and substitute the following:

4.2.4 The Owner and Contractor may communicate with each other directly or through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors, is any, shall be through the Owner.

4.2.7 Change first line to read "The A/E will review, or take other ..."

4.2.9 In the first line of this subparagraph, delete the word "Inspections" and replace with "Observations of the Work".

Add the following:

4.2.15 If the Contractor claims that any instructions or orders, whether oral, written, or by drawings, or otherwise, involve extra cost or time, and such instructions or orders are not accompanied by a written acknowledgment by the Owner or A/E that extra payment will be made or time extended, he shall promptly so notify the A/E in writing and shall not proceed with the work until he has received a further written order to proceed, except, as provided in paragraph 10.4, in the case of an emergency affecting life or property. No claim for extra cost or time on account of such instructions or orders shall be valid unless the Contractor has so notified the A/E, before proceeding, that he claims extra cost and time and has received the further written order to proceed.

Upon receipt from the Contractor of a written notice of claim the A/E shall review such claim and if he determines that any work in dispute should proceed, he shall issue to the Contractor a written order to proceed, in which he shall review the Contractor's claim, in whole or in part, or shall instruct the Contractor to proceed with the work subject to a later determination by A/E of the Contractor's right to extra payment.

To the extent that the A/E, when issuing the written order to proceed, reviews the Contractor's claim, the contract sum shall be adjusted, subsequently. If the A/E, when issuing his written order to proceed, instructs the Contractor to proceed with the work subject to a later determination by the A/E of the Contractor's right to extra time or payment, the Contractor shall have the right to request a decision from the A/E, but the Contractor shall proceed with the work without delay, in any case.

ARTICLE 5 - SUBCONTRACTORS

5.1 DEFINITIONS

5.1.2 After this paragraph, add the following:

5.1.3 Each Subcontractor or Sub-Subcontractor shall be a person or organization of established reputation, regularly engaged in specialized manufacture or installation of items required, who selects and combines materials involved, who maintains and makes available for this purpose a regular force of workmen skilled in such work, and who is licensed as an installer by manufacturer of products involved or is working under direct supervision of manufacturer. The term "Subcontractor", as used in the specifications, may mean either a Subcontractor or Sub-Subcontractor.

ARTICLE 7 - CHANGES IN THE WORK

7.3.3 Delete this subparagraph in its entirety and substitute the following:

The amount by which the contract sum shall be adjusted shall be determined by one of the following methods, as selected by the Owner.

- (A) By unit prices, when stated in the contract documents.
- (B) By cost and percentages estimated by the Contractor and accepted by the Owner. The Contractor's estimate shall become a fixed price which shall not be changed by any variation in the actual cost of executing the work.
- (C) By actual cost determined after the work is completed, plus percentage.
- (D) By submission to a court having competent jurisdiction (or arbitration if mutually agreed upon by Owner and Contractor or if mandated by laws or regulations of governing authority), which shall determine the fair value of the work covered by the change.

As used in this paragraph, "cost" shall be limited to the following: cost of materials, including sales tax (if applicable) and cost of delivery, cost of labor, including social security, old age and unemployment insurance (labor cost may include a pro rate share of the foreman's time only in case an extension of contract time is granted on account of the change); workmen's compensation insurance; rental value of power tools and equipment.

As used in this paragraph, "Overhead" shall include all other expenses not included in "cost". "All other expenses" shall be described as including, but not limited to, bond premiums, insurance premiums, supervision, foremen, superintendents, time-keepers, watchmen, clerks, small tools, incidentals, general office expenses, supervisory personnel, accounting and home office expenses.

As used in this paragraph, "percentage" shall mean an allowance to be added to the cost in lieu of overhead and profit. The allowance for overhead and profit combined, included in the total cost to the Owner, shall be based on the following schedule:

For the Contractor, Subcontractor, or Sub-Subcontractor, for any work performed by his own forces, 15% of the cost.

For the Contractor, Subcontractor, or Sub-Subcontractor, for the work performed by his respective Subcontractor, 8% of the amount due his Subcontractor.

When in the judgment of the A/E, a series of additive or credit change orders accumulate to a single change, percentage shall be calculated on the cumulative net increase in cost, if any. In the case of changes which result in a net decrease in cost, the credit to the Owner shall be the exact amount of the decrease in cost. No credit shall be given for overhead or profit on such decrease.

If the Owner elects to determine the cost of the work by unit prices as provided in subparagraph 7.3.3 and the nature of the work is such that its extent cannot readily be measured after the completion of such work or any subsequent work, the Contractor shall keep daily records, available at all times to the Architect for review, of the actual quantities of such work put in place, and delivery receipts or other adequate evidence, acceptable to the A/E, indicating the quantities of materials delivered to the site for use in such unit price work, and distinguishing such from other similar material delivered for use in work included in the base contract sum. If so require by the A/E, materials for use in unit price work shall be stored apart from all other materials on the project.

If the Owner elects to determine the cost of the work as provided in subparagraph 7.3.3 using unit prices as stated in the contract documents or subsequently agreed upon, and if the quantities originally contemplated are so changed in a proposed change order that application of the agreed unit prices to the quantities of work proposed will create a hardship on the Owner or the Contractor, the applicable unit prices shall be equitably adjusted to prevent such hardship. Notwithstanding the inclusion of unit prices in the contract documents, it shall be the Owner's option to require the cost of any given change to be determined by one of the other methods stated in 7.3.3.

If the Owner elects to determine the cost of the work as provided in method (C) and (D) of subparagraph 7.3.3 or if the method of determining the cost has not been established before the work is begun, the Contractor shall keep detailed daily records of labor and materials costs applicable to the work.

Upon request of the Owner or the A/E, the Contractor shall submit to the A/E, in such form as the A/E may require, an accurate written estimate of the cost of any proposed extra work or change prior to any execution. The estimate shall indicate the quantity and unit cost of each item of materials, and the number of hours of work and hourly rate for each class of labor, as well as the description and amounts of all other costs chargeable under the terms of this article. Unit labor costs for the installation of each item of materials shall be shown if required by the A/E. The Contractor shall promptly revise and resubmit such estimate if the A/E determined that is in not in compliance with the requirements of this article, or that it contains errors of fact or mathematical errors. If required by the A/E, in order to establish the exact cost of new work added or of previously required work omitted, the Contractor shall obtain and furnish to the A/E bona fide proposals from recognized suppliers for furnishing any material or labor included in such work. Such estimates shall be furnished promptly so as to occasion no delay in the work, and shall be furnished at the Contractor's expense. The Contractor shall state in the estimate any extension of the time required for the completion of the work if the change or extra work is ordered.

#### ARTICLE 8 - TIME

8.1.3 In the first line of this subparagraph, delete the work "certified" and replace with the word "determined".

#### ARTICLE 9 - PAYMENTS AND COMPLETION

##### 9.2 SCHEDULE OF VALUES

Add at the end of the first sentence:

"And shall be revised if later found by the A/E to be inaccurate".

Add the following:

“Schedule of values shall not be altered without written permission of A/E.”

### 9.3 APPLICATION FOR PAYMENT

#### 9.3.1 Add the following:

"The format and number of copies of such application for payment shall be as directed by the Architect.

#### 9.4.2 Delete the word "certified" and replace with the word "determined".

### 9.5 DECISIONS TO WITHHOLD CERTIFICATION

#### 9.5.1 Delete the word "certify" wherever it appears in this subparagraph and replace with the word "recommend". Also, add sub-paragraph 9.5.1.8 as follows:

"Failure of any Subcontractor to comply with mandatory requirements for maintaining properly executed record drawings".

### 9.6 PROGRESS PAYMENTS

#### 9.6.1 Delete this subparagraph in its entirety and substitute the following:

9.6.1 The Owner shall make payment to the Contractor within a total of 25 calendar days from when the Contractor's Application for Payment is received. A retainage not exceeding ten (10) percent of the approved amount will be withheld from each payment for work performed during the preceding month and for materials not incorporated in the work but delivered and suitably stored at the site or at some location agreed upon in writing to which the Contractor has title or a Subcontractor has title and has authorized the Contractor to transfer title to the Owner. Any additional retainage, which may be required, shall be over and above the initial ten (10) percent retained.

9.6.1.1 First progress payment - A/E will process this requisition, only after he has received (1) the information required of post-bid information/submissions of the instructions to bidder, (2) certification that the Contractor is currently maintaining as-built drawings, and (3) the information required of Article 3 of the General Conditions and Supplementary Conditions.

9.6.1.2 Second and subsequent progress payments - the A/E will process the second and subsequent requisitions only after receipt of (1) the certification that Contractor is currently maintaining as-built drawings and (2) release of liens.

9.6.1.3 Releases of lien shall be required from all Subcontractors and material suppliers who, at the time of submission by the contractor of his previous requisition for payment, have submitted a requisition for payment. Requisitions will not be processed unless these releases are included herewith.

9.6.1.4 Contractor shall immediately satisfy any lien or encumbrance which, because of any act or default of the Contractor is filed against the premises, and indemnify and save the Owner harmless against all resulting loss and expenses, including attorney's fees. In addition, moneys due under this contract, as may be considered necessary by the Owner, may be retained by the Owner until all such suits, claims for damages or expenses as aforesaid shall have been settled and paid.



**9.7 FAILURE OF PAYMENT**

Delete the word "certified" in this subparagraph and replace with the word "recommended".

**9.8 SUBSTANTIAL COMPLETION**

9.8.1 At the end of this sub-paragraph, add the following:

"And only minor items which can be corrected or completed without substantial interference with the Owner's use of the work remain to be corrected or completed".

**9.10 FINAL COMPLETION AND FINAL PAYMENT**

9.10.1 Delete the word "inspection" wherever it appears in this subparagraph and replace with the word "review". Also, delete the word "promptly" wherever it occurs in this subparagraph.

9.10.3 Delete the word "certification" wherever it appears and replace with "recommendation".

**ARTICLE 11 – INSURANCE AND BONDS**

**11.1 CONTRACTOR'S LIABILITY INSURANCE**

11.1.1 In the second line following the word "companies" insert the words, "to which the Owner has no reasonable objection".

11.1.2 Delete subparagraph 11.1.2 in its entirety and substitute the following.

11.1.2 The insurance required by Section 11.1.1 shall be written for not less than the limits of liability specified below or required by law, as applicable. Coverages shall be written on an occurrence basis and shall be maintained without interruption from date of commencement of the Work until date of final payment and termination of any coverage required to be maintained after final payment.

- |   |             |  |
|---|-------------|--|
| a. Commercial General Liability:  | \$1,000,000 | General Aggregate Limit (other than Products-Completed Operations) |
|   | \$1,000,000 | Products-Completed Operations Aggregate Limit                      |
|   | \$1,000,000 | Personal and Advertising Liability                                 |
|   | \$1,000,000 | Each Occurrence Limit  |
|   | \$1,000,000 | Fire Legal Liability   |
|   | \$ 10,000   | Medical Expense Limit (each person)                                |
|   | \$1,000,000 | Employee Benefit Liability   |
| b. Business Automobile Liability  | \$1,000,000 | Bodily Injury and Property Damage Combined Single Limit            |
| c. Excess Umbrella Liability  |             | Minimum of \$5,000,000   |
| d. Worker's Compensation  |             | In accordance with Rhode Island law                                |
| e. Contractor's Property Insurance as identified in Paragraph 11.1.2.2 below. |             |  |

11.1.2.1 As to the Commercial General Liability policy, it shall include, without limitation, the following coverage: (i) Premises/Operations, including deletion of explosion, collapse and underground (XCU) exclusions, (ii) Independent Contractor's Protective Liability, (iii) Products/Completed Operations to be maintained in full force and effect for a period of two (2) years following Final Payment and continuing to name required parties as additional insureds for the entire two (2) year period, (iv) Broad Form

Contractual Liability, (vi) Personal Injury Liability, (vii) endorsements equivalent to ISO CG 20 10 for ongoing operations and CG 20 37 for completed operations, (viii) endorsement equivalent to CG 24 04, a Waiver of Subrogation in favor of Owner and additional insured's, and (ix) shall include endorsement CG 24 10, coverage for injury to leased workers. Additionally, the General Aggregate limit shall be specifically endorsed to provide that the General Aggregate Limit applies separately to the Project.

11.1.2.2 Business Automobile Liability shall include contractual liability coverage for all owned, non-owned and hired vehicles. The Umbrella Policy shall specifically identify each of the policies described in Section 11.1.2a on the Schedule of Underlying Coverage, and shall provide coverage at least as broad as each and every one of the underlying policies. The Contractor's Property Insurance shall cover all property owned by, or in control of, Contractor or which is not to be incorporated into the Work, including, without limitation, tools, equipment and materials, Owner shall not be responsible for, nor shall it insure, such property of the Contractor or any subcontractor. Contractor shall also maintain Contractor's Equipment Floater Insurance for owned or leased equipment under its care, custody and control as required for the performance of Contractor's duties. The policy shall include a waiver of subrogation in favor of the Owner.

11.1.4 Delete this subparagraph in its entirety and substitute the following

11.1.4 The Contractor shall cause the commercial liability coverage and umbrella policy required above to include: (i) the Owner, State of Rhode Island, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by Contractor's negligent acts or omissions during the Contractor's operations; (ii) the Owner and State of Rhode Island as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's negligent acts or completed operations, and (iii) and if requested by Owner as additional insureds on the Business Automobile Liability policy. The coverage afforded under any insurance policy obtained under or pursuant to Section 11.1 shall be primary to any valid and collectible insurance carried separately by any of the required additional insureds.

Add the following:

11.1.5 In no event shall any failure of Owner to receive certificates of insurance required under Section 11.1.3 hereof or to demand receipt of such certificates of insurance prior to Contractor commencing Work be construed as a waiver of the Contractor's obligations to obtain insurance.

11.1.6 Contractor shall cause each subcontractor, vendor or supplier to procure and maintain insurance coverage in accordance with the requirements of above, but with limits of liability as deemed appropriate by Contractor.

11.3.1.4 At the end of this sub-paragraph, add the following:

The Contractor shall report the value, time and location of any such transit or temporary location. Contractor shall be responsible for any loss that is uninsured or underinsured arising out of such failure to notify the Owner.

11.3.1.5 delete.

11.3.3 BOILER AND MACHINERY INSURANCE

In the first line of this paragraph, delete the word "The Owner" and replace with "The Contractor".

11.3.7 WAIVERS OF SUBROGATION

At the end of this subparagraph, add the following:

The legal owner of the building upon which the Work is being performed is the State of Rhode Island. Nothing herein shall require a waiver of subrogation as to any insurance policies owned by it.

11.4 PERFORMANCE BOND AND PAYMENT BOND

11.4.2 After this subparagraph, add the following:

11.4.3 Having satisfied all conditions of award as set forth elsewhere in these documents, successful bidder shall, within five days of award, furnish a performance bond and labor-and-materials bond in penal sum of not less than 100% of amount of contract as awarded, as security for faithful performance of the contract, and for payment of persons, firms or corporations to whom Contractor may become legally indebted for labor, materials, tools, equipment, or services, of any nature, employed or used by him in performing the work. Such bonds shall be in the forms stipulated in the bidding requirements, in such number of counterparts as Owner may require and shall bear same date as, or a date subsequent to, date of "agreement". Separate bond forms shall be furnished upon request.

11.4.4 The Bonds must be appropriately executed by the Contractor and:

- i) The Surety Company executing the Bonds must be licensed to do business in the State of Rhode Island or the Bonds must be countersigned by a company so licensed.
- ii) The Bonds must be signed by an official of the Surety Company and the corporate seal must be affixed over his signature.
- iii) Signatures of witnesses must appear on the Bonds.
- iv) A power of Attorney for the official signing of the Bond for the Surety Company must be submitted with the Bond.

11.4.5 Failure of successful bidder to execute such bond contract, and to supply required bonds within such period as Owner may grant, based on reasons determined adequate by the Owner, shall constitute default, and Owner may either award contract to next responsible bidder, or re-advertise for bids, of bid and amount for which a contract for the work is subsequently executed, irrespective of whether amount thus due exceeds amount of bid guaranty.

ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK

12.2 Correction of work

12.2.1 Add the following:

"And any cost, loss, or damages to the Owner resulting from such failure or defect".

ARTICLE 13 - MISCELLANEOUS PROVISIONS

13.2 SUCCESSORS AND ASSIGNS

13.2.2 After this subparagraph, add the following:

13.2.3 If, after making final payment, the Owner conveys to a third party any building or other improvement constructed under the contract, any rights with respect to the property so conveyed which the Owner may have against the Contractor under Article 13 or by virtue of claims which, under

the terms of subparagraph 9.10.4 are reserved to the Owner after the making and acceptance of final payment, shall automatically transfer to such third party.

**13.5 TESTS AND INSPECTIONS**

13.5.4 Delete this subparagraph in its entirety and substitute the following:

13.5.4 The Contractor shall obtain and deliver promptly to the A/E any required certificates of testing, review, final inspection of any part of his work or operating permits for any mechanical apparatus, such as elevators, escalators, boilers, air compressors, etc., which may be required by law to permit full use and occupancy of the premises by the Owner. Receipt of such permits or certificates by the A/E shall be a condition precedent to substantial completion of the work.

**13.6 INTEREST**

13.6.1 Delete this subparagraph in its entirety and substitute the following:

13.6.1 Approved payments due and unpaid under the contract documents shall bear interest from a date thirty days after such approval at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing at the place of the project.

**ARTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT**

**14.2 TERMINATION BY THE OWNER FOR CAUSE**

14.2.1 thru 14.2.4 Delete these subparagraphs in their entirety and substitute the following:

14.2.1 If the Contractor is adjudged a bankrupt, a trustee-in-bankruptcy, appointed by the bankruptcy court, may proceed to continue performance of the construction contract after giving the Owner adequate assurance of its ability to cure defaults, compensate for damages and perform satisfactorily in the future. The trustee-in-bankruptcy shall also assume all terms and conditions of the contract including all liquidated damage clauses that may be stated therein.

14.2.1.1 If no trustee-in-bankruptcy is appointed by the bankruptcy court and the Contractor makes a general assignment for the benefit of his creditors, or if a receiver is appointed on account of his insolvency, except as stipulated in paragraph 14.2.1, the Owner may, only after a review of the circumstances by legal counsel, terminate the employment of the Contractor, take over the site and finish the work.

14.2.2 If the Contractor should persistently or repeatedly refuse or should fail, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials, or if he should fail to make prompt payment to Subcontractors or for materials or labor, or if it is found by the Rhode Island Director of Labor and Training that any employee employed by Contractor or any subcontractor directly on the Project site has been or is being paid a rate of wages less than the wages required by the Contract, or Contractor persistently disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction or Contractor disregards an instruction, order or decision of the A/E, or otherwise is guilty of substantial violation of any provision of the contract, then the Contractor shall be in default, and the Owner, with the concurrence of the A/E, may, without prejudice to any other right or remedy and upon written notice to the Contractor, take possession of all materials, tools, appliances, equipment, construction equipment and machinery and vehicles, offices and other facilities on the project site, and all materials intended for the project, wherever stored, and, seven (7) days after such notice, may terminate the employment of the

Contractor, and finish the work by whatever methods he may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the work is finished.

14.2.3 If the balance of the contract sum exceeds the costs of finishing the work, including compensation for the A/E's additional services made necessary thereby, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor or his surety shall pay the difference to the Owner. The amount to be paid to the Contractor or to the Owner, as the case may be, shall be recommended by the A/E, upon application, in the manner provided in paragraph 9.4, and this obligation for payment shall survive the termination of the contract.

OTHER CONDITIONS

A. “DIG SAFE” DAMAGE PREVENTION SYSTEM

All Contractors or Subcontractors performing drilling, boring, augering, jetting, sheeting or pile installation, soil preloading for consolidation, demolition, excavation or like work shall, prior to commencement of these activities, contact utility companies having responsibility for underground transmission systems for information relative to locations of existing underground utilities and/or an appropriate dig safe damage prevention and notification agency.

END OF DOCUMENT

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**011100 SUMMARY OF WORK**

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- A. Include all items required to carry out the intent of the work as described, shown and implied in the Contract Documents.
- B. Upon discovery, Contractor shall immediately notify the Architect, in writing, discovery of unknown existing conditions, discrepancies, inconsistencies and instances of non-compliance with applicable codes and regulations within the documents, and of any work, which will not fit or properly function if installed as indicated on the Contract Documents. Any additional costs arising from the Contractor's failure to provide such notification shall be borne by the Contractor.
- C. The Work will be constructed under a single lump sum.
- D. Summary of the Work: **A new building** with restrooms, office, storage, and a future area for a 'Clam Shack/Restaurant' vendor and site landscaping and hardscapes. A new concrete slab for a tent constructed adjacent to the new building an. The existing buildings that include public bathrooms, clam shack/food vendor, pergola, and associated plantings and hardscapes for sitework will be demolished following construction of the new building.
  - 1. Work Sequence - Phase(s): 2
  - 2. The entire Project shall be constructed in **2 Phases** and shall be substantially complete, ready for occupancy within the time specified in the Contract.
  - 3. Phase 1 shall include the following portions of work, including all labor and material, shown on the drawings and/or as specified hereinafter. The Work of this Phase includes but is not limited to the following:
    - a. New building construction of post and beam, wood trusses, wood framing, asphalt and standing seam metal roofing, and cmu walls.
    - b. New sitework associated as identified on the drawings.
    - c. New concrete tent slab adjacent the new building.
  - 4. Phase 2 shall include the following portions of work, including all labor and material, shown on the drawings and/or as specified hereinafter. The Work of this Phase includes but is not limited to the following:
    - a. Demolition of the existing restroom building, clamshack building, pergola with associated site work.
- E. Owner: The Owner is: The City of East Providence, 145 Taunton Avenue, East Providence, RI 02914
- F. Site: Crescent Park, 684 & 700 Bullocks Point Avenue, Riverside, RI 02915
- G. The Owner's Representative is: Tracy Johnson, [tjohnson@eastprovidenceri.gov](mailto:tjohnson@eastprovidenceri.gov) | 401-435-7518
- H. The Architectural Firm is Northeast Collaborative Architects LLC and is located at 650 Ten Rod Road, North Kingstown, RI 02852.
- I. The Architect representing the firm for this project is Andrea T. Baranyk, Principal, email: [abaranyk@ncarchitects.com](mailto:abaranyk@ncarchitects.com) telephone: 401-846-9583.

1. The Architect and Engineer or their accredited representatives are referred to in the Contract Documents as Architect, Engineer, or by pronouns that imply them. As information for the Contractor, the Architect's status is defined as follows:
2. The Architect and Engineer will not make interpretations or decisions directly to the Contractor. All interpretations or decisions will be conveyed through the Construction Administrator or Owner.
3. As the authorized representative of the Owner, the Architect is responsible for review of shop drawings, materials, and equipment intended for the work, in accordance with the General Conditions, and the Supplementary Conditions.
4. Wherever the Architect is mentioned in the documents with an administrative function, it shall include the Project Manager in that function except for shop drawings.

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**011120 EXAMINATION OF SITE**

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- A. It is not the intent of the Documents to show all existing conditions. Contractors shall visit and examine the site prior to submitting bids and finalizing the Contract.
- B. Contractor shall confirm the conditions affecting the Work, including, but not limited to, conditions regarding transportation, disposal, handling and storage of materials, availability of labor, water, electric power, uncertainties of weather, roads or similar physical conditions of the site, equipment, and facilities needed prior to and during the prosecution of the Work. Contractor shall further confirm the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the Contract Documents. Any failure by the Contractor to review and confirm the available information shall not relieve the Contractor from the responsibility for properly estimating the difficulty and cost of successfully performing the Work.

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**011130 PROJECT DOCUMENTS**

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- A. The Specifications and Drawings are intended to describe and illustrate the materials and labor necessary for the Work to construct this Project.

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**011140 DOCUMENTS FURNISHED**

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- A. The Contractor shall be responsible for securing and printing copies of drawings and project manual for the execution of the Work.
- B. The Contractor shall receive one (1) set of AutoCAD compatible (latest version) floor plans at no cost on or about the time of execution of the Contract from the Architect. A CAD file release form shall be completed prior to Architect and any of the Architect's Consultants releasing CAD files.

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**011160 OCCUPANCY REQUIREMENTS**

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- A. Final Owner Occupancy:
  1. A comprehensive list of items to be completed or corrected as issued by the Contractor, together with the status of completion and terms of occupancy, shall be forwarded to the Architect.

2. The Owner's Representative will determine whether such occupancy or use is possible and, if so, will make arrangements for scheduling a Substantial Completion inspection with the Contractor, Owner's Representative, Architect.
3. Prior to Owner occupancy, mechanical, plumbing, and electrical systems shall be fully operational and required inspections and tests shall be successfully completed. Upon occupancy, the Owner will operate and maintain mechanical, plumbing, and electrical systems serving occupied portions of the building.
4. The Architect will prepare a Certificate of Substantial Completion for the Work to be occupied prior to Owner occupancy.
5. A letter from the Owner to the Contractor will state the terms and conditions of occupancy and that proper insurance coverage has been requested, the effective date of which will indicate to the Contractor that he may cancel insurance coverage for that portion of the project.
6. Upon occupancy, the Owner will assume responsibility for maintenance and custodial service for occupied portions of the building.
7. Work after Owner Occupancy:
  - a. Contractor shall be responsible for all costs associated with working in an occupied building for all work to complete the area occupied, including, but not limited to, warranty work, balancing and commissioning of systems, repair of latent defects and adjustments after partial occupancy and other items necessary to achieve Final Completion of the Work.

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**011413 CONTRACTOR'S USE OF PREMISES**

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- A. Confine operations, including storage of apparatus, equipment and materials to the contract limit lines as shown in the Construction Documents.
- B. The areas and/or spaces, including their access, shall be maintained free and clear throughout the contract term.
- C. Parking for Contractor's employees will be limited to an area (or areas) designated by the Owner. Contractor may be required, at Owner's discretion, to provide identification stickers for employees' cars.

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**012000 PRICE AND PAYMENT PROCEDURES**

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- A. Allowances:
  1. The Contractor's costs for unloading, handling, labor, installation costs, storage, insurance, overhead, profit, and other expenses related to the Allowance item shall be included in the Lump Sum Bid Amount and not in the Allowance unless stated otherwise in the Allowance Schedule of this section.
  2. Submit a list products, suppliers, and installers to the Architect, as necessary and required by allowances, for consideration and approval.
  3. Assist Architect in selection of Products and Suppliers.
  4. Obtain proposals from Suppliers and offer recommendations.
  5. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
  6. If the actual cost of an Allowance item is more or less than the given amount, the Contract Sum will be adjusted by Change Order.
  7. Allowance Schedule:
    - a. None.



- B. Unit Prices - General:
1. Definition of Unit Price: Amount the Contractor acknowledges in the Bid Proposal Form as a price per unit of measurement for materials or services as described in the Bidding Documents or in the Contract Documents.
  2. Procedures:
    - a. Unit Prices included in the Contract shall be used for determining compensation to the Contractor or Owner for changes to the scope of the work indicated in the Contract Documents and included in the Lump Sum Contract Price. Unit Prices are for items complete, in place, and shall be inclusive of furnishing and installing of all material, labor, trucking, overhead, profit, equipment, hoisting, engineering, scaffolding, power hookups, protection, shop drawings, taxes, permits, appliances, delivery, insurance, supervision, cost of bond, etc. and shall remain in effect until completion of the Contract.
    - b. Unit Price: Is identified by the Owner as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if the estimated quantities of Work required by the Contract Documents are increased or decreased.
- C. Unit Prices for Rock and Earth Excavation:
1. Earth and Rock Excavation: This Section includes administrative and procedural requirements for the following unit prices, and provisions shall be included in and become part of this Contract to be used in evaluating additions to or deductions from the work required by the Contract Documents.
    - a. Unless otherwise specified elsewhere in these documents, Contractors shall assume that all excavation is earth. However, if unspecified rock is encountered, it will be paid for at the given unit prices listed in the Contract. Rock excavation prices shall be net in that allowances for reduced quantities of earth are also included in the unit prices. The Unit Prices shall include all costs for overhead, profit and rock surveys.
    - b. Wherever rock to be excavated is encountered, the Contractor shall strip or expose the rock to such an extent that in the Owner's opinion the necessary measurements can be taken. The Contractor shall provide the Owner with a survey by a licensed land surveyor indicating top of rock elevations at points of intersection on a rectilinear grid with lines spaced sufficiently close to show accurately the rock surface contours. At the Owner's option, the Owner may furnish an additional survey.
    - c. If the conditions of the excavation work indicated are clearly of a special nature, the Contractor may ask the Owner for reconsideration of the established unit prices and, if granted, the unit prices will not apply, and prices will be negotiated in accordance with the General Conditions.
    - d. Definitions:
      - i. "EARTH" - is defined, as excavation shall include removal of all materials other than 'water' and 'rock'.
      - ii. "ROCK" - is defined as a boulder of 2 cubic yards or more in volume (1 cubic yard for a boulder in trenches), and rock in definite ledge formation and masonry structures of one cubic yard or more in volume, the removal of which requires the use of mechanical equipment or the use of explosives. Rock removed by scarification or ripping method is considered as a separate classification under paragraph 4.a.(1).

- iii. “ORIGINAL GRADE” - is defined as being the grade that exists at the time of Contract Award.
- iv. “ROUGH GRADE” - is defined as being the completed surface of required excavations greater than 13’ in width.
- v. “MASS” - excavation is to be considered as an open area whose minimum horizontal dimensions exceeds 13’.
- vi. “TRENCH” - is defined as excavation is defined as the removal of material from areas 13 feet or less in its minimal horizontal dimensions and below the elevation of rough grade or original grade, whichever is lower.

e. Procedures:

Rock Excavation In Trenches: Basis For Horizontal Measurement:

- i. Horizontal Measurements shall be taken between the vertical planes as defined below.
- ii. The Minimum Width of Trenches In Rock shall be taken as 3’ 0.”
- iii. Excavation For Walls or Piers With Footings: The measurements shall be taken parallel to and one foot outside of the edges of the concrete footings as shown on the Contract Documents (i.e. for 4’ 0” footing, rock shall be taken as 6’ 0” in width).
- iv. Excavation For Walls or Piers Without Footings: The limits of the excavation will be 1’ 6” outside of the line of concrete at bottom as shown on the Contract Documents (i.e. for a wall with a bottom thickness of 1’ 0,” the width of the trench will be considered to be 4’ 0”).
- v. Excavation For Pipe Lines shall be measured at 2’ 0” more than the nominal inside diameter of the pipe but in no case less than 3’ 0” wide.
- vi. Excavation For Tanks, Vaults, Manholes, Pits, Etc., shall be measured as 2’ 0” greater in both length and width or diameter than the actual exterior dimensions of the structures and this excavation is considered to be trench only if any measured horizontal dimensions is 13’ or less.
- vii. No allowance will be made for rock removed beyond the above limits.

Rock Excavation In Trenches - Basis for Vertical Measurement:

- i. To determine depth of trench, vertical measurements shall be taken from original grade or rough grade, (whichever is applicable), to the bottom of required excavation. These measurements will define the maximum depths for payments.
- ii. To determine quantity of rock in trench, vertical measurements shall be taken from the top of rock as encountered in the trench to 12” below the bottom of required rock excavation. Any over excavation below the required elevation shall be filled with concrete or other material as specified at no cost to the Owner.
- iii. No allowance will be made for rock removed beyond the above limits.

Earth Excavation In Trenches - Basis of Measurement: (Horizontal & Vertical):  
The basis of measurements and allowance limit for earth excavation in trenches is identical to that indicated for rock excavation in trenches, except that there will be no allowance for 12” below the required elevation. In addition the following will prevail:

- i. Maximum allowable widths for earth excavation in trenches without shoring:

Trench Depth - Classification	Add To Nominal ID Of Pipe Or To Footing Width
0 ft. - 6 ft.	3 ft.
Over 6 ft. - 10 ft.	5 ft.
Over 10 ft. - 15 ft.	7 ft.
Below 15 ft. deep the width of the trench shall be based on the individual case. The final depth of trench will determine the actual width for payment.	

- ii. If shoring is required the measurement shall be taken between the exterior walls of the shoring not to exceed 4' plus the I.D. of the pipe (for all depths).
  - iii. To determine quantity of earth in trench, vertical measurements shall be taken from the original or rough grade to actual bottom of earth excavation required.
- f. Unit Prices - Earth and Rock Excavation (Basis For Payment): Prices include backfill with excavated material if it is suitable. Prices also include all excavation and disposal of all surplus or unsuitable material. Where replacement with the excavated material is prohibited or a particular backfill material is specified, the cost of the delivered replacement material in a volume equal to the above excavation pay limits minus the volume of the items installed in the trench shall be paid for a prior negotiated price. Prices do not include costs of shoring and de-watering but do include sloping for sides of excavation. Payment and credit amounts shall be determined in the following manner: Widths and depths of trench excavation as indicated. The total quantity of earth or rock excavation encountered in each depth payment category shall be paid for at its respective unit price as shown below. For example, in a 15' trench the first 6' will be paid for at the 0' - 6' price; the next 4' will be paid for at the over 6' - 10' price and the next 5' will be paid for at the over 10' - 15' price. Thus three different price brackets will prevail.

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**012300 ALTERNATES**

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- A. Definition: An Alternate is an amount proposed by bidders and stated on the Bid Proposal Form for certain work defined in the Bidding Documents that may be added to the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. The cost for each Alternate is the net addition to the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.
- B. Procedures:
  - 1. Coordination: Modify or adjust affected adjacent Work as necessary to completely and fully integrate that Work into the Project.
    - a. Include as part of each Alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.
  - 2. Execute accepted Alternate under the same conditions as other Work of this Contract.
  - 3. Schedule: A "Schedule of Alternates," if included in this Project, will be included as a specification section and will be shown in the Bid Form.

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**012500    EQUALS AND SUBSTITUTIONS**

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- A.     Definitions: Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.
1.     Equals and Substitutions General: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract.
  2.     Equal: Any deviation from the specification, which is defined as follows: A replacement for the specified material, device, procedure, equipment, etc., which is recognized and accepted as substantially equal to the listed manufacturer or procedure specified. After review by the Architect the proposed equal may be rejected or approved at the sole discretion of the Owner. Equals must be substantially equivalent to the product or procedure listed in the Specifications with reference to all of the following:
    - a.     Quality
    - b.     Workmanship
    - c.     Operation and function
    - d.     Durability
    - e.     Suitability for purposes intended
    - f.     Size
    - g.     Rating
    - h.     Cost
    - i.     Proposed equal does not constitute a modification in the scope of Work, the Schedule or Architect/Engineer’s design intent of the specified material, device, procedure, equipment.
  3.     Substitution: Any deviation from the specified requirements, which is defined as follows: A replacement for the specified material, device, procedure, equipment, which is not recognized or accepted as equal to the manufacturer or procedure listed in the Specification. After review by the Architect the proposed substitution may be rejected or approved at the sole discretion of the Owner. A substitution may be rejected if it is not equal in comparison to the product or procedure listed in the Specifications in one or more of the following areas:
    - a.     Quality
    - b.     Workmanship
    - c.     Operation and function
    - d.     Durability
    - e.     Suitability for purposes intended
    - f.     Size
    - g.     Cost
    - h.     Rating
    - i.     Substitution constitutes a modification in the scope of Work, the Schedule or the Architect/Engineer’s design intent of the specified material, device, procedure, equipment.
  4.     The following are not considered requests for Equals or Substitutions:
    - a.     Revisions to the Contract Documents requested by the Owner or Architect
    - b.     Specified options of products and construction methods included in the Contract Documents

- c. The Contractor's review and recommendation that the proposed Equal or Substitution is necessary to comply with regulations and orders issued by governing authorities having jurisdiction
- B. Submittals:
1. Equals and Substitution Request Submittals: The Owner will consider requests for equals or substitutions if received within thirty (30) days after the start of the contract. Requests received after that date will be rejected.
    - a. Submit electronic copies of the required data for the product or procedure listed in the specification section and the proposed Equal or Substitution with reference to all of the evaluation criteria noted above.
    - b. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.
    - c. Provide complete documentation showing compliance with the requirements for equals or substitutions, and the following information, as appropriate on a Substitution Request form as required by the Owner:
      - 1) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate contractors, that will be necessary to accommodate the proposed Equal or Substitution
      - 2) Detailed comparison chart of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect
      - 3) Product Data, including Shop Drawings and descriptions of products and fabrication and installation procedures
      - 4) Samples, where applicable or requested
      - 5) A statement indicating the effect on the Contractor's Construction Schedule or CPM Schedule compared to the schedule without approval of the Equal or Substitution. Indicate the effect on overall Contract Time
      - 6) Cost information, in adequate detail, including a proposal of the net change, if any, in the Contract Sum
      - 7) The Contractor's certification that the proposed Equal or Substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated
      - 8) The Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the Equal or Substitution to perform adequately
  2. Architect's Action: If necessary, the Architect will request additional information or documentation for evaluation within one week of receipt of the original request for equal or substitution request. The Architect will notify the Owner's Representative with a recommendation to accept or reject the proposed equal or substitution, within two (2) weeks of receipt of the request, or one (1) week of receipt of additional information or documentation, whichever is later. The Owner's Representative will give final acceptance or rejection by the Owner not less than one (1) week after notification.
    - a. Any request deemed an Equal and accepted by the Owner will result in written notification to the Contractor and will not be in the form of a change order for an Equal.

- b. Any request deemed a Substitution and rejected or approved by Owner's Representative, Architect, and Owner may result in written notification to the Contractor and may be in the form of a change order if the Substitution is approved.
- C. Equal or Substitutions:
1. Conditions: The Architect will review the Contractor's request for Equal or Substitution of a product or method of construction when one or more of the following conditions are satisfied, as determined by the Architect, in consultation with the Owner. If the following conditions are not satisfied, the Architect will return the requests to the Contractor without action except to record noncompliance with these requirements.
    - a. The proposed request does not require extensive revisions to the Contract Documents.
    - b. The proposed request is in accordance with the general intent of the Contract Documents.
    - c. The proposed request is timely, fully documented, and/or properly submitted.
    - d. The proposed request can be provided within the Contract Time. However, the Architect will not consider the proposed request if it is a result of the Contractor's failure to pursue the Work promptly or coordinate activities properly.
    - e. The proposed request will offer the Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the Owner must assume. However, if the proposed request requires the Owner to incur additional responsibilities, including but not limited to, additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or similar considerations, then the Owner will have just cause to reject the request for Equal or Substitution.
    - f. The proposed request can receive the necessary approvals, in a timely manner, required by governing authorities having jurisdiction.
    - g. The proposed request can be provided in a manner that is compatible with the Work as certified by the Contractor.
    - h. The proposed request can be coordinated with the Work as certified by the Contractor.
    - i. The proposed request can uphold the warranties required by the Contract Documents as certified by the Contractor.
  2. The Contractor's submission and the Architect's review of Submittals, including but not limited to, Samples, Manufacturer's Data, Shop Drawings, or other such items, which are not clearly identified as a request for an Equal or Substitution, will not be considered or accepted as a valid request for an Equal or Substitution, nor does it constitute an approval.

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**012600 MODIFICATION PROCEDURES**

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- A. Request for Information:
1. In the event that the contractor or subcontractor determines that some portion of the drawings, specifications, other contract documents, or construction condition requires clarification or interpretation by the Architect, the contractor shall submit a Request for Information (RFI) in writing to the Architect. Requests for Information may only be submitted by the contractor and shall only be submitted on Request for

Information forms as required by the Owner. In the Request for Information, the contractor shall clearly and concisely set forth the issue for which clarification or interpretation is sought and why a response is needed from the Architect.

- a. In the Request for Information, the contractor shall set forth an interpretation or understanding of the requirement along with reasons why such an understanding was reached.
- b. The Architect will review the Request for Information to determine whether it is a Request for Information within the meaning of this term. If it is determined that the document is not a Request for Information, it will be returned to the contractor, without review.
- c. A response to the Request for Information shall be issued within seven (7) Working Calendar Days of receipt of the request from the contractor unless the Owner or Architect determines that a longer time is necessary to provide an adequate response. If a longer time is necessary, the Owner or Architect will, within seven (7) Working Calendar Days of receipt of the request, notify the contractor of the anticipated response time. If the contractor submits a Request for Information on an activity with seven (7) Working Calendar Days or less of float on the current project schedule, the contractor shall not be entitled to any time extension due to the time it takes the Architect to respond to the request.
- d. The response to the Request for Information from the Architect will not change any requirement of the contract documents. In the event the contractor believes that the response to the Request for Information Response will cause a change to the requirements of the contract document, the contractor shall immediately give written notice to the Architect stating that the contractor believes the response to the Request for Information will result in a Change Order and the reason for the Change Order. Failure to give such written notice immediately shall waive the contractor's right to seek additional time or cost.

B. Architect's Request for Information:

1. If Architect observes construction that does not conform to the intent of the Construction Documents, the Architect may submit a "Request for Information" to the Contractor. The Contractor shall have seven (7) days to respond with a solution for correcting the non-conforming construction. The Architect will review the response and take appropriate action to, with Owner's approval, accept the corrective measures, or determine that the proposed resolution is not acceptable. Contractor shall provide additional information on how the non-conforming construction will be corrected.

C. Minor Changes in the Work

1. The Architect will issue supplemental instruction authorizing minor changes in the Work, not involving adjustment to the Contract Sum or Contract time.

D. Proposal Request:

1. Architect/Owner-Initiated Requests For Proposals: The Architect or Owner will issue a detailed description of proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
2. A Proposal Request is issued for information only. It is not instruction to stop work in progress or to execute the proposed change.

3. Within Seven (7) Working Calendar Days of receipt of a Proposal Request, submit a Change Order Proposal with the required information necessary for review by the Architect and Owner.
  4. Include a list of quantities of products, unit costs, labor hours, and labor rates, with the total amount of each. Where requested, furnish survey data to substantiate quantities.
    - a. Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.
    - b. Include costs for General Conditions, overhead, profit and subcontractor markup, and other associated costs, in accordance with the Owner-Contractor contract.
    - c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.
    - d. Dollar values shown on the Schedule of Values shall not be the governing (or deciding) final amounts for change orders involving either additional charges or deletions.
- E. Change Order Proposal:
1. When either a Request for Information from the Contractor or a Proposal Request from the Architect or Owner results in conditions that may require modifications to the Contract, the Contractor may propose changes by submitting a Change Order Proposal to the Architect.
    - a. Include statements outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change.
    - b. Indicate the effect of the proposed change on the Contract Sum.
    - c. Include a list of quantities of products required, unit costs, and labor hours, labor rates, with the total amount of each.
    - d. When requested, furnish survey data to substantiate quantities.
    - e. Include costs for General Conditions, overhead, profit and subcontractor markup, and other associated costs, in accordance with the Owner-Contractor contract.
    - f. Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.
    - g. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.
    - h. Comply with requirements in Section Equals and Substitutions if the proposed change requires an equal or substitution of one product or system for a product or system specified.
  2. A Change Order Proposal shall not be submitted without submission of a Request for Information from the Contractor or as a response to a Proposal Request submitted by the Architect or Owner.
- F. Construction Change Directive:
1. Construction Change Directive: When the Owner and the Contractor disagree on the terms of a Change Order Proposal resulting from either a Request for Information or Proposal Request, the Architect may issue a Construction Change Directive. The Construction Change Directive instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
    - a. The Construction Change Directive will include a description of the change in the Work. It will also designate the method to be followed to determine change in the Contract Sum or Contract Time.



2. Documentation: The Contractor shall maintain detailed records on a time and material basis for work required by the Construction Change Directive.
  - a. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.
  - b. The final value shall be negotiated based on the supporting data to determine the value of the work.
- G. Change Order: Upon the Owner's approval of a Contractor's Change Order Proposal, or the acceptance of final itemized account from a Construction Change Directive, the Architect will issue a Change Order for signatures the Owner, Contractor, and Architect.

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#### **012976 APPLICATIONS FOR PAYMENT**

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- A. Schedule of Values: Submit the Schedule of Values to the Architect at the earliest possible date but no later than twenty-one (21) Calendar Days after the Contract Start Date. A separate Schedule of Values shall be provided for each Phase of the Project identified in Section 011110 Summary of Work, Work Sequence - Phase(s).
  1. Format and Content: Use the Project Manual Table of contents as a guide to establish the format for the Schedule of Values. Provide at least one line item for each of the Specification Section.
  2. Identification: Project identification on the Schedule of Values shall include, but not be limited to, the following:
    - a. Owner
    - b. Project Number
    - c. Project Name
    - d. Project Location
    - e. Vendor or Sub Contractor's name and address
  3. Arrange the Schedule of Values in tabular format, containing separate columns including, but not limited to, the following Items:
    - a. Item Number
    - b. Description of Work with related Specification Section or Division Number
    - c. Scheduled Values broken down by description number, type material, units of each material
    - d. Name of subcontractor
    - e. Name of manufacturer or fabricator
    - f. Name of supplier
    - g. Retainage
    - h. Contract sum in sufficient detail
  4. Percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
  5. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Break principal subcontract amounts down into several line items.
  6. Round amounts to nearest whole dollar. The total shall equal the Contract Sum.
  7. Unit-Cost Allowances: Show the line-item value of unit-cost allowances, as a product of the unit cost, multiplied by the measured quantity. Estimate quantities from the best indication in the Contract Documents.

8. General Conditions: Show line items for indirect costs and margins on actual costs only when such items are listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete. Include the total cost and proportionate share of general overhead and profit margin for each item.
  - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at the Contractor's option.
- B. General: Each Application for Payment shall be consistent with previous applications and payment as certified by the Architect and paid by the Owner.
  1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment, involve additional requirements.
  2. Payment-Application Terms: The Contractor may submit and the Owner will process monthly progress payments.
  3. Payment-Application Forms: Use the Application for Payment form as required by the Owner.
  4. For each item, provide a column including but not limited to the following items:
    - a. Item Number
    - b. Description of Work and Related Specification Section or Division
    - c. Scheduled Value, break down by units of material and units of labor
    - d. Work completed from previous application
    - e. Work completed this period
    - f. Materials presently stored
    - g. Total completed and stored to date of application
    - h. Percentage of Completion
    - i. Balance to Finish
    - j. Retainage
  5. Application Preparation: Complete every entry on the Application form. The Architect will return incomplete Applications without action.
    - a. Entries shall match data on the Schedule of Values.
    - b. Include amounts of Change Orders issued prior to the last day of the construction period covered by the application.
  6. Transmittal: Except for final payment, submit to the Architect by a method ensuring receipt within forty-eight (48) hours. Submit one (1) signed and notarized original of each Application for Payment, including lien waivers and similar attachments, when required, along with three (3) copies.
    - a. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to the Architect.
  7. Administrative: Provide the following administrative actions and submittals before, or with, the first Application for Payment, and updated as required for subsequent Applications for Payment including, but not limited to, the following items:
    - a. List of subcontractors and suppliers' name, FEIN/Social Security numbers, and Rhode Island Tax Registration Numbers
    - b. List of principal suppliers and fabricators
    - c. Schedule of Values

- d. Contractor's Construction Schedule
  - e. List of Contractor's staff assignments
  - f. List of Contractor's principal consultants
  - g. Copies of all applicable permits
  - h. Copies of authorizations and licenses from governing authorities for performance of the Work
  - i. Proof that as-built documents are updated as required by Section 017700 Contract Closeout
  - j. Initial as-built survey and damage report, if required
- C. Application for Payment at Substantial Completion:
1. Include partial Certificates of Substantial Completion if issued previously for Owner occupancy of designated portions of the Work.
  2. Provide the following administrative actions and submittals before, or with, this Application for Payment, including, but not limited to, the following:
    - a. Occupancy permits and similar approvals
    - b. Warranties (guarantees) and maintenance agreements
    - c. Test/adjust/balance records
    - d. Maintenance instructions
    - e. Startup performance reports
    - f. Changeover information related to Owner's occupancy, use, operation, and maintenance
    - g. Final cleaning
    - h. Application for reduction of retainage and consent of surety
    - i. Advice on shifting insurance coverage
    - j. Final progress photographs
    - k. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion
- D. Final Payment Application: Provide an executed Application for Payment by a person authorized to sign legal documents on behalf of the Contractor. Provide the following administrative actions and submittals before, or with, this Application for Payment, including, but not limited to, the following:
1. Completion of Project Closeout requirements
  2. Completion of list of items remaining to be completed as indicated on the attachment to the Certificate of Substantial Completion
  3. Ensure that unsettled claims will be settled
  4. Ensure that incomplete Work is not accepted and will be completed without undue delay
  5. Transmittal of required Project construction records to the Owner, including as-built documents indicated in Section 017700 Contract Closeout
  6. Certified property survey
  7. Proof that taxes, fees, and similar obligations were paid
  8. Removal of temporary facilities and services
  9. Removal of surplus materials, rubbish, and similar elements
  10. Completion of the requirements of the General Conditions and Supplementary Conditions for Final Acceptance, Final Completion, Final Inspection, and Final Payment
  11. Asbestos, Lead or other hazardous material manifests

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**013100 COORDINATION**

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- A. Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly progress of the Work. Coordinate construction operations that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required obtaining 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.
  4. Construction Mobilization:
    - a. Cooperate with the Owner’s Representative and Architect in the allocation of mobilization areas of the site, for field offices and sheds, for Owner facility access, traffic, and parking facilities.
    - b. During Construction, coordinate use of site and facilities through the Architect and Owner’s Representative.
    - c. Comply with approved procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
    - d. Comply with instructions for use of temporary utilities and construction facilities.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
1. Prepare similar memoranda for the Architect, Owner and separate contractors where coordination of their work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of schedules
  2. Installation and removal of temporary facilities
  3. Delivery and processing of submittals
  4. Progress meetings
  5. Preinstallation conferences
  6. Project closeout activities
  7. Startup of system
- D. Coordination of Inspections:
1. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed and coordinate such inspections with the Owner, Architect, and authorities having jurisdiction. If unsatisfactory conditions exist notify the Owner’s Representative, Architect, immediately. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
  2. The Contractor shall coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

- E. Coordination Drawings: 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. Coordinate the addition of trade-specific information to coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
    - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
    - f. Indicate required installation sequences.
    - g. 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.
  2. Review: Architect will review coordination drawings to confirm that in general the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.

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**013119 PROJECT MEETINGS**

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- A. Pre-construction Conference:
1. The Contractor shall attend a Pre-construction Conference before starting construction, as scheduled by the Architect or Owner. This meeting will take place within fourteen (14) Calendar Days after the written Notice to Proceed and before the Contract Start Date.
  2. Attendees shall include Owner, Architect, Architect's consultants, Contractor and its Project Manager and Superintendent, major subcontractors. All participants shall be familiar with the Project and authorized to conclude matters relating to the Work.
  3. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule
    - b. Critical work sequencing
    - c. Progress meeting schedule
    - d. Designation of responsible personnel

- e. Procedures for processing field decisions and Change Orders
  - f. Procedures for processing Applications for Payment
  - g. Distribution of Contract Documents
  - h. Submittal of Shop Drawings, Product Data, and Samples
  - i. Preparation of record documents
  - j. Use of the premises
  - k. Parking availability
  - l. Office, work, and storage areas
  - m. Equipment deliveries and priorities
  - n. Safety procedures
  - o. First aid
  - p. Security
  - q. Housekeeping
  - r. Working hours
- B. Progress Meetings:
- 1. The Contractor shall conduct progress meetings at the Project Site at regular intervals as determined at the Pre-construction Conference. The Contractor shall notify the Owner and the Architect of the scheduled Progress Meeting dates. Coordinate dates of Progress Meetings with preparation of Application for Payment requests.
  - 2. Attendees: In addition to representatives of the Contractor, Building Users, Owner and the Architect, subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities may be requested to attend these meetings on an as needed basis. All participants at the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work. The Contractor shall include the site superintendent as a minimum.
  - 3. Agenda: Progress Meetings shall review and correct or approve minutes of the previous Progress Meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.
    - a. Construction Schedule: Review progress since the last Progress Meeting. Determine where each activity is in relation to the required Contractor's Construction Schedule and whether each activity is on time or ahead or behind Schedule. Determine how Work that is behind Schedule will be expedited; secure commitments from parties involved to do so. Discuss whether Schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.
    - b. Review the present and future needs of each entity present.
  - 4. Reporting: Contractor shall promptly distribute minutes of each meeting, no later than three (3) days prior to next meeting, to each attendee, and others as determined.

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**013216 CONSTRUCTION SCHEDULE**

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- A. Construction Schedule Format:
- 1. Format: Horizontal bar chart with a separate bar for each major portion of the Work or operation, identifying first work day of each week
  - 2. Sequence of Listings: Use Table of Contents of this Project Manual and the chronological order of the start of each item of work
  - 3. Scale and Spacing: Provide space for notations and revisions
- B. Content:

1. Show complete sequence of construction by activity, with beginning and completion of each element of construction.
  2. Identify work of separate phases and other logically grouped activities.
  3. Show accumulated percentages of completion of each item, and total percentage of Work completed, as of the first day of each month.
  4. Provide separate schedule of submittal dates for shop drawings, product data, and samples, Owner furnished products and any products identified as Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.
  5. Indicate delivery dates for Owner furnished products and any products identified as Allowances.
  6. Coordinate with Schedule of Values specified in Section 012976 Application for Payment.
  7. Indicate critical path with original baseline indicated.
- C. Submittals And Revisions To Schedules:
1. Indicate progress of each activity on date of submittal, and projected completion date of each activity.
  2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
  3. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect.
  4. Submit revised Construction Schedules with each Application for Payment.
- D. Distribution:
1. Distribute copies of the Construction Schedules to, Architect, Owner, Subcontractors, suppliers, and other concerned parties.
  2. Instruct recipients to promptly report, in writing, problem anticipated by projections indicated in schedules.

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**013300 SUBMITTALS**

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- A. Summary
1. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including but not limited to the following:
    - a. Submittal Procedures
    - b. Submittal schedule
    - c. Daily Construction reports
    - d. Shop Drawings
    - e. Shop Drawings for Fire Protection Systems
    - f. Product Data
    - g. Samples
    - h. Quality assurance submittals
    - i. Architects Action
- B. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:
1. Permits
  2. Applications for Payment
  3. Performance and payment bonds

4. Construction schedule
  5. Daily construction reports
  6. Construction Photographs
  7. Insurance certificates
  8. List of subcontractors
  9. Subcontractors/Suppliers FEIN and Rhode Island tax registration numbers
- C. Definitions
1. Coordination Drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended and as identified in the Specification Division 2 through 16.
  2. Preparation of Coordination Drawings is specified in Division 1 Section 013100 Coordination and may include components previously shown in detail on Shop Drawings or Product Data.
  3. Field samples are full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish the standard by which the Work will be judged.
  4. Mockups are full-size assemblies for review of construction, coordination, testing, or operation.
- D. Submittal Procedures
1. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
  2. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  3. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
    - a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
    - b. The Architect reserves the right to reject incomplete submitted packages.
  4. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.
    - a. Allow two (2) weeks for initial review. Allow additional time if the Architect must delay processing to permit coordination with subsequent submittals.
    - b. If an intermediate submittal is necessary, process the same as the initial submittal.
    - c. Allow two (2) weeks for reprocessing each submittal.
    - d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.
- E. Submittal Preparation: Place a permanent label, title block or 8-1/2 inches x 11 inches cover page, acceptable by the Architect, on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
1. Submittals shall be submitted and distributed electronically, in PDF format unless large-scale drawings are required and electronic submission is not possible.



2. Provide a space approximately 4 inches by 5 inches on the label, beside the title block or on the cover page on Shop Drawings to record the Contractor's review and approval markings and the action taken.
  3. Include the following information on the label for processing and recording action taken.
    - a. Project Name
    - b. Date
    - c. Name and address of the Architect and Owner
    - d. Name and address of the Contractor
    - e. Name and address of the subcontractor
    - f. Name and address of the supplier
    - g. Name of the manufacturer
    - h. Number and title of appropriate Specification Section
    - i. Drawing number and detail references, as appropriate
    - j. Indicate either initial or resubmittal
    - k. Indicate deviations from Contract Documents
    - l. Indicate if equal or substitution
- F. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal electronically from the Contractor to the Architect using a transmittal form. The Architect will return submittals to the Contractor after action is taken. The Architect will not accept submittals received from sources other than the Contractor.
1. Include Contractor's certification that information complies with Contract Document requirements.
- G. Shop Drawings
1. Submit information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.
  2. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:
    - a. Dimensions
    - b. Identification of products and materials included by sheet and detail number
    - c. Compliance with specified standards
    - d. Notation of coordination requirements
    - e. Notation of dimensions established by field measurement
    - f. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 36 by 48 inches
    - g. Shop drawings shall be submitted in electronic PDF format unless hard copies are required due to size of files
    - h. Details shall be large scale and/or full size
  3. The Contractor shall review Shop Drawings, signify that the Shop Drawing complies with the Contract Documents with a stamp and signature, and submit them with reasonable promptness and in orderly sequence so as to cause no delay in the Work or in the Work of any subcontractor. Shop Drawings shall be properly identified as specified for item, material, workmanship, and specification section. At the

submission, the Contractor shall inform the Architect, in writing of any deviation in the shop drawings from the requirements of the Contract Documents.

4. The Architect will review and comment on shop drawings with reasonable promptness, but only for conformance with the design concept of the project and with the information given in the Contract Documents. Shop Drawings that indicate insufficient study of drawings and specifications, illegible portions or gross errors, will be rejected. Such rejections shall not constitute an acceptable reason for granting the Contractor additional time to perform the work.
5. The Contractor shall make corrections required by the Architect and shall resubmit shop drawings for review.
6. The Architect's review and comments on shop drawings shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents.
7. Only final reviewed shop drawings shall be used on the project site.
8. The Work installed shall be reviewed in accordance with the shop drawings and Contract Documents. Final Review of the shop drawings by the Architect shall not constitute acceptance by the Owner and the Architect of a variation or deviation from the Contract Documents unless the variation or deviation is clearly identified on the Shop Drawings. A variation or deviation from the reviewed shop drawings or from the Contract Documents shall not be used as a reason for the Contractor to issue a change order.

H. Product Data

1. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, schedules, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.
2. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information.
3. Include the following information:
  - a. Manufacturer's printed recommendations
  - b. Compliance with trade association standards
  - c. Compliance with recognized and specified testing standards
  - d. Application of specified testing labels and seals
  - e. Notation of dimensions verified by field measurement
  - f. Notation of coordination requirements
4. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
5. Submittals: Submit electronic copy in PDF format unless the size of the submittal or size of drawings do not permit electronic submission.
6. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
  - a. Do not permit non-reviewed copies of Product Data to be used for construction.

I. Samples

1. Submit full-size and fully fabricated Samples, cured and finished as specified, and physically identical with the material or product proposed. Samples include partial or full sections of manufactured or fabricated components, multiple materials to

- illustrate variations, color range sets, and swatches showing color, texture, and pattern. When the Architect provides Samples, prepare Samples to match.
2. Store, mount or display Samples on site in the manner to facilitate review. If requested by Architect, arrange for distribution of samples to the Architect. Include the following:
    - a. Specification Section number and reference
    - b. Generic description of the Sample
    - c. Sample source
    - d. Product name or name of the manufacturer
    - e. Compliance with recognized standards
    - f. Availability and delivery time
  3. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
    - a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least three (3) multiple units that show approximate limits of the variations.
    - b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
    - c. Refer to other Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be undamaged at time of use. Indicate special requests regarding disposition of Sample submittals.
    - d. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.
  4. Preliminary Submittals: Submit a full set of choices where Samples are submitted for selection of color, pattern, texture, or similar characteristics from a range of standard choices, unless otherwise noted.
    - a. The Architect will review and return preliminary submittals with the Architect's notation, indicating selection and other action.
  5. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit two (2) sets. The Architect will return one set marked with the action taken.
  6. Maintain sets of Samples, as returned, at the Project Site, for quality comparisons throughout the course of construction.
    - a. Reviewed Samples may be used for comparison for final acceptance of the construction.
  7. Field samples are full-size examples erected on-site to illustrate finishes, coatings, or finish materials and to establish the Project standard.
    - a. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.
- J. Quality Assurance Submittals

1. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required.
  2. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation comply with specified requirements, submit a certification from the manufacturer certifying compliance with specified requirements.
    - a. Signature: Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.
  3. Inspection and Test Reports: Requirements for submittal of inspection and test reports from independent testing agencies are specified in Division 1 Section Quality Control.
- K. Architect's Action
1. Except for submittals for the record or information, where action and return is required, the Architect will review each submittal, mark to indicate action taken, and return.
    - a. Compliance with the Contract Documents is the Contractor's responsibility.
  2. Action Stamp: The Architect will stamp each submittal and will mark the stamp to indicate the action taken, as follows:
    - b. Final Unrestricted Release: When the Architect marks a submittal "No Exceptions Taken," the Work covered by the submittal may proceed, provided it complies with requirements of the Contract Documents.
    - c. Final-But-Restricted Release: When the Architect marks a submittal "Make Corrections Noted," the Work covered by the submittal may proceed, provided it complies with notations or corrections on the submittal and requirements of the Contract Documents.
    - d. Returned for Resubmittal: When the Architect marks a submittal "Rejected, or Revise and Resubmit," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations and resubmit. Repeat if necessary to obtain different action mark.
      - 1) If more than one re-submission is required, Architect will notify Owner. Owner may require a deduct Change Order to compensate Architect for additional time to review multiple re-submissions.
      - 2) Do not use, or allow others to use, submittals marked "Rejected, or Revise and Resubmit" at the Project Site or elsewhere where Work is in progress.
      - 3) Other Action: Where a submittal is for information, record purposes, special processing, or other activity, the Architect will return the submittal marked "Action Not Required."
  - e. Unsolicited Submittals: The Architect will discard unsolicited submittals without action.

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**014100 REGULATORY REQUIREMENTS**

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- A. Permits, Licenses, and Certificates: Contractor shall be responsible for obtaining all local and state municipal documentation, including permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments,

correspondence, records, as required for contractor to obtain a Building Permit and Certificate of Occupancy.

- B. Municipal Inspections: Contractor shall be responsible for obtaining all required municipal inspections from municipal departments that have jurisdiction over the project.

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**014220 REFERENCE STANDARDS & DEFINITIONS**

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- A. For products specified by association or trade standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. References to standard specifications and codes refer to the editions current at the date bids were received. References include their addenda and errata, if any, and shall be considered a part of these specifications as if they were printed herein in full.
- C. Manufacturers' standard warranties or guarantees shall apply when their products are used on this project, unless more stringent warranties are specified.
- D. Flame Spread Ratings: All materials that are required to meet specified Flame Spread Ratings shall be submitted to the owner as part of the submittal process.

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**014500 QUALITY CONTROL**

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- 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. Payment for these services will be made by Owner.
  - 3. 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.
  - 4. Materials and assemblies for this project will be tested and construction operations inspected as the work progresses. Failure to detect any defective work or material shall not prevent later rejection when such defect is discovered nor shall it obligate the Owner for final acceptance.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Provide testing, inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. All tests required by the individual specification sections are required to be scheduled and notification given to the Testing Agency and Owner a minimum of twenty-four (24) hours in advance of the test/inspection as applicable.
  - 1. Cost for all Contractor's testing and inspection services will be paid by the Owner.
  - 2. Where testing services are indicated as Contractor's responsibility, engage a qualified testing agency to perform quality-control services.
    - a. Engage inspection and testing service agencies, including independent testing laboratories, that are pre-qualified as complying with the National Voluntary Laboratory Accreditation Program and that specialize in the types of inspections and tests to be performed.
    - b. Each independent inspection and testing Agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

- c. Agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.
    - d. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  3. Notify testing agencies at least twenty-four (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. Owner will issue a deduct Change Order for the Contractor to reimburse the Owner for payment of tests due to the following conditions:
    - a. When the Contractor notifies the Testing Agency less than twenty-four (24) hours before the expected time of testing.
    - b. When the Contractor requires testing for his own convenience.
    - c. When the Contractor schedules a test and is not ready for the required test.
  7. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
  8. The Owner's use of testing and inspection services shall not relieve the contractor of the responsibility to furnish materials and finished construction in full compliance with the Contract Documents.
- C. Retesting: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.
  1. The cost of retesting construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements.
  2. The Owner will issue a credit change order to the Contractor to cover all costs incurred related to all re-tests/re-inspection due to non-compliance to the contract documents, including but not limited to the Owners costs and the Consultants costs.
- D. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the Owner sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
  1. Provide access to the Work.
  2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
  3. Take adequate quantities of representative samples of materials that require testing or assist the Owner in taking samples.
  4. Provide facilities for storage and curing of test samples.
  5. Deliver samples to testing laboratories.
  6. Provide an approved design mix proposed for use for material mixes that require control by the testing Owner.
  7. Provide security and protection of samples and test equipment at the Project Site.
- E. Duties of the Testing Agency: The independent testing Agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Contractor, Architect and Owner's Representative in

performance of the testing Agency's duties. The testing Agency shall provide qualified personnel to perform required inspections and tests.

1. The testing Agency shall notify the Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. The testing Agency is not authorized to modify requirements of the Contract Documents or approve or accept any portion of the Work.
3. The testing Agency shall not perform any duties of the Contractor.

F. Fire Alarm/Acceptance Testing Procedures:

1. Fire alarm testing shall be as required by the authority having jurisdiction.

G. Test and Inspection Reports:

1. Submit a certified written report of each inspection, test, or similar service to the Architect and Owner's Representative.
2. Submit additional copies of each written report, when applicable or when requested by the Authority Having Jurisdiction.
3. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:
  - a. Date of issue
  - b. Project title and number
  - c. Name, address, and telephone number of testing Owner
  - d. Dates and locations of samples and tests or inspections
  - e. Names of individuals making the inspection or test
  - f. Designation of the Work and test method
  - g. Identification of product and Specification Section
  - h. Complete inspection or test data
  - i. Test results and an interpretation of test results
  - j. Ambient conditions at the time of sample taking and testing
  - k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements
  - l. Name and signature of laboratory inspector
  - m. Recommendations on re-testing

H. Conflicting Information

1. The Contract Documents are complimentary. They describe the intent of the final product. The contractor's performance is expected to meet the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated final product.
2. If compliance with two or more standards or instructions is specified and these standards establish different or conflicting requirements for minimum quantities or quality levels, contractor shall comply with the most stringent, more costly, and/or more time consuming requirement. Refer conflicting requirements to Architect for a decision before proceeding.
3. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be 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.
4. The order of information describing the Work is as follows:
  - a. Schedules shall override Specifications

- b. Specifications shall override drawing details
  - c. Drawn details shall override building or wall sections
  - d. Drawn building or wall sections shall override drawing plans or elevation views
5. Interpretation:
- a. The Contractor shall provide the final decisions and coordination for any means and methods conflicts that arise with the Work.
  - e. The Architect shall provide the final interpretation of any conflicting information on the Construction Documents.
- I. Copies of Standards:
- 1. Each entity engaged in construction on the Project shall be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
  - 2. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.
- J. Repair and Protection:
- 1. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes.
  - 2. Protect construction exposed by or for quality-control service activities, and protect repaired construction.
  - 3. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

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**015035 CONSTRUCTION EQUIPMENT**

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- A. The Contractor shall furnish tools, apparatus and appliances, hoists and/or cranes and power for same, scaffolding, runways, ladders, temporary supports and bracing and similar work or material necessary to insure convenience and safety in the execution of the Contract, except where this is otherwise specified in any Specification Section. Responsibility for design, strength and safety shall remain with the Contractor. All such items shall comply with Federal OSHA regulations and applicable codes, statutes, rules, and regulations, including compliance with the requirements of the current edition of the Manual of Accident Prevention in Construction published by the A.G.C. and the standards of the State Labor Department.
- B. Staging, exterior and interior, required for the execution of this Contract, shall be furnished, erected, relocated if necessary, and removed by the Contractor. Staging shall be maintained in a safe condition.

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**015045 PROTECTION**

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- A. Protect buildings, equipment, furnishings, grounds and plantings from damage. Any damage shall be repaired or otherwise made good at no expense to the Owner.
- B. Provide protective coverings and barricades to prevent damage. The Contractor shall be held responsible for, and must repair or replace construction, at no cost to the Owner, any damage due to improper coverings. Protect the public and building personnel from injury.
- C. Provide temporary protection for installed products. Control traffic in immediate area to minimize damage.



- D. Provide protective coverings for walls, projections, jambs, sills and soffits of openings. Protect finished floors and stairs from traffic, movement of heavy objects and storage. Prohibit traffic and storage on waterproofed and roofed surfaces and on lawn and landscaped areas.
- E. Provide temporary partitions and ceilings to separate work areas from Owner-occupied areas to prevent penetration of dust and moisture into Owner-occupied areas and equipment. Erect framing and sheet materials with closed joints and sealed edges at intersections with existing surfaces.

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**015050 SECURITY**

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- A. Provide security program and facilities to protect work, existing facilities and Owner's operations from unauthorized entry, vandalism and theft. Coordinate with Owner's security program.
- B. The Contractor shall be solely responsible for damage, loss or liability due to theft or vandalism.

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**CONDUCT WHILE ON THE SITE**

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- A. DO NOT communicate with any persons under the age of 18. Particular attention to this requirement shall be noted given its public park setting, neighboring residents.
- B. Smoking, including e-cigarettes, is not permitted on and within 100 feet of the property.
- C. Drinking alcoholic beverages is not permitted on and within 100 feet of the property.
- D. Use of any banned substances will be immediately reported to police and personal will be prosecuted to the fullest extent provided by law.

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**015055 TRAFFIC WAYS**

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- A. The Contractor may use on-site paved roads and parking areas but shall not encumber same or their access. Public highways shall not be blocked by standing trucks, parked cars, material storage, and construction operations or in any other manner.
- B. Public roads and existing paved roads, drives and parking areas on Owner's property shall be kept free from scrap or debris due to construction operations and any damage to their surface caused by the Contractor shall be repaired at no expense to the Owner.
- C. If the work of the Contract affects public use of any street, road, highway or thoroughfare, the Contractor, shall confer with the police authority having jurisdiction to determine if and how many police are needed for public safety in addition to any barriers and signals that may be needed. Owner will not be responsible for payment of any needed police services.

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**015113 TEMPORARY ELECTRICITY AND LIGHTING**

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- A. Connect to existing electric power service. Maintain equipment in a condition acceptable to Owner, to the point equipment is replaced. Provide branch wiring and distribution boxes located to provide power and lighting by construction-grade extension cords. Owner will pay cost of energy used. Take measures to conserve energy. Provide lighting for construction operations. At the termination of construction, remove

temporary lighting and power and restore or provide permanent power and lighting as required by the Contract Documents.

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**015116 FIRE PROTECTION**

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- A. The Contractor shall be responsible for loss or damage by fire to the work of the Contract until completion. Any fire used within the structure for working purposes shall be extinguished when not in use. Bitumen or tar shall be melted on the ground only. No flammable material shall be stored in the structure in excess of amounts allowed by the authorities. No gasoline shall be stored in or close to the building at any time. The Contractor shall assign a responsible employee to be in charge of fire protection measures.

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**015123 TEMPORARY HEATING, COOLING AND VENTILATING AND LIGHTING**

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- A. Provide temporary heat during construction for interior areas included in the Contract to counteract low temperatures or excessive dampness and, in any event, between October 15th and April 15th. Maintain during said period or periods until final completion of the Contract, unless otherwise approved by the Owner's Representative in writing. Windows, doors, ventilators and similar openings shall be temporarily closed. Provide heat and ventilation to maintain specified conditions for construction operations and to protect materials and finishes from damage by temperature or humidity. The Owner shall pay regular and normal utility costs of gas, electric, and water required from temporary heating, ventilating and lighting and shall be used for temporary heating unless approved, in writing, by the Owner's Representative. See individual Sections for temperature/humidity limits. Temporary heating methods shall comply with OSHA regulations and other applicable codes, statutes, rules and regulations.

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**015133 TEMPORARY TELEPHONE**

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- A. Contractor shall provide telephone service in the field office. Cellular service is preferred as long as signals are acceptable and no "blackouts" occur.

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**015136 TEMPORARY WATER**

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- A. Water for construction purposes may be taken from the existing service. Upon completion of work, the Contractor shall remove the temporary connections and backfill if necessary. If new water service is installed before construction is complete, the new system may be used provided it is returned to the Owner in as-new condition. Owner will pay for water for construction use.

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**015219 TEMPORARY SANITARY FACILITIES**

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- A. The Contractor shall provide, where directed, chemical toilets with toilet tissue, plus wash basins with water, soap and paper towels. Provide adequate facilities for each gender. The Contractor shall maintain the facilities in a sanitary condition.
- B. If acceptable by Owner, designated existing toilets may be used during construction. It is the responsibility of the Contractor to maintain the facilities in a clean and sanitary condition and return them to their original condition after use.

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**015400      TEMPORARY CONTROLS**

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- A. Temporary Environmental Controls: Contractor shall provide the following controls:
  - 1. Rodent and Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Employ this service to perform extermination and control procedures at regular intervals so the Project will be free of pests and their residues at materials.
  - 2. Dust Control (construction and demolition)
  - 3. Noise Control
  - 4. Erosion and Sediment Control
  - 5. Pollution Control
  - 6. Traffic Control

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**015600      BARRIERS AND ENCLOSURES**

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- A. Provide barriers to prevent public entry into construction areas and to protect existing facilities from damage by construction operations.
- B. Provide a fence around construction site; equip with vehicular and pedestrian gates with locks.
- C. Provide covered walkways as required by governing authorities for public rights-of-way and for public access to existing buildings.
- D. Provide barriers around trees and plants designated to remain. Protect against vehicular traffic, materials' dumping, chemically injurious materials, ponding or running water.
- E. Provide temporary, insulated, weathertight closures at openings to the exterior to provide acceptable working conditions and protection for materials, to allow for temporary heating and to prevent entry of unauthorized persons. Provide doors with self-closing hardware and locks.
- F. Barriers and enclosures shall be in conformance with code requirements. Do not block egress from occupied buildings unless necessary to further the work of the Contract. In this case, secure the Department's approval of an alternate egress plan.

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**015723      STORM WATER CONTROL**

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- A. Conform to the Storm Water Pollution Control Plan included in the Contract Documents or have another plan, prepared at Contractor's expense, which has been approved by the Authorities Having Jurisdiction (AHJ).
- B. Monitor storm water management to avoid all runoff on the adjacent athletic field and artificial turf.
- C. Sign, and cause to be signed by each appropriate subcontractor, the Certification Statement required by the General Permit.
- D. Provide, maintain, and monitor a rain gauge on the site; monitoring shall include maintaining a log of the readings. The rain gauge shall remain the property of the General Contractor.

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**015800 PROJECT SIGNS**

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- A. Project Signs: Engage an experienced sign company to apply graphics. Comply with details to be furnished by the Owner’s Representative.
1. Project Sign: Fabricate sign of 48” x 96”x 3/4”, exterior grade, A-B plywood. Mount sign on preservative treated 4” x 4” x 96” posts. The Owner will provide design, color selection, font type and sizes, and illustration to be included on the Project Sign. Paint both sides and all edges of sign and the posts with two coats of exterior, white, alkyd primer. Paint the sign with paint recommended by sign company for exterior use or use film coatings suitable for exterior signs. Erect the sign within two weeks after execution of the Contract and remove the sign within one week after completion of the project.

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**015850 IDENTIFICATION BADGES / HELMET STICKERS**

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- A. Identification Badges for Contractor's Personnel, Visitors & Parking Stickers:
1. If requested by Owner, provide each person working or visiting at the site with an identification badge, bearing the name of the Contractor and a number.

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**016600 PRODUCT STORAGE AND HANDLING REQUIREMENTS**

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- A. Materials and Equipment: Shall be delivered, stored and handled to prevent intrusion of foreign matter and damage by weather or breakage. Packaged materials shall be delivered and stored in original, unbroken packages.
1. Promptly inspect shipments to assure that products comply with requirements, that quantities are correct and products are undamaged.
  2. Packages, materials and equipment showing evidence of damage will be rejected and replaced at no additional cost to the Owner.
- B. Storage and Protection:
1. Store products in accordance with manufacturers' instructions with seals and labels intact and legible. Store sensitive products in weathertight enclosures; maintain within temperature and humidity range required by manufacturer.
  2. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.
  3. Store loose granular material on solid surfaces in a well-drained area; prevent mixing with foreign matter.
  4. Arrange storage to provide access for inspection. Periodically inspect to insure products are undamaged and are maintained under required conditions. Keep log showing date, time and problems, if any.
  5. Stone, masonry units and similar materials shall be stored on platforms or dry skids and shall be adequately covered and protected against damage.
  6. Prepare, as directed by the Owner, one area or space in the building for storage of Owner equipment.

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**017123 FIELD ENGINEERING**

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- A. Provide field-engineering services to establish and record grades, lines and elevations.

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**017329 CUTTING AND PATCHING**

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- A. Openings and chases may not be shown on the Drawings. Examine the Contract Documents and provide chases, channels or openings where needed.
- B. Install sleeves, inserts and hangers furnished by the trades needing same.
- C. Close all openings after installing work into openings, channels and/or chases. Restore finishes to new work shall match the original. The trade customarily responsible for the particular kind of work shall do Restoration Work.
- D. Permission shall be obtained from the Owner’s Representative and Architect before cutting beams, arches, lintels or other structural members.
- E. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.
  - 1. Provide a Cutting and Patching proposal for review and obtain approval from the Architect/Engineer before cutting and patching the following structural elements:
    - a. Foundation construction
    - b. Bearing and retaining walls
    - c. Structural concrete
    - d. Structural steel
    - e. Lintels
    - f. Structural decking
    - g. Miscellaneous structural metals
    - h. Equipment supports
    - i. Piping, ductwork, vessels, and equipment
- F. Perform cutting and patching to integrate all elements of the work. Provide penetrations of existing surfaces. Provide samples for testing. Seal penetrations through floors, walls, ceilings and roofs, as applicable. Restore or preserve fire-rated and smoke-barrier construction. Construction and finishes shall match original work.
- G. Verify dimensions for built-in work and/or work adjoining that of other trades before ordering material and performing work. Discrepancies shall be submitted to the Owner’s Representative and Architect for review and approval before proceeding with the work.

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**017350 RENOVATION, ALTERATION AND DEMOLITION PROJECT PROCEDURES**

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- A. This Section includes requirements for renovations, alterations and selective demolition.
- B. Products For Patching and Extending Work:
  - 1. New materials: As specified in product sections, match existing products, work and appearance.
  - 2. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary. Refer to existing construction as a standard.
- C. Inspection- General:
  - 1. Verify that demolition is complete and areas are ready for installation of new Work.
  - 2. Beginning of restoration Work means acceptance of existing conditions.
- D. Project Procedures for Work Involving Lead Containing Material (LBP):
  - 1. Exposure levels for lead in the construction industry are regulated by 29 CFR 1926.62. Construction activities disturbing surfaces containing lead-based paint

(LBP) which are likely to be employed, such as sanding, grinding, welding, cutting and burning, have been known to expose workers to levels of lead in excess of the Permissible Exposure Limit (PEL). Conduct demolition and removal Work specified in the technical sections of this specification in conformance with these regulations. In addition, construction debris/waste may be classified as hazardous waste. Disposal of hazardous waste material shall be in accordance with 40 CFR Parts 260 through 271 and Rhode Island Hazardous Waste Management Regulations.

2. This facility was constructed prior to 1978 and is likely to have painted surfaces containing lead-based paint.
3. Testing for lead-based paint has been conducted at the facility scheduled for renovation, demolition, reconstruction, alteration, remodeling, or repair. Results of the LBP testing are for information purposes only. The testing results are in a separate Volume of this Project Manual. Under no circumstance shall this information be the sole means used by the Contractor for determining the extent of LBP. The Contractor shall be responsible for verification of all field conditions affecting performance of the Work.

E. Project Procedures for Work Involving Asbestos Containing Material (ACM):

Retain one of two paragraphs below based on Owner's scope of Work.

1. The Contractor shall be responsible for abating all ACM that is visible and accessible. Refer to the Contract Documents for Scope of Work and procedures.
2. If the Contractor encounters any material suspect or known to contain ACM, should immediately notify the Owner and Construction Administrator. The Owner's will either have the material tested and abated (if necessary), or direct the Contractor to provide testing and abatement. The Owner will respond within twenty-four (24) hours after receiving the Contractor's written request to the Construction Administrator for testing the suspect material.
3. Testing for asbestos has been conducted for this Project. Results of the asbestos testing are for information purposes only. The testing results are in a separate Volume of this Project Manual. Under no circumstance shall this information be the sole means used by the Contractor for determining the extent of asbestos. The Contractor shall be responsible for verification of all field conditions affecting performance of the Work.

F. Preparation:

1. Cut, move, or remove items necessary for access to alterations and renovation Work. Replace and restore at completion to match new or existing construction and materials.
2. Remove unsuitable material not marked for salvage. Replace materials as specified for finished Work.
3. Remove debris and abandoned items from area and from concealed spaces.
4. Remove surface finishes and prepare surfaces to provide proper installation of new Work and finishes.
5. Close openings in exterior surfaces to protect existing Work.

G. Installation:

1. Coordinate Work of alterations and renovations to expedite completion and, if required, sequence Work to accommodate Owner occupancy.
2. Remove, cut and patch Work in a manner to minimize damage and to provide restoring products and finishes to original or specified condition in accordance with Section 01045 "Cutting and Patching."

3. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with neat transition to adjacent finishes in accordance with Section 017329 “Cutting and Patching.”
  4. In addition to specified replacement of equipment and fixtures, restore existing plumbing, heating, ventilation, air conditioning, fire protection, electrical, and other systems to full operational condition.
  5. Recover and refinish Work that exposes mechanical and electrical Work exposed accidentally during the Work.
  6. Install Products as specified in individual sections.
- H. Transitions:
1. Where new Work abuts or aligns with existing, perform a smooth and even transition. Patch work to match existing adjacent Work in texture and appearance.
  2. When finished surfaces are cut so that a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect/Engineer.
- I. Adjustments:
1. Where removal of partitions or walls result in adjacent spaces becoming one space, or remaining voids requiring patching, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
  2. Where a change of plane of ¼ inch in 12 inches or more occurs, request recommendation from Architect for providing a smooth transition.
  3. Trim existing doors as necessary to clear new floor finish. Refinish trim as required.
  4. Fit Work at penetrations of surfaces as specified in Section 017329 “Cutting and Patching.”
- J. Repair of Damaged Surfaces:
1. Patch or replace portions of existing surfaces that are damaged, lifted, discolored, or showing imperfections.
  2. Repair substrate prior to patching finish.
- K. Finishes:
1. Finish surfaces as specified in individual Product sections.
  2. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.
- L. Cleaning:
1. In addition cleaning specified in Section 017400 “Cleaning,” and Section 017700 “Contract Closeout,” clean Owner occupied areas of Work.

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**017400 CLEANING**

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- A. Maintain areas under Contractor's control free of waste materials, debris and rubbish. Maintain in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces and other closed or remote spaces before closing the space.
- C. Periodically clean interior areas before start of surface finishing and continue cleaning on an as-needed basis.

- D. Control cleaning operations so that dust and other particulates will not adhere to products and finishes prior to manufacturer’s recommended curing times.
- E. Remove waste materials, debris and rubbish from site daily and dispose legally off-site. No debris shall remain inside the building or anywhere on site upon final acceptance of the project.

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**017500 STARTING OF SYSTEMS**

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- A. General:
  - 1. Coordinate schedule for start-up of various equipment and systems.
  - 2. Provide written notification to the Owner’s Representative and Architect ten (10) Calendar Days prior to start-up of each item.
  - 3. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, and control sequence and for other conditions that may cause damage.
  - 4. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
  - 5. Verify in wiring that support components are complete and tested.
  - 6. Execute the start-up in accordance with manufacturer’s instructions.
  - 7. When referenced in individual specification sections, require manufacturer to provide an authorized representative to be present at the site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
  - 8. Submit a written report in accordance Section 014500 “Quality Control” that the equipment or system has been properly installed and is functioning properly.
- B. Demonstration and Instructions:
  - 1. Demonstrate operation and maintenance of Products to Owner and Owner Personnel two (2) weeks prior to substantial completion.
  - 2. Demonstrate Project equipment and instruct Owner in a location designated by the Owner’s Representative and instructed by a qualified manufacturer’s representative who is knowledgeable about the project.
  - 3. For equipment or systems requiring seasonal operation perform demonstration for season within six (6) months.
  - 4. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner and Owner Personnel in detail to explain all aspects of operation and maintenance.
  - 5. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item.
  - 6. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during demonstration.
- C. Testing Adjusting, and Balancing:
  - 1. Provide the services of an independent consultant to verify the testing, adjusting, and balancing of all systems.
  - 2. Reports shall be submitted by the independent testing consultant to the Owner’s Representative indicating observations and results of tests and indicating compliance or non-compliance with the requirements of the Contract Documents.
  - 3. The Owner may employ and pay for the services of an independent consultant to verify testing, adjusting, and balancing, previously performed by the Contractor.



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**017700 CONTRACT CLOSEOUT**

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A. Substantial Completion:

1. Preliminary Procedures: Before requesting inspection for Certification of Substantial Completion, complete the following. List exceptions in the request.
  - a. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete.
    - 1) Include supporting documentation for completion as indicated in the Contract Documents and a statement showing an accounting of changes to the Contract Sum.
    - 2) If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete items, and reasons the Work is not complete.
  - b. Advise the Owner of pending insurance changeover requirements.
  - c. Submit specific warranties, bonds, maintenance agreements, final certifications, and similar documents.
  - d. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include Certificates of Occupancy, operating certificates, and similar releases.
  - e. Submit record drawings, maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
  - f. Deliver tools, spare parts, extra stock, and similar items.
  - g. Advise the Owner's personnel of changeover in security provisions.
  - h. Demonstrate, through operation and testing, the functions of all systems and/or equipment to the satisfaction of the Owner. Complete testing of systems, and requirements in Section 017500 "Starting of Systems.
  - i. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.
2. Inspection Procedures: The Contractor shall be ready and prepared when requesting an inspection for a Substantial Completion. If the inspection reveals that the work is not complete, there are extensive punchlist items and the items listed above are not complete, the Owner's Representative, Architect, and Owner will either not provide the inspection or, if the inspection was provided, will determine the inspection has failed.
3. The Contractor is responsible for all costs to re-inspect due to a failed inspection. The Owner will issue a deduct Change Order to cover all costs for re-inspection.
  - a. The Architect will repeat inspection when requested and assured that the Work is substantially complete.
  - b. Results of the completed inspection will form the basis of requirements for final acceptance.

B. Final Acceptance:

1. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
  - a. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
  - b. Submit an updated final statement, accounting for final additional changes to the Contract Sum.

- c. Submit a certified copy of the final inspection list of items to be completed or corrected, endorsed and dated by the Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  - d. If required to verify final payment of utilities used during construction, submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion or when the Owner took possession of and assumed responsibility for corresponding elements of the Work.
  - e. Submit consent of surety to Final Payment.
  - f. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
2. Final Inspection Procedure: Owner, Architect and Owner's Representative will inspect the Work upon receipt of notice from the Contractor that the Work, including inspection list items from earlier inspections, has been completed.
    - a. Upon completion of Final Inspection, the Owner's Representative will prepare a certificate of final acceptance.
- C. As Built Document Submittals:
1. General: Do not use record documents for construction purposes. Protect Record Documents from deterioration and loss in a secure location. Provide access to record documents for the Architect's reference during normal working hours. Keep documents current; do not permanently conceal any work until required information has been recorded. Failure to keep documents current is sufficient cause to withhold progress payments.
  2. As-built Drawings: Maintain one clean, complete undamaged set of blue or black line white-prints of Contract Documents and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Contract Documents. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
    - a. Mark all new information that is not shown on the Contract Documents.
    - b. Note related change-order numbers where applicable.
    - c. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
    - d. Upon completion of the work, the Contractor shall submit Record Drawings to the Owner for the Owner's Records.
    - e. Submit electronic format data of all Coordination Drawings as required by the owner, at no additional cost.
  3. Record Specifications: The Contractor shall maintain one complete copy of the Project Manual, including Addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction.
    - a. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
    - b. Give particular attention to equals and substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
    - c. Note related record drawing information and Product Data.

- d. Upon completion of the Work, submit record Specifications for the Owner's records.
  4. Record Product Data: The Contractor shall maintain one copy of each Product Data submittal. Note related Change Orders and markup of record drawings and Specifications.
    - a. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations.
    - b. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
    - c. Upon completion of markup, submit complete set of Record Product Data for the Owner's records.
  5. Record Samples Submitted: Immediately prior to Substantial Completion, the Contractor shall meet with the Architect and the Owner's Representative at the Project Site to determine which Samples are to be transmitted to the Owner for record purposes. Comply with the Owner's instructions regarding delivery to the Owner's Sample storage area.
  6. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records. Identify miscellaneous records properly and bind or file, ready for continued use and reference and submit for the Owner's records.
  7. Maintenance Manuals: Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-inch (51-mm), 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Maintenance Manuals shall also be submitted in electronic format, PDF files, as noted in Section 017823 "Operations & Maintenance Data." Included but not limited to the following types of information:
    - a. Emergency instructions
    - b. Spare parts list
    - c. Copies of warranties
    - d. Wiring diagrams
    - e. Recommended "turn-around" cycles
    - f. Inspection procedures
    - g. Shop Drawings and Product Data
    - h. Fixture lamping schedule
- D. Closeout Procedures:
1. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Provide all documents in PDF format and provide two (2) flash drives, of all documents, including a detailed review of the following items:
    - a. Maintenance manuals
    - b. Record documents

- c. Spare parts and materials
  - d. Tools
  - e. Lubricants
  - f. Hazards
  - g. Cleaning
  - h. Warranties and bonds
  - i. Maintenance agreements and similar continuing commitments
- E. Final Cleaning:
- 1. General: The General Conditions requires general cleaning during construction.
  - 2. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion and Certification of Occupancy.
  - 3. Interior:
    - a. Remove labels that are not permanent labels.
    - b. Clean transparent materials, including glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Remove paint spots. Wash and polish glass.
    - c. Clean exposed interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean.
  - 4. Exterior:
    - a. Remove rubbish, litter, and other foreign substances. Sweep paved areas broom clean. Remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth, even-textured surface.
    - b. Clean exposed exterior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances.
    - c. Remove waste and surplus materials, rubbish and construction equipment and facilities from the site.
  - 5. Compliance: Comply with regulations of Authorities Having Jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site.
    - a. Where extra materials of value remain after completion of associated Work, they become the Owner's property. Dispose of these materials as directed by the Construction Administrator.
    - b. Leave building clean and ready for occupancy. If the Contractor fails to clean up, the Owner may do so, with the cost charged to the Contractor. The Owner will issue a credit change order to cover the costs.

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**017823 OPERATION AND MAINTENANCE DATA**

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- A. Instruct the Owner's designated personnel in the operation of new equipment and shall provide manuals and video data of basic maintenance of the equipment for training purposes. Provide qualified personnel for as long as necessary to instruct the Owner's personnel.

- B. Submit two (2) draft copies of the manuals in 3-ring, loose-leaf notebooks, or two (2) draft copies, in PDF, on flash drives, to the Architect for approval. Manuals may consist of approved shop drawings and catalog cuts. Architect will return both copies with comments, required additional information, and corrections. Upon completion of the manuals, submit two (2) final copies, including two (2) electronic copies on flash drives, to the Owner.
- C. Manuals shall include:
  - 1. Operating Procedures:
    - a. Written procedures for each mode of operation of each piece of equipment. Procedures shall indicate the status of each component of a system in each operating mode.
    - b. Procedures shall include names, symbols, valve tags, circuit numbers, schematic wiring diagrams, locations of thermostats, manual starters, control cabinets and other controls of each system.
  - 2. Emergency shutdown procedures for each piece of equipment or system, both automatic and manual, as appropriate.
  - 3. Maintenance Schedule:
    - a. Written schedule describing manufacturers schedule of maintenance and maintenance procedures
  - 4. Catalog Cuts:
    - a. To illustrate each piece of installed equipment, including options
    - b. Include equipment descriptions including physical, electrical and mechanical performance characteristics. installation and erection diagrams.
    - c. Include spare parts numbers and names, address and phone number of manufacturer and local representative or service department.
    - d. Written list of all subcontractors on the project, including name, address and phone number of local representative or service department.
  - 5. Manuals shall be indexed with dividers indicating each system or piece of equipment. Electronic Manuals shall have a tagged index.
  - 6. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

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**017830 WARRANTIES AND GUARANTEES**

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- A. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty, and special warranties, on the Work and products, as specified in the Project Manual. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors from countersigning special warranties with the Contractor.
- B. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure. If necessary, remove and replace other materials and construction to provide access for correction of warranted construction.
- C. Reinstatement of Warranty: When Work covered by a warranty has been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated

warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

- D. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor shall be responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- E. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.
  - 1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- F. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.
- G. The warranty for this Project is noted in the Contract. Submit two (2) hard copies and two (2) flash drives of each warranty to the Owner in the supplier's standard form, and including all specified conditions of the warranty noted in the Contract Documents.
- H. Submittals:
  - 1. Submit written warranties prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.
  - 2. Special Warranties: Prepare a written document utilizing the appropriate form, ready for execution by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Submit a draft to the Owner, through the Construction Administrator, for approval prior to final execution.
    - a. Refer to Divisions 2 through 17 Sections for specific content requirements and particular requirements for submitting special warranties.
  - 3. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
    - a. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
    - b. Identify each binder on the front and spine with the typed or printed title WARRANTIES, Project title or name, and name of the Contractor.
    - c. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

**END OF DIVISION 1 - GENERAL REQUIREMENTS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. This Section includes, but is not limited to, the following:
  - 1. Demolition and removal of entire existing buildings and foundation.
  - 2. Demolition and removal of site elements directly adjacent to the existing buildings.
  - 3. Demolition and removal of mechanical, electrical, and plumbing systems.
- B. Related Sections include the following:
  - 1. Division 01 Section "Summary of Work" for overall scope summary and use of premises.
  - 2. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
  - 3. Division 01 Section "Cutting and Patching" for cutting and patching procedures.
  - 4. Division 50 Section "Existing Conditions Information" for hazardous material reports.

**1.3 DEFINITIONS**

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

**1.4 MATERIALS OWNERSHIP**

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.



**1.5 PRE-DEMOLITION MEETINGS**

- A. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
  - 1. Inspect and discuss condition of construction to be selectively demolished.
  - 2. Review structural load limitations of existing structure.
  - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
  - 5. Review areas where existing construction is to remain and requires protection.

**1.6 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For refrigerant recovery technician.
- B. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control, and for noise control. Indicate proposed locations and construction of barriers.
- C. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
  - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
  - 3. Coordination for shutoff, capping, and continuation of utility services.
  - 4. Locations of proposed dust- and noise-control temporary partitions and means of egress.
  - 5. Use of stairs
  - 6. Coordination of Owner's continuing occupancy of portions of existing building.
  - 7. Means of protection for items to remain and items in path of waste removal from building.
- D. Predemolition Photographs or Video: Submit before Work begins.
- E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

**1.7 CLOSEOUT SUBMITTALS**

- A. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

**1.8 PROJECT CONDITIONS**

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
  - 1. Comply with requirements specified in Division 01 Section "Summary of Work."
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: Hazardous materials may be present in buildings to be selectively demolished. A report on the presence of hazardous materials is included in Division 50 Section 500000 "Existing Conditions Information." Examine report to become aware of locations where hazardous materials are present.
  - 1. Hazardous materials will be removed under separate contract prior to start of work.
  - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials.
  - 3. If unidentified hazardous materials are encountered during the work, do not disturb hazardous materials or items suspected of containing hazardous materials. Stop all work on the project and immediately notify Architect and Construction Manager.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain water, sewer and electrical services to all other park facilities (including, but not limited to, separate toilet room structure and irrigation systems) in service during selective demolition operations (until October 31, then beginning April 1 during the following year).

**PART 2 - PRODUCTS**

**2.1 PERFORMANCE REQUIREMENTS**

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

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**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
  - 1. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
  - 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

**3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS**

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
  - 1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
  - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
  - 2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
  - 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

- a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
  - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
  - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
  - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
  - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
- C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

### 3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
  3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  4. Cover and protect furniture, furnishings, and equipment that have not been removed.
  5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."
  6. Comply with indoor air quality requirements specified in Division 01 Section "Indoor Air Quality Construction Plan."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

### 3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
  2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
  3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
  5. Maintain adequate ventilation when using cutting torches.
  6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  9. Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section "Construction Waste Management and Disposal."
- B. Removed and Salvaged Items:
1. Clean salvaged items.
  2. Pack or crate items after cleaning. Identify contents of containers.
  3. Store items in a secure area until delivery to Owner.
  4. Transport items to Owner's storage area designated by Owner.
  5. Protect items from damage during transport and storage.
- C. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
  2. Pack or crate items after cleaning and repairing. Identify 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. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
  5. Remove and salvage for reinstallation all existing face brick above new entry vestibule.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable,

protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

### **3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS**

- A. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
  - 1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.
- B. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

### **3.6 DISPOSAL OF DEMOLISHED MATERIALS**

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them.
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
  - 4. Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property.
  - 1. Include cost of all transportation and disposal.
  - 2. Provide verification of all disposal trips.
  - 3. Hazardous materials are to be handled and disposed of in accordance with all State, Local, and Federal regulations.

### **3.7 CLEANING**

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

**END OF SECTION 02 51 19**

SECTION 03300

CONCRETE

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. The extent of concrete work shown on drawings.
- B. Concrete paving and walks are specified in Division 2.
- C. Thermal and moisture protection is specified in Section 7.

1.02 RELATED SECTIONS

- A. Section 3231313 – Concrete Paving
- B. Section 07160 – Bituminous damp-proofing.
- C. Section 07212 – Board insulation.

1.03 QUALITY ASSURANCE

Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:

ACI 301 "Specifications for Structural Concrete for Buildings."

ACI 318 "Building Code Requirements for Reinforced Concrete".

Concrete Reinforcing Steel Institute, "Manual of Standard Practice".

Concrete Testing Service: The Contractor shall employ a testing laboratory to perform concrete mix material evaluation tests and to design concrete mixes.

1.04 SUBMITTALS

Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by Architect.

Shop Drawings; Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing,

diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required and openings through concrete structures.

Laboratory Test Reports: Submit laboratory test reports for concrete mix materials and mix design test as specified.

## PART 2 - PRODUCTS

### 2.01 FORM MATERIALS

Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.

Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

Form for Unexposed Finished Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

### 2.02 REINFORCING MATERIALS

Reinforcing Bars (ReBar): ANSI/ASTM A 615, Grade 60, deformed.

Welded Wire Fabric (WWF): ANSI/ASTM A 185, welded steel wire fabric.

Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendations, unless otherwise acceptable.

For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

### 2.03 CONCRETE MATERIALS

Portland Cement: ANSI/ASTM C 150, Type I or II, unless otherwise acceptable to



Architect.

Use one brand of cement throughout project, unless otherwise acceptable to Architect.

Normal Weight Aggregates: ANSI/ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.

Local aggregates not complying with ANSI/ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to the Architect.

Water: Potable.

Air-Entraining Admixture: ANSI/ASTM C 260.

Water-Reducing Admixture: ANSI/ASTM C 494, Type A, and contain not more than 1% chloride ions.

Products: Subject to compliance with requirements, provide one of the following:

"Eucon WR-75"; Euclid Chemical Co.  
"Pozzolith 322N"; Master Builders.  
"Plastocrete 160"; Sika Chemical Corp.  
"Chemtard"; Chem-Masters Corp.

High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C 494, Type F or Type G and contain not more than 1% chloride ions.

Products: Subject to compliance with requirements, provide one of the following, or an approved equal:

"WRDA 19"; W.R. Grace  
"PSP"; Protex Industries Inc.  
"Sikament"; Sika Chemical Corp.  
"Mighty 150"; ICI Americas Corp.  
"Eucon Super 37"; Euclid Chemical Co.  
"PSI Super"; Gifford-Hill.  
"LA-8"; Master Builders.

Water-Reducing, Retarding Admixture: ASTM C 494, Type D, and contain not more than 1% chloride ions.

Products: Subject to compliance with requirements, provide one of the following, or an approved equal:

"Pozzolith 300-R"; Master Builders.  
"Eucon Retarder 75"; Euclid Chemical Co.  
"Daratard"; W.R. Grace.  
"Plastiment"; Sika Chemical Co.

Calcium chloride not permitted.

## 2.04 RELATED MATERIALS

Moisture Barrier: Provide moisture barrier cover over prepared base material where indicated. Use only materials which are resistant to decay when tested in accordance with ANSI/ASTM E 154, as follows:

Polyethylene sheet not less than 15 mils thick.

Water resistant barrier paper consisting of heavy Kraft papers laminated together with glass fiber reinforcement and overcoated with black polyethylene on each side.

Non-Shrink Grout: CRD-C 588, factory pre-mixed grout.

Products: Subject to compliance with requirements, provide one of the following, or an approved equal:

Type D, Non-metallic

"Masterflow 713"; Master Builders.  
"SonogROUT"; Sonneborn-Contech.  
"Euco-NS"; Euclid Chemical Co.  
"Five Star Grout"; U.S. Grout Co.  
"DuragROUT"; L & M Const. Chemical Co.

Expansion joint filler: Asphalt impregnated fiberboard conforming to ASTM D1751 and Federal Specification HH-F-341, Type I for interior work.

Self-expanding corkboard: Conforming to ASTM D1752 and Federal Specification HH-F-341, Type II, for exterior work.

Moisture-Retaining Cover: One of the following, complying with ANSI/ASTM C 171.

Waterproof paper.

Polyethylene film.

Polyethylene-coated burlap.

Liquid Membrane-Forming Curing Compound: Federal Spec TT-C-800, Type I, unless other type acceptable to Architect. Prior to using curing compound, verify that material will be

compatible with proposed floor finish.

Products offered by manufacturers to comply with the requirements for membrane-forming curing compounds include the following, or an approved equal:

"Klearseal"; Setcon Industries.  
"Floor Coat"; The Euclid Chemical Corp.  
"MB-429"; Master Builders.  
"Kure N Seal 800"; Sonneborn-Contech.  
"Klorkure 800"; Setcon Industries.  
"Clear Seal 800"; W.R. Grace.  
"Dress and Seal"; L & M Construction Chemicals.  
"Sealco 800"; Gifford - Hill.

## 2.05 PROPORTIONING AND DESIGN OF MIXES

Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Architect.

Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect.

Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules.

Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Architect before using in work.

Admixtures:

Use water-reducing admixture or high range water-reducing admixture (super plasticizer) in all concrete.

Use air-entraining admixture in all exterior concrete exposed to the weather. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having air content within following limits:

Concrete structures and slabs exposed in the completed work to freezing and thawing or subjected to hydraulic pressure:

6% to 8% for maximum 3/4" aggregate.  
6% to 8% for maximum 1/2" aggregate.  
Other Concrete: 2% to 4% air.

Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.

Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

Ramps and sloping surfaces: Not more than 3".

Reinforced foundation systems: Not less than 1" and not more than 3".

Concrete containing HRWR admixture (super plasticizer): Not more than 8".

Other concrete: Not less than 1" and not more than 4".

## 2.06 CONCRETE MIXES

Ready-Mix Concrete: Comply with requirements of ANSI/ASTM C 94, and as herein specified.

During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ANSI/ASTM C 94 may be required.

When air temperature is between 85 degrees F (30 degrees C) and 90 degrees F (32 degrees C), reduce mixing and delivery time from 1 - 1/2 hours to 75 minutes, and when air temperature is above 90 degrees F (32 degrees C), reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.01 TOLERANCES

The Contractor shall set and maintain concrete formwork to insure completed work is within the tolerance limits listed below:

Variation from the plumb.

In lines and surfaces of columns, piers, walls, and in arrises 1/4 inch per 10 feet but not more than 1/2 inch.

Variations from the level or grades indicated on the drawings.

In slabs

in 10 feet..... 1/4 inch  
in any bay or 20 foot max.... 3/8 inch  
in 40 feet or more..... 3/4 inch

Variations in the sizes and locations of sleeves, floor openings and wall openings. 1/4 inch

#### Footings

Variations in dimensions in plan  
minus..... 1/2 inch  
Misplacement or eccentricity  
\*2 percent of the footing width  
in the direction of misplacement  
but not more than..... 2 inches

Reduction in thickness  
minus..... 5% of  
specified thickness.

\*Applies to concrete not reinforcement.

### 3.02 FORMS

Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

Form Ties: Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

Unless otherwise indicated, provide ties so portion remaining within concrete after removal is at least 1-1/2" inside concrete.

Unless otherwise shown, provide form ties which will not leave holes larger than 1" diameter in concrete surface.

Provide wood tie cones for exposed tie pockets, pattern as acceptable to Architect for exposed exterior walls.

Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.

### 3.03 PLACING REINFORCEMENT

Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

### 3.04 JOINTS

Construction Joints: Locate and install construction joints in walls, slabs and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs. Provide keyways at least 1-1/2" deep in construction joints in walls, slabs and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.

Provide keyways at least 1-1/2" deep in construction joints in walls, slabs and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.

Place construction joints perpendicular to the main reinforcement.

Isolation Joints in Slabs-on-Ground: Construct isolation joints in slabs-on-ground at points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, grade beams and elsewhere as indicated.

Joint filler and sealant materials are specified in Division-7 sections of these specifications.

Shrinkage Joints in Slabs-on-Ground: Construct shrinkage joints in slabs-on-ground to form rectangular panels of not more than 40 feet on an edge patterns or as shown. Joints shall be 1/8" wide x 1/3 of slab depth, unless otherwise indicated.

Form shrinkage joints by inserting premolded hardboard or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. After concrete has cured, remove inserts and clean groove of loose debris.

Shrinkage joints may be formed by saw cuts as soon after slab finishing without dislodging aggregate.

Joint sealant material is specified in Division-7 sections of these specifications.

### 3.05 INSTALLATION OF EMBEDDED ITEMS

General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.

### 3.06 PREPARATION OF FORM SURFACES

Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

### 3.07 CONCRETE PLACEMENT

**Preplacement Inspection:** Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

**General:** Comply with ACI 304, and as herein specified.

Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

**Placing Concrete in Forms:** Deposit concrete in forms in horizontal layers not deeper than 18" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other



embedded items without causing segregation of mix.

**Placing Concrete Slabs:** Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

Maintain reinforcing in proper position during concrete placement operations.

**Hot Weather Placing:** When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F (32 degrees C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing.

Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

Wet forms thoroughly before placing concrete.

Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

### 3.08 FINISH OF FORMED SURFACES

**Rough Form Finish:** For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.

**Smooth Form Finish:** For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, such as waterproofing, dampproofing, painting or other similar system. This is the as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

**Smooth Rubbed Finish:** Provide smooth rubbed finish to scheduled concrete surfaces, which

have received smooth form finish treatment, not later than one day after form removal. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.

Related Uniformed Surfaces: At tops of walls, horizontal offsets surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

### 3.09 MONOLITHIC SLAB FINISHES

Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.

After screening, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 1/4" in 10' when tested with a 10' straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, paint or other thinfilm finish coating system.

After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8" in 10' when tested with a 10' straightedge. Grind smooth surface defects which would telegraph through applied floor covering system.

Broom Finish: Apply broom finish to parking deck slabs, exterior concrete platforms, steps and ramps, and elsewhere as indicated.

Immediately after trowel finishing, slightly roughen concrete surface by wood floating using nondirectional route. Coordinate required final finish with Architect before application.

### 3.10 CONCRETE CURING AND PROTECTION

General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by curing compound, and by combinations thereof, as herein specified.

Provide moisture curing by following methods.

Keep concrete surface continuously wet by covering with water.

Continuous water-fog spray.

Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

Provide moisture-cover curing as follows:

Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

Provide curing compound as follows:

Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring, painting, and other coatings and finish materials, unless otherwise acceptable to Architect.

Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of

beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing compound.

Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

### 3.11 REMOVAL OF FORMS

Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F (10 degrees C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

### 3.12 MISCELLANEOUS CONCRETE ITEMS

Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

Reinforced Masonry: Provide concrete grout for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

### 3.13 CONCRETE SURFACE REPAIRS

Patching Defective Areas: Repair and patch defective areas with colored cement mortar immediately after removal of forms, when acceptable to Architect. Walls shall be removed and replaced wherever the defective surface area exceeds 10% per 100 square feet of wall.

Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

**Repair of Formed Surfaces:** Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

**Repair of Unformed Surfaces:** Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.

Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" side or which penetrate to reinforcement of completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

Correct low areas in unformed surfaces during, or immediately after, completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.

Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack after

bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

Use epoxy-based mortar for structural repairs, where directed by Architect. Repair methods not specified above may be used, subject to acceptance of Architect.

### 3.14 QUALITY CONTROL TESTING DURING CONSTRUCTION

The Contractor will engage an independent testing and inspection agency for sampling and testing and quality control during placement of concrete including the following, as directed by Architect.

Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

Slump: ASTM C 143; one test for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.

Air Content: ASTM C 173; volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure for normal weight concrete; one for each set of compressive strength test specimens.

Concrete Temperature: Test hourly when air temperature is 40 degrees F (4 degrees C) and below, and when 80 degrees F (27 degrees C) and above; and each time a set of compression test specimens made.

Compression Test Specimen: ASTM C 31; one set of 6 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

Compressive Strength Tests: ASTM C 39; one set for each 100 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 5,000 sq. ft. of surface area placed; 2 specimens tested at 7 days, 3 specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

When total quantity of a given class of concrete is less than 50 cu. yds., strength test may be waived by Architect if, in his judgement, adequate evidence of satisfactory strength is provided.

When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive by more than 500 psi.

Test results will be reported in writing to Architect and Contractor on same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength and type of break for both 7-day tests and 28-day tests.

Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other method as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION

SECTION 04200

UNIT MASONRY

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Concrete masonry units for single-wythe and cavity wall construction.
- B. Face brick units for cavity wall construction.
- C. Mortar for masonry units.
- D. Reinforcement, anchorage and accessories.
- E. Masonry flashings.
- F. Masonry sealer coating.

1.2 RELATED SECTIONS

- A. Section 081113 – Hollow Metal Doors and Frames.

1.3 REFERENCES

- A. ANSI/ASTM A82 – Cold-Drawn Steel Wire for Concrete Reinforcement.
- B. ASTM A123 – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A615 – Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- D. ASTM B370 – Copper Sheet and Strip for Building Construction.
- E. ASTM C90 – Hollow Load Bearing Concrete Masonry Units.
- F. ASTM C145 – Solid Load Bearing Concrete Masonry Units.
- G. ASTM C144 – Aggregate for Masonry Mortar.
- H. ASTM C150 – Portland Cement.
- I. ASTM C207 – Hydrated Lime for Masonry Purposes.



- J. ASTM C270 – Mortar for Unit Masonry.
- K. ASTM C387 – Packaged, Dry, Combined Materials, for Mortar and Concrete.
- L. ASTM C404 – Aggregates for Masonry Grout.
- M. ASTM C476 – Grout for Masonry.
- N. ASTM C780 – Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- O. ASTM C1019 – Method of Sampling and Testing Grout.
- P. ANSI/ASTM C73 – Calcium Silicate Face Brick (Sand-Lime Brick).
- Q. ANSI/ASTM C126 – Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
- R. IMIAC – International Masonry Industry All-Weather Council: Recommended Practices and Guide Specification for Cold Weather Masonry Construction.
- S. UL – Underwriters' Laboratories.

#### 1.4 SUBMITTALS

- A. Submit product data under provisions of Section 01340.
- B. Submit samples under provisions of Section 01340.
- C. Submit four samples of face brick units to illustrate color, texture and extremes of color range.
- D. Include mortar design mix; indicate Proportion or Property method used, required environmental conditions and admixture limitations.
- E. Samples: Submit two ribbons of mortar color, illustrating color and color range.
- F. Submit manufacturer's certificate under provisions of Section 01340 that products meet or exceed specified requirements.

#### 1.5 QUALIFICATIONS

- A. Installer: Company specializing in performing the work of this Section with minimum five years documented experience.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements for masonry construction.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site under provisions of Section 01600.
- B. Store and protect products under provisions of Section 01600.
- C. Accept face brick units on site. Inspect for damage.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Strictly comply with recommendations of the International Masonry Industry All-Weather Council – Recommended Practices and Guide Specifications for Cold (Hot) Weather Masonry Construction; the Brick Institute of America – Technical Notes on Brick Construction, Parts 1, 2 and 3; The Portland Cement Assoc.

1.9 SEQUENCE AND SCHEDULING

- A. Coordinate work under provisions of Section 01040.
- B. Coordinate the masonry work with brick veneer and installation of window anchors.

**PART 2 PRODUCTS**

2.1 MANUFACTURERS – CONCRETE MASONRY UNITS

- A. Park Avenue Cement Block Company.
- B. Substitutions: Under provisions of Section 01600.

2.2 CONCRETE MASONRY UNITS

- A. Hollow Load Bearing Block Units: ASTM C90, Grade N, Type I - Moisture Controlled; normal weight.
- B. Masonry Units: Nominal modular sizes of 4 x 16 x 8 inches, 6 x 16 x 8 inches, and 8 x 16 x 8 inches. Provide special units for 90 degree corners, bond beams, lintels and control joints.

2.3 MORTAR MATERIALS – CONCRETE MASONRY UNITS

- A. Portland Cement: ASTM C150, Type I.
- B. Aggregates: ASTM C144, standard masonry type; clean, dry, protected against dampness, freezing and foreign matter.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Water: Clean and free from injurious amounts of oil, alkali, organic matter or other deleterious material.
- E. Use no admixtures unless written approval is obtained from Architect.
- F. Color: As selected by Architect.

2.4 MORTAR MIXES – CONCRETE MASONRY UNITS

- A. Mortar for Load Bearing Walls and Partitions: ASTM C270, Type S, using the Property Method, 1800 psi compressive strength.
- B. Mortar for Reinforced Masonry; ASTM C270, Type S using the Property Method, 1800 psi compressive strength.

2.5 GROUT MIXES

- A. Grout: ASTM C476; consistency which will completely fill all spaces intended to receive grout.
- B. Bond Beams and Lintels: 3,000 psi strength at 28 days; 7-8 inches slump; premixed type in accordance with ASTM C94 or mixed in accordance with ASTM C476, fine and course grout.
- C. Engineered Masonry: 3,000 psi strength at 28 days; 7- 8 inches slump; premixed type in accordance with ASTM C94 or mixed in accordance with ASTM C476, fine and course grout.

2.6 ADMIXTURES

- A. The use of air entraining, antifreeze compounds or calcium chloride admixtures or other substances is not allowed.

2.7 REINFORCEMENT AND ANCHORAGE

- A. CMU: Truss type, welded wire units fabricated from 9 gage ASTM A82 cold-drawn galvanized steel wire with deformed side wire and smooth cross wire; Space reinforcing at 16 inches on center vertically maximum.

B. Reinforcing Steel: ASTM A615, 60 ksi 276, 414, 517 MpA yield grade, deformed billet bars, un protected finish..

C. Substitutions: Under provisions of Section 01600.

## 2.8 MASONRY FLASHINGS

A. Membrane Flashings: Grace Construction Products, Inc. –“Perm-A-Barrier” self-sealing, self-healing, fully adhered wall flashing; 32 Mil thick, pliable and highly adhesive rubberized asphalt compound bonded completely and integrally to 8 mil thick, high density 4 ply cross laminated fill; 40 mil overall thickness.

B. Substitutions: Under provisions of Section 01600.

## 2.9 ACCESSORIES

A. Preformed Control Joints: Neoprene material conforming to ASTM D1056, Class RE41; provide with heat fused joints; thickness as required to suit masonry condition; manufactured by "AA Wire Products Company".

B. Weep Holes: Preformed plastic tubes.

C. CLEANING SOLUTIONS: ProSoCo, Inc. “SureKlean 600” detergent masonry cleaner; Non-acidic, not harmful to masonry work or adjacent materials.

D. Substitutions: Under provisions of Section 01600.

## 2.10 MASONRY SEALER COATING

A. Sealer Coating: ProSoCo, Inc. “Sure Klean” products.

1. “Sure Klean Weather Seal”: For use on brick veneer surfaces.

2. “Sure Klean Blok-Guard”; For use on CMU veneer surfaces.

## **PART 3 EXECUTION**

### 3.1 EXAMINATION

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

B. Verify items provided by other Sections of work are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

D. Beginning of installation means installer accepts existing conditions.

### 3.2 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied to other Sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

### 3.3 COURSING

- A. Establish lines, levels and coursing indicated; protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Lay concrete masonry units in running bond. Course one unit and one mortar joint to equal 8 inches. Form concave mortar joints.

### 3.4 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head, bed and collar joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering courses of joints or excessive furrowing of mortar joints are not permitted.
- D. Remove excess mortar as Work progresses.
- E. Interlock intersections and external corners.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform jobsite cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- H. Cut mortar joints flush where insulation bitumen dampproofing is applied.

### 3.5 REINFORCEMENT AND ANCHORAGES – SINGLE-WYTHE MASONRY

- A. Install horizontal joint reinforcement 16 inches oc.
- B. Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place joint reinforcement continuous in first joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches. Extend minimum 16 inches each side of openings.
- E. Reinforce joint corners and intersections with prefabricated corner pieces 16 inches oc.

### 3.6 MASONRY THROUGH-WALL FLASHINGS

- A. Install through wall flashing on top of masonry base course or at locations shown on the Drawings. Terminate flashing at top by extending up and behind sheathing as shown on the Drawings. Overlap adjacent pieces by 2 inches and roll all overlaps with a steel hand roller or blunt object..
- B. Trim bottom edge 1/2 inch back from exposed face of building. Apply a bead or trowel coat of bituthene mastic along termination's seams, cuts, penetrations and punctures.
- C. Fill cavity to depth of 8 inches with 3/8-inch pea stone.

### 3.7 LINTELS

- A. Install reinforced unit masonry lintels over openings as specified on the drawings.
- B. Openings up to 48 Inches Wide: Place two, No. 5 reinforcing bars 1 inch from bottom web, unless noted otherwise.
- C. Openings Over 48 Inches. Reinforce openings as detailed.
- D. Use single piece reinforcing bars only.
- E. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- F. Place and consolidate grout fill without displacing reinforcing.
- G. Allow masonry lintels to attain specified strength before removing temporary supports.
- H. Maintain minimum 8-inch bearing on each side of opening.

3.8 GROUTED COMPONENTS

- A. Reinforce bond beams as shown on drawings, placed 1 inch from bottom of web.
- B. Lap splices minimum 24 bar diameters.
- C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- D. Place and consolidate grout fill without displacing reinforcing.
- E. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

3.9 ENGINEERED MASONRY

- A. Lay masonry units with core cells vertically aligned and cavities between wythes clear of mortar and unobstructed.
- B. Place mortar in masonry unit bed joints back 1/4 inch from edge of unit grout spaces, bevel back and upward. Permit mortar to cure 7 days before placing grout.
- C. Reinforce masonry unit cores with reinforcement bars and grout as indicated.
- D. Retain vertical reinforcement in position at top and bottom of cells and at intervals not exceeding 192 bar diameters. Splice reinforcement in accordance with Section 03300.
- E. Wet masonry unit surfaces in contact with grout just prior to grout placement.
- F. Grout spaces less than 2 inches in width with fine grout using low lift grouting techniques. Grout spaces 2 inches or greater in width with course grout using low lift grouting techniques.
- G. When grouting is stopped for more than one hour, terminate grout 1 1/2 inch below top of upper masonry unit to form a positive key for subsequent grout placement.
- H. Low Lift Grouting: Place first lift of grout to a height of 16 inches and rod for grout consolidation. Place subsequent lifts in 8 inch increments and rod for grout consolidation.

3.10 CONTROL JOINTS

- A. Do not continue horizontal joint reinforcement through control joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

- C. Size control joint in accordance with Section 07900 for sealant performance.
- D. Provide control joints at 20 feet on center, maximum, unless noted otherwise.

### 3.11 BUILT-IN WORK

- A. As work progresses, build in metal door frames, window frames, wood nailing strips, anchor bolts, plates, lintels and other items furnished by other Sections.
- B. Build in items plumb and level.
- C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- D. Do not build in organic materials subject to deterioration.

### 3.12 TOLERANCES

- A. Maximum Variation From Unit to Adjacent Unit: 1/32 inch.
- B. Maximum Variation From Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
- C. Maximum Variation From Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- D. Maximum Variation From Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.
- E. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.
- F. Maximum Variation From Cross Sectional Thickness of Walls: 1/4 inch.

### 3.13 CUTTING AND FITTING

- A. Cut and fit for concealed items as required. Coordinate with other Sections of Work to provide correct size, shape and location.
- B. Obtain Architect approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

### 3.14 CLEANING

- A. Clean work under provisions of Section 01700.
- B. Remove excess mortar and mortar smears.



- C. Replace defective mortar. Match adjacent work.
- D. Clean soiled surfaces with cleaning solution.
- E. Use non-metallic tools in cleaning operations.
- F. Do not use strong acids for cleaning.

3.15 PROTECTION OF FINISHED WORK

- A. Protect finished installation under provisions of Section 01500.
- B. Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

3.16 SCHEDULES

- A. Exterior wall systems; Locations of wall types shown on drawings.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Wood blocking, nailers, and plywood associated with miscellaneous work at roofing.
- 2. Plywood backing panels.
- 3. Wood blocking for mounting on partition framing.
- 4. Door hardware installation.

- B. Related Sections include the following:

- 1. Division 06 Section “Plate Connected Timber Trusses” for roof framing  
Division 07 Section “Asphalt Shingles” for furnishing and installation of wood blocking, nailers and plywood associated with roofing.  
Division 07 Section “Sheet Metal Flashing and Trim” for furnishing and installation of wood blocking, nailers and plywood associated with metal flashing and trim.
- 2. Division 08 Section "Door Hardware" for door hardware and additional installation requirements.
- 3. Division 10 Section “Toilet and Bath Accessories.”

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

- 1. NeLMA: Northeastern Lumber Manufacturers' Association.
- 2. NLGA: National Lumber Grades Authority.

1.4 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 products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
  1. Preservative-treated wood.
  2. Fire-retardant-treated wood.
  3. Power-driven fasteners.
  4. Powder-actuated fasteners.
  5. Expansion anchors.

#### 1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.
- B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

### 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. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
  3. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent.
- C. Plywood: DOC PS 1.
1. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
  2. Factory mark panels to indicate compliance with applicable standard.

## 2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic, chromium or chromated copper arsenate (CCA).
- 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.
- D. Application: Treat miscellaneous carpentry, including the following:
1. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
- E. Manufacturers: Subject to compliance with requirements, provide products by one the following:
1. Georgia Pacific.
  2. Hoover Treated Wood Products, Inc.
  3. Koppers Performance Chemicals.

## 2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying 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 E 84, 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 beyond the centerline of the burners at any time during the test.

- 1.
2. Use treatment that does not promote corrosion of metal fasteners.
3. 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 D 2898. Use for exterior locations and where indicated.
4. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
5. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841.

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 testing and inspecting agency acceptable to authorities having jurisdiction.

E. Application: Treat the following:

1. Concealed blocking in wall framing and window opening framing.
2. Plywood backing panels.

F. Products: Subject to compliance with requirements, provide products by one of the following:

1. Dricon.
2. Hoover Treated Wood Products, Inc.
3. Koppers Performance Chemicals.

## 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. For items of dimension lumber size, provide Construction or No. 2 lumber with 15 percent maximum moisture content and the following species:

1. Hem-fir (north); NLGA.

C. For blocking not used for attachment of other construction Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

- D. 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.
- E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.
- F. Application: Provide kiln dried lumber in the following locations:
  - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing.

## 2.5 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch 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, fire retardant treated, or in area of high relative humidity, provide G185 galvanized steel fasteners, or fasteners with hot-dipped galvanized after fabrication, in compliance with Section 23 04 .9.5 of the Rhode Island State Building Code.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
  - 1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- C. 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 o.c.
- D. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
  - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
- E. Sort and select lumber so that natural characteristics will 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.
- F. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. NES NER-272 for power-driven fasteners.
  - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
- G. Use common wire 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; do not countersink nail heads, unless otherwise indicated.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

- 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 WOOD FURRING INSTALLATION

- 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: Install 1-by-3-inch nominal- size furring vertically 24 inches o.c.

3.4 FIRE-RETARDANT-TREATED (FRT) MATERIALS INSTALLATION

- A. Cutting to length, drilling holes, joining cuts and light sanding are permissible. It is not necessary to field treat cut ends to maintain flame spread rating.
  - 1. Ripping, milling, and surfacing of FRT lumber is not permitted.
  - 2. FRT plywood can be cut in either direction without loss of fire protection.

3.5 FINISH HARDWARE INSTALLATION

- A. General: Comply with requirements indicated below and in Division 08 Section "Door Hardware."
- B. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
  - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
- C. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
  - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
  - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- D. Thresholds: Set thresholds for exterior doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

3.6 PROTECTION

- A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 53



SECTION 06 16 43 – GLASS-REINFORCED GYPSUM SHEATHING

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
  - 1. Division 06 – Section “Rough Carpentry” for framing to support glass-reinforced gypsum sheathing
  - 2. Division 09 – Section “Painting” for primers and paint applied to glass-reinforced gypsum sheathing

1.2 SUMMARY

- A. This section includes the following:
  - 1. Exterior sheathing
  - 2. Interior ceiling sheathing/gypsum board

1.3 DESIGN / PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 (UL 263, CAN/ULC-S101) by a testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Fire-Resistance Ratings: Indicated by design designations from ULI and ULC "Fire Resistance Directory" and Products Certified for Canada.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Design data test reports.
  - 4. Installation methods.
- C. Verification Samples: For each product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product.
- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- B. Installer Qualifications: Company specializing in performing Work of this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's packaging indicating manufacturer and product name and protect until ready for installation.
- B. Store materials protected against damage from weather, direct sunlight, surface contamination, construction traffic, or other causes.
- C. Stack sheathing flat on leveled supports off the ground, under cover, and fully protected from weather.
- D. Store and support boards in flat stacks to prevent sagging. Protect materials to keep them dry. Protect boards to prevent damage to edges and surfaces.

1.8 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer: CertainTeed Gypsum, Inc., which is located at: 4300 W. Cypress St. Suite 500 ; Tampa, FL 33607; Toll Free Tel: 800-233-8990; Fax: 610-341-7940; Email: request info (building.solutions@saint-gobain.com); Web: [www.certainteed.com/products/gypsum](http://www.certainteed.com/products/gypsum)
- B. Acceptable Manufacturers of Equivalent Product:
  - 1. Continental Building Products
  - 2. National Gypsum Company
  - 3. USG Corporation
- C. Single Source Responsibility: Obtain gypsum sheathing products, joint treatment, and accessories from a single manufacturer or from manufacturers recommended by prime manufacturer of gypsum sheathing products.

2.2 GYPSUM SHEATHING

- A. Gypsum Sheathing: Fully embedded glass mat gypsum sheathing meeting the requirements of ASTM C 1177 with water-resistant acrylic/gypsum facing.

1. Product: GlasRoc Sheathing with EGRG technology, manufactured by CertainTeed Gypsum, Inc.
2. Thickness: 1/2 inch (12.7 mm) thick.
3. Properties:
  - a. Flame spread: ASTM E 84 (CAN/ULC-S102): 0 maximum.
  - b. Smoke developed: ASTM E 84 (CAN/ULC-S102): 0 maximum.
  - c. Mold Resistance: 10 (No mold Growth) when tested in accordance with ASTM D 3273 and ASTM D 3274.
  - d. Water Resistance:
    - 1) Humidified Deflection (Sag), 1/16 inch (1.6 mm) as tested in accordance with ASTM C 473.
    - 2) Permeance, 26 perms as tested in accordance with ASTM E 96.
4. Thermal Resistance, R 0.51 as tested in accordance with ASTM C 518.
5. Size: 48 by 96 inches (1219 by 2438 mm); longer lengths are available to reduce number of joints.

### 2.3 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Silicone Emulsion Sealant: Meeting ASTM C 920, Type S, Grade NS, compatible with glass fiber mesh tape and for covering exposed fasteners.
- B. Glass-Fiber Mesh Tape: Self-adhering glass-fiber tape, nominal 2 inches (51 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing board and with a history of successful in-service use.

### 2.4 ACCESSORY MATERIALS

- A. Fasteners:
  1. Sheathing: Steel drill screws or nails, in lengths recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating.
  2. Ceiling/Soffits: For ceiling/soffit applications with Direct-Applied Exterior Finish Systems (DEFS) and painted ceilings/soffits, use fasteners having a salt spray resistance of more than 800 hours according to ASTM B 117 are recommended.
    - a. For steel framing less than 0.0329 inch (0.835 mm) thick, attach sheathing with steel drill screws complying with ASTM C 1002.
    - b. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, attach sheathing with drill screws complying with ASTM C 954.
    - c. For wood framing, attach with nails or screws of type and spacing as recommended by sheathing manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Do not begin installation until supports and substrates have been properly prepared.
- B. Verify that framing and supports are ready to receive work and opening dimensions are as indicated on the Drawings.
- C. If support and substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.2 PREPARATION

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

### 3.3 GYPSUM SHEATHING INSTALLATION

- A. Install in accordance with manufacturer's written instructions, ASTM C 1280, GA-253 and applicable building codes.
- B. Install Sheathing with acrylic coated side (logo side) out. Some boards may be printed with "This Side Out" on the face side.
- C. Cut boards at penetrations, edges, and other obstructions of work and fit tightly against abutting construction, unless otherwise indicated.
- D. Install boards with a 3/8-inch (10 mm) setback where non-load-bearing construction abuts structural elements.
- E. Install boards with a 1/4-inch (6 mm) setback where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- F. Allow no joints greater than 1/8 inch (3 mm).
- G. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevents exterior moisture from passing through completed exterior wall assembly.
- H. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.
- I. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.
- J. Horizontal Installation: Install sheathing with long edges in contact with edges of adjacent boards without forcing.
  - 1. Abut ends of boards over centers of stud flanges, and stagger end joints of adjacent boards not less than one stud spacing.

2. Screw-attach boards at perimeter and within field of board to each steel stud.
3. Space fasteners approximately 8 inches (200 mm) o.c. (or tighter spacing if recommended by manufacturer for specific application) and set back a minimum of 3/8 inch (10 mm) from edges and ends of boards.
4. Treat board joints, when required by local building code or exterior finish system, per manufacturer's written instructions.

### 3.4 SHEATHING JOINT-AND-PENETRATION TREATMENT

A. Seal all sheathing joints, as required, according to sheathing manufacturer's written recommendations.

1. If a weather seal is required before the application of a water-resistive barrier, apply silicone emulsion sealant on joints and trowel flat. Apply sufficient quantity of sealant to completely cover joints after troweling. Seal other penetrations and openings. Check with the water-resistive barrier manufacturer for installation instructions prior to the application of sealant.
2. As an alternate to separate water-resistive barrier - Apply glass-fiber mesh tape to fiberglass reinforced gypsum sheathing board joints, and apply and trowel silicone emulsion sealant to embed sealant in entire face of tape. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

B. Water-Resistant Barriers: Consult building code authority having jurisdiction for requirements regarding water-resistive barrier installation, if necessary.

### 3.5 FINISH SYSTEM

A. Coordinated with the requirements of the exterior finish as specified in Division 09, Section "Painting".

### 3.6 PROTECTION

A. Protect installed products until completion of project.

B. Repair or replace damaged products before Substantial Completion.

END OF SECTION 06 16 43

SECTION 06 20 13 – EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes exterior standing and running trim including the following:
  - 1. Cellular PVC trim boards.
- B. Related Sections include the following:
  - 1. Division 06 Section “Miscellaneous Rough Carpentry” for wood blocking.
  - 2. Division 07 Section “Composite Siding” for engineered wood siding and trim.
  - 3. Division 09 Section “Painting” for field finishing exterior finish carpentry.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
- B. Samples for Verification:
  - 1. For cellular PVC trim, with 1/2 of exposed surface finished; 50 sq. in.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site.
- B. Mockups: Build mockups to set quality standard for installation.
  - 1. Build mockup of each type of trim installation, as directed by the Architect.
  - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store trim materials and sheets on a flat and level surface on a full shipping pallet. Handle materials to prevent damage to product ends and corners. Provide for air circulation within and around stacks and under temporary coverings.

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
  - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.8 WARRANTY

- A. Manufacturer's Warranty for Cellular PVC Trim: Manufacturer agrees to repair or replace trim that fails due to defects in manufacturing within specified warranty period. Failures include, but are not limited to, deterioration, delamination, and excessive swelling from moisture.
  - 1. Warranty Period: 25 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CELLULAR PVC TRIM

- A. Cellular PVC Trim: Extruded, expanded PVC with a small-cell microstructure, made from UV- and heat-stabilized, rigid material.
  - 1. Product: Subject to compliance with requirements, provide products by one of the following:
    - a. AZEK Building Products, Inc.
    - b. Klear.
    - c. Versatex.
  - 2. Performance and physical characteristic requirements:
    - a. Density: ASTM D 792, not less than 0.55 g/cu.cm.
    - b. Heat Deflection Temperature: Not less than 150 deg F, per ASTM D 648.
    - c. Coefficient of Linear Expansion: Not more than  $3.2 \times 10^{-5}$  inches/inch x deg F.
    - d. Water Absorption: Not more than 1 percent, per ASTM D 570.
    - e. Flame-Spread Index: 25 or less, per ASTM E 84.

3. Trim Boards: 4/4-inch and 5/4-inch thicknesses in nominal widths indicated.
4. Color: White.
5. Texture: Smooth.

## 2.2 MISCELLANEOUS MATERIALS

- A. Fasteners for Exterior Finish Carpentry: Provide stainless steel nails screws recommended by manufacturer in sufficient length to penetrate into wood substrate.
  1. The use of staples, brads, finish nails and wire nails is not permitted.
  2. Provide hidden fastening system complete with screws, plugs and setting tools for concealed fastening of cellular PVC trim.
    - a. Product: Subject to compliance with requirements, provide the following, or equal for use with cellular PVC trim product selected:
      - 1) Cortex Hidden Fastening System.
- B. Adhesive for Cellular PVC Trim: Cellular PVC cement product recommended by trim manufacturer to bond trim joints.
- C. Flashing: Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.
- D. Sealants: Urethane based sealants without silicone, complying with applicable requirements in Division 07 Section "Joint Sealants"; recommended by sealant manufacturer and manufacturer of substrates for intended application.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of the work indicates acceptance of substrates.

### 3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.



3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
  - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
  - 1. Scribe and cut exterior finish carpentry to fit adjoining work.
  - 2. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
  - 3. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 CELLULAR PVC TRIM INSTALLATION

- A. Install cellular PVC trim to comply with manufacturer's written instructions.
- B. Install trim with minimum number of joints practical, using full-length pieces from maximum lengths of trim available. Do not use pieces less than 24 inches long except where necessary.
  - 1. Use scarf joints for end-to-end joints.
  - 2. Stagger end joints in adjacent and related members.
- C. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.
- D. Install trim boards with two fasteners per every framing member. Trimboards 12-inches and wider, and sheets, require additional fasteners per manufacturer's recommendation. Install fasteners no more than 2-inches from the end of the board.
  - 1. Fasten all trim boards and sheets with stainless steel screws.
  - 2. Predrilling for fasteners may be required in low temperatures. Comply with manufacturer's recommendations.
  - 3. Allow for 1/8-inch per 18 foot of run for expansion and contraction.
- E. Glue all PVC to PVC joints with cellular PVC cement to prevent joint separation. Secure glue joint with fasteners on each side of the joint to allow adequate bonding time.
- F. Provide plugs in all fastener holes prior to finish painting by Division 09 Section "Painting." Sand all plugs smooth with face of trim.

3.5 ADJUSTING

- A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

- A. Clean exterior finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.7 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
  - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 20 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Asphalt shingles for sloped roofs.
- 2. Ridge vents.
- 3. Underlayment and self-adhering sheet underlayment.
- 4. All hoisting and scaffolding necessary for the completion of the roof work.
- 5. Waste disposal.

- B. Related Sections include the following:

- 1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking.
- 2. Division 07 Section "Sheet Metal Flashing and Trim" for vent pipe and vent cap flashing, drip edges, and other sheet metal work.
- 3. Division 07 Section "Roof Specialties" for gutters and downspouts."

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For Installer, Manufacturer, and Roofing Inspector.

Letter written for this Project indicating manufacturer approval of Installer to apply specified products and provide specified warranty.

- C. Contractor's Product Certificate: Submit notarized certificate, indicating products intended for Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.
- D. Provide manufacturer's UL listing certificate for roofing system.
- E. Provide FM Global Form 2688 Checklist for Roofing System and FM Approval RoofNav Contractors Package for each new roof assembly to FM Global for review and comment. The Form 2688 should include a RoofNav Assembly number and contain all the materials proposed for the roofing project. Exact trades names of the materials proposed should be stated along with

the proposed fastening rates and insulation thickness. These forms are to be sent to FM Global by the contractor of record before the roof rehabilitation begins.

- F. Product Test Reports: If requested, based on the evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing rehabilitation.
- G. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, and for dust control. Indicate proposed locations and construction of barriers.
- H. Warranties: Unexecuted sample copies of special warranties.
- I. Existing Conditions Photographs: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, which might be misconstrued as having been damaged by re-coating operations. Submit before Work begins.
- J. Inspection Reports: Reports of Roofing Inspector. Include weather conditions, description of work performed, tests performed, defective work observed, and corrective actions required and carried out.  

Submit report within 48 hours after inspection.
- K. Samples for Initial Selection: For each type of asphalt shingle indicated.
- L. Samples for Verification: For the following products, of sizes indicated, to verify color selected.
  - 1. Asphalt Shingle: Full-size asphalt shingle strip.
  - 2. Ridge Vent: 12-inch- long Sample.
  - 3. Ridge and Hip Cap Shingles: Full-size ridge cap asphalt shingle.

4. Underlayment: 12 inches square.
5. Self-Adhering Underlayment: 12 inches square.

M. Qualification Data: For Installer.

N. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for asphalt shingles.

O. Research/Evaluation Reports: For asphalt shingles.

P. Maintenance Data: For asphalt shingles to include in maintenance manuals.

Q. Warranties: Special warranties specified in this Section.

#### 1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual that is approved, authorized, or licensed by asphalt shingle roofing system manufacturer to install roofing system indicated.

B. Fire-Test-Response Characteristics: Provide asphalt shingle and related roofing materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method 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. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for application and roof slopes indicated.

C. Wind-Resistance-Test Characteristics: Provide asphalt shingles and related products identical to those tested according to ASTM D 7158 Class H 150 mph wind resistance and passed. Identify each bundle of asphalt shingles with appropriate markings of applicable testing and inspecting agency.

D. FM Global: Provide asphalt shingle and related roofing materials in full compliance with FM Global Property Loss Prevention Data Sheet 1-28, Wind Design. Provide installation that complies with nailing spacing and pattern in full compliance with the requirements of the Wind Pressure Determinations contained in the Data Sheet.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated, weathertight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double-stack rolls.
  - 1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.
- B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt shingle roofing to be performed according to manufacturer's written instructions and warranty requirements.
  - 1. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.

1.8 WARRANTY

- A. Standard Warranty: Standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - I. Manufacturing defects.
    - II. Structural failures including failure of asphalt shingles to self-seal after a reasonable time.
  - 2. Material Warranty Period: 50 years, prorated, with first 20 years non-prorated.
  - 3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds up to 130 mph for 15 years from date of Substantial Completion.
  - 4. Algae-Discoloration Warranty Period: Asphalt shingles will not discolor 10 years from date of Substantial Completion.
- B. Special Project Warranty: Roofing Installer's Warranty, signed by roofing Installer, covering the Work of this Section, in which roofing Installer agrees to repair or replace components of asphalt shingle roofing that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Asphalt Shingles: 25 sq. ft of each type, in unbroken bundles.

PART 2 - PRODUCTS

2.1 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Laminate Strip Asphalt Shingles: ASTM D 3462, laminated multi ply overlay construction, glass fiber reinforced, mineral granule, surfaced and self-sealing, and rated to perform at 130 mph.
1. Basis-of-Design Product: Subject to compliance with requirements, provide **CertainTeed; Landmark Premium** or one of the following:
    - a. GAF; Timberline HD.
    - b. Owens Corning; TruDefinition Duration.
  2. Butt Edge: Straight cut.
  3. Strip Size: Manufacturer's standard.
  4. Weight/Square: 300 lbs.
  5. Algae Resistance: Granules treated to resist algae discoloration.
  6. Color: As selected by Architect from manufacturer's full range.
- B. Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.2 UNDERLAYMENT MATERIALS

- A. Synthetic Underlayment: Meeting the physical requirements of ASTM D 226 or ASTM D 4869, UV stabilized polypropylene, breathable non-woven construction.
1. Obtain underlayment from same manufacturer of asphalt shingles, or equal product approved in writing by manufacturer, as required to maintain specified warranty of system.
  2. Products: Subject to compliance with requirements, provide the following or equal:
    - a. CertainTeed; DiamondDeck High-Performance Synthetic Underlayment.
    - b. GAF; Tiger Paw.
    - c. Owens Corning; Deck Defense.
- B. Self-Adhering Sheet Underlayment, Polyethylene Faced: ASTM D 1970, minimum of 40-mil-thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release paper backing; cold applied.

1. Obtain self-adhering sheet underlayment from same manufacturer of asphalt shingles, or equal product approved in writing by manufacturer, as required to maintain specified warranty of system.
2. Products: Subject to compliance with requirements, provide one of the following:
  - a. CertainTeed; WinterGuard Granular.
  - b. GCP Applied Technologies; Grace Ice and Water Shield.
  - c. Owens Corning; WeatherLock M.

### 2.3 RIDGE VENTS

- A. Rigid Ridge Vent: Manufacturer's standard rigid section high-density polypropylene or other UV-stabilized plastic ridge vent with nonwoven geotextile filter strips; for use under ridge shingles.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Air Vent Inc., a CertainTeed Company; ShingleVent II.
    - b. Cor-A-Vent; V-600.
    - c. Quarrix Building Products; Ridge Vent.
  2. Minimum Net Free Area: 18 sq. in. /ft.
  3. Width: 12 inches.

### 2.4 ACCESSORIES

- A. Roofing Nails: ASTM F 1667; hot-dip galvanized steel wire shingle nails, minimum 0.120-inch- diameter, barbed shank, sharp-pointed, with a minimum 3/8-inch- diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through plywood sheathing.
  1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

### 2.5 METAL FLASHING AND TRIM

- A. General: Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim."
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item.
  1. Step Flashings: Fabricate with a headlap of 2 inches and a minimum extension of 5 inches over the underlying asphalt shingle and up the vertical surface.
  2. Drip Edges: Fabricate in lengths not exceeding 10 feet with 2-inch roof deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.



- C. Vent Pipe Flashings: ASTM B 749, Type L51121, at least 1/16 inch thick. Provide sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof and extending at least 4 inches from pipe onto roof.

### 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 work.
  - 1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
  - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through asphalt shingles.
  - 3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 UNDERLAYMENT INSTALLATION

- A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
- B. Single-Layer Synthetic Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2 inches over underlying course. Lap ends a minimum of 4 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with roofing nails.
  - 1. Install underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of felt over self-adhering sheet underlayment not less than 3 inches in direction to shed water. Lap ends of felt not less than 6 inches over self-adhering sheet underlayment.
  - 2. Install fasteners at no more than 36 inch o.c.
- C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on entire roof deck, as indicated on drawings. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated on Drawings, lapped in direction to shed water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.
- D. Concealed Valley Lining: For closed-cut valleys. Comply with NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems." Install underlayment centered in valley and fastened to roof deck.

1. Lap roof-deck underlayment over valley underlayment at least 6 inches.
2. Install a 36-inch- wide strip of granular-surfaced valley lining, with granular-surface face up, centered in valley. Lap ends of strips at least 12 inches in direction to shed water, and seal with asphalt roofing cement. Fasten to roof deck.

### 3.3 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim."
- B. Step Flashings: Install with a headlap of 2 inches and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.
- C. Rake Drip Edges: Install rake drip edge flashings over underlayment and fasten to roof deck.
- D. Eave Drip Edges: Install eave drip edge flashings over underlayment and fasten to roof sheathing.
- E. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

### 3.4 ASPHALT SHINGLE INSTALLATION

- A. Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."
  1. Fasten asphalt shingles to roof sheathing with roofing nails.
  2. Fasten asphalt shingles in accordance with the **Rhode Island State Building Code**.
- B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip at least 7 inches wide with self-sealing strip face up at roof edge.
  1. Extend asphalt shingles 1/2 inch over fascia at eaves and rakes.
  2. Install starter strip along rake edge.
- C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with 5-inch offset pattern at succeeding courses, maintaining uniform exposure.
- D. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- E. Fasten asphalt shingle strips with a minimum of six roofing nails located according to manufacturer's written instructions.

1. Where roof slope is less than 4:12, seal asphalt shingles with asphalt roofing cement spots.
  2. When ambient temperature during installation is below 50 deg F, seal asphalt shingles with asphalt roofing cement spots.
- F. Closed-Cut Valleys: Extend asphalt-shingle strips from one side of valley 12 inches beyond center of valley. Use one-piece shingle strips without joints in valley. Fasten with extra nail in upper end of shingle. Install asphalt-shingle courses from other side of valley and cut back to a straight line 2 inches short of valley centerline. Trim upper concealed corners of cut-back shingle strips.
1. Do not nail asphalt shingles within 6 inches of valley center.
  2. Set trimmed, concealed-corner asphalt shingles in a 3-inch- wide bed of asphalt roofing cement.
- G. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.
- H. Ridge and Hip Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

### 3.5 WASTE DISPOSAL

- A. Disposal: At completion of roofing work, transport demolished materials and waste off Owner's property.

END OF SECTION 073113

SECTION 07 46 43 – COMPOSITE SIDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Engineered wood siding.

B. Related Sections:

- 1. Division 06 Section “Exterior Finish Carpentry” for cellular PVC trim installed with composite siding.
- 2. Division 07 Section “Sheet Metal Flashing and Trim.”
- 3. Division 09 Section “Painting” for field finishing engineered wood siding.

1.3 COORDINATION

- A. Coordinate installation with flashings, weather barriers, and other adjoining construction to ensure proper sequencing for weathertight performance.
- B. Coordinate with finish coat to be applied over primed cladding. Comply with coating manufacturer's written requirements for substrate primer.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples for Initial Selection: For siding including related accessories.
- C. Samples for Verification: For each type, color, texture, and pattern required.
  - 1. 12-inch- long-by-actual-width Sample of siding.
- D. Qualification Data: For qualified siding Installer.
- E. Product Certificates: For each type of siding, signed by product manufacturer.
- F. Research/Evaluation Reports: For each type of siding required.

- G. Warranty: Sample of special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

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

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Furnish full lengths of siding including related accessories, in a quantity equal to 2 percent of amount installed.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall have a minimum of 3 years' experience installing like products specified in this section on projects of similar scope and size.
- B. Source Limitations: Obtain each type, color, texture, and pattern of siding, including related accessories, from single source from single manufacturer.
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockups for siding including accessories.
    - a. Size: 48 inches long by 60 inches high.
    - b. Include outside corner on one end of mockup and inside corner on other end.
  - 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. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Preinstallation Conference: Conduct conference at Project site.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in a dry, well-ventilated, weathertight place.

#### 1.9 WARRANTY

- A. Manufacturer's Standard Warranty: Transferable limited warranty.
  - 1. Warranty Period: 50 years prorated from date of Substantial Completion.

- B. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including buckling.
    - b. Deterioration of materials beyond normal weathering.
    - c. Fungal degradation.
    - d. Cracking, peeling, separating, chipping, flaking, or rupturing of resin-impregnated surface overlay.
    - e. Hail damage consisting of a crack, chip, or dent in the surface overlay exceeding 3/8 inch in length or diameter.
  - 2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 ENGINEERED WOOD SIDING

- A. General: Composite siding fabricated from extruded polyvinyl chloride with inorganic material coextruded with an acrylic cap profiles as specified in this section.
  - 1. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:
    - a. **LP Building Products; LP SmartSide.**
- B. Horizontal Lap Siding: 38 Series Cedar Texture Lap Siding - ExpertFinish
  - 1. Description: Engineered wood siding complying with ANSI A135.6, with resin and linseed oil impregnated surface; EPA-registered zinc-borate-preserved-treated; AWPA compliant; acrylic primed for painting.
  - 2. Fire Rating: 1 hour per ASTM E119; ASTM E 84 Class C flamespread.
  - 3. Thickness: .354 inch minimum.
  - 4. Width: 5.84 inch
  - 5. Style: **38 Series Cedar Texture Lap Siding – ExpertFinish**
  - 6. Color: to be selected by Architect from manufacturer's full range of colors.
  - 7. Length: 16 feet.

### 2.2 ACCESSORIES

- A. Fasteners: ASTM A153, hot-dip galvanized or stainless steel nails with 0.113 inch diameter shank and 0.27 inch diameter head, long enough to achieve 1 1-1/2 inch penetration into structural sheathing and framing
- B. Sealant: ASTM C920, minimum Class 25 sealant.
- C. Flashing: Aluminum at window and door heads and where indicated on Drawings. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal flashing.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

- A. General: Comply with siding manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
  - 1. Do not install damaged components.
  - 2. Center nails in elongated nailing slots without binding siding to allow for thermal movement.
- B. Install siding and related accessories according to ASTM D 4756.
  - 1. Install fasteners for horizontal composite siding no more than 16 inches o.c.
- C. Install joint sealants as specified in Division 07 Section "Joint Sealants" and to produce a weathertight installation.

3.4 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 07 46 43

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Formed Products:

- a. Formed steep-slope roof sheet metal fabrications.
- b. Roof penetration flashing.

2. All hoisting and scaffolding necessary for the completion of the work.
3. Waste disposal.

B. Related Sections:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 Section "Asphalt Shingles."
3. Division 07 Section "Roof Specialties" for manufactured roof edge specialties including fascia, gutters and downspouts.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- C. FM Global: Provide sheet metal flashing and related roofing materials in full compliance with FM Global Property Loss Prevention Data Sheet 1-28, Wind Design. Provide installation that complies with adhesive application in full compliance with the requirements of the Wind Pressure Determinations contained in the Data Sheet.



1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
  - 1. Identification of material, thickness, weight, and finish for each item and location in Project.
  - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
  - 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
  - 4. Details of termination points and assemblies, including fixed points.
  - 5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
  - 6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
  - 7. Details of special conditions.
  - 8. Details of connections to adjoining work.
  - 9. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches.
- C. Fabrication Samples: For roof edge flashings made from 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.
- D. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.
- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
  - 1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
  - 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
  - 3. Accessories and Miscellaneous Materials: Full-size Sample.
- F. Qualification Data: For qualified fabricator.
- G. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.
- H. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
  - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- B. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- C. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.
- D. Preinstallation Conference: Conduct conference at Project site.
  - 1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, and roof-mounted equipment.
  - 2. Review methods and procedures related to sheet metal flashing and trim.
  - 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
  - 4. Review special roof details, roof drainage, roof penetrations, and condition of other construction that will affect sheet metal flashing.
  - 5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.7 COORDINATION

- A. Coordinate installation of manufactured roof specialties with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

1.8 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
  - 1. Surface: Smooth, flat.
  - 2. Exposed Coil-Coated Finish:
    - a. 2-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.2 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
    - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
  2. Fasteners for Aluminum Sheet: Series 300 stainless steel.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- G. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- 2.3 FABRICATION, GENERAL
- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
  2. Obtain field measurements for accurate fit before shop fabrication.
  3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
  4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

- D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.
- G. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.
- H. Do not use graphite pencils to mark metal surfaces.

#### 2.4 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Step Flashing: Fabricate from the following material:
  - 1. Aluminum, Mill: 0.040 inch thickness.
- B. Drip Edges: Fabricate from the following material:
  - 1. Aluminum: 0.032 inch thick.
    - a. Color: Custom, to match Architect's sample.
- C. Roof-Penetration Flashing: Fabricate from the following material:
  - 1. Aluminum, Mill: 0.040 inch thickness.

2.5 WALL SHEET METAL FABRICATIONS

- A. Wall Sheet Metal Flashing: Fabricate from the following material:
1. Aluminum: 0.040 inch thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
1. Verify compliance with requirements for installation tolerances of substrates.
  2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
  2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
  3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
  4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
  5. Install sealant tape where indicated.
  6. Torch cutting of sheet metal flashing and trim is not permitted.
  7. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

1. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.
  - C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
  - D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
  - E. Seal joints as shown and as required for watertight construction.
    1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
    2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
  - F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
    1. Do not solder aluminum sheet.
    2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
- 3.3 ROOF FLASHING INSTALLATION
- A. General: Install sheet metal flashing and trim to comply with performance requirements[, sheet metal manufacturer's written installation instructions,] and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
  - B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

- C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant.
- D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

### 3.4 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Frame Construction: Install continuous head, sill, and similar flashings to extend 4 inches beyond wall openings.

### 3.5 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

### 3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

### 3.7 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.



- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.8 WASTE DISPOSAL

- A. Unless otherwise indicated, excess materials are Contractor's property. At completion of roofing work, remove from Project site.

END OF SECTION 07 62 00

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
  - 1. Roof-edge specialties.
  - 2. Roof-edge drainage systems.
- B. Related Requirements:
  - 1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.

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.
- B. Sustainable Design Submittals:
  - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings: For roof specialties.
  - 1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
  - 2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
  - 3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
  - 4. Detail termination points and assemblies, including fixed points.
  - 5. Include details of special conditions.
- D. Samples: For each type of roof specialty and for each color and texture specified.

- E. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.
- F. Samples for Verification:
  - 1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For each type of roof specialty.
- C. Product Test Reports: For roof-edge flashings, for tests performed by a qualified testing agency.
- D. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
- B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.
- B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

**PART 2 - PRODUCTS**

**2.1 PERFORMANCE REQUIREMENTS**

- A. **General Performance:** Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

**2.2 ROOF-EDGE DRAINAGE SYSTEMS**

- A. **Gutters:** Manufactured in uniform section lengths not exceeding 12 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.
  - 1. Aluminum Sheet: 0.032 inch thick.
  - 2. Gutter Profile: Match existing profile, according to SMACNA's "Architectural Sheet Metal Manual.
  - 3. Corners: Factory mitered and mechanically clinched and sealed watertight.
  - 4. Gutter Supports: Manufacturer's standard supports as selected by Architect with finish matching the gutters.
- B. **Downspouts:** Plain rectangular complete with smooth-curve elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
  - 1. Formed Aluminum: 0.032 thick.
- C. **Aluminum Finish:** Mill.
  - 1. Color: As selected by Architect from manufacturer's full range.

**2.3 MATERIALS**

- A. **Aluminum Sheet:** ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
- B. **Aluminum Extrusions:** ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:

**2.4 MISCELLANEOUS MATERIALS**

- A. **Fasteners:** Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
  - 1. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted 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 unacceptable. 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 substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
  - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
  - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
  - 3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
  - 4. Torch cutting of roof specialties is not permitted.
  - 5. Do not use graphite pencils to mark metal surfaces.

3.3 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

- A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.

- B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 24 inches apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.
  - 1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion-joint caps.
- C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.
  - 1. Provide elbows at base of downspouts at grade to direct water away from building.
- D. Splash Pans: Install where downspouts discharge on ground at locations of newly installed gutter & downspouts.

#### 3.4 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Acoustical joint sealants.

B. Related Sections include the following:

1. Division 04 Section “Unit Masonry” for masonry sealants
2. Division 04 Section “Adhered Stone Masonry Veneer” for stone veneer sealants
3. Division 06 Section “Glass Reinforced Gypsum Sheathing” for sheathing sealants
4. Division 06 Section “Exterior Finish Carpentry for exterior trim sealants
5. Division 07 Section “Composite Siding” for lap siding sealants.
6. Division 07 Section “Sheet Metal Flashing and Trim” for metal flashing and trim sealants.

1.03 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
  2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
  3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
  5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.04 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.05 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- 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. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. 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.

1.06 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- B. Qualification Data: For Installer.
- C. Compatibility and Adhesion 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 needed for adhesion.
- D. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.
- E. Preconstruction Compatibility and Adhesion 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 needed for adhesion.



- F. Warranties: Special warranties specified in this Section.

#### 1.07 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
  - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
  - 2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
- D. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
  - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
  - 2. Each type of sealant and joint substrate indicated.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

#### 1.08 PROJECT 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.
  - 2. When joint substrates are wet.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

#### 1.09 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric 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's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period for Urethane: Five years from date of Substantial Completion.
  - 2. Warranty Period for Silicone: 20 years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
  - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
  - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
  - 3. Mechanical damage caused by individuals, tools, or other outside agents.
  - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 - PRODUCTS

### 2.01 MATERIALS, 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. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
  - 1. Architectural Sealants: 250 g/L.
  - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
  - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- E. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- F. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

- G. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.02 SILICONE JOINT SEALANTS

- A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Dow Corning Corporation; 790.
- b. Pecora Corporation; 890 NST.
- c. Tremco Incorporated; Spectrem 1.

- B. Mildew Resistant, Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Dow Corning Corporation; 786 Mildew Resistant.
- b. GE Silicones; Sanitary SCS1700.
- c. Tremco; Tremsil 200 Sanitary.

2.03 URETHANE JOINT SEALANTS

- A. Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920. Type M, Grade P, Class 25, for Use T and I.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. BASF Corporation-Construction Systems; MasterSeal SL 2.
- b. Pecora Corporation; Dynatrol II-SG.
- c. Sherwin Williams; Loxon 2K SL.
- d. Tremco; THC-900.

2.04 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. American Sealants, Inc.; ASI 174.
- b. Pecora Corporation; AC-20+.
- c. Sherwin Williams; 950A.
- d. Tremco; Tremflex 834.

2.05 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:
- 1.
  2. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
  3. Products: Subject to compliance with requirements, provide one of the following:
    - a. Green Glue; Green Glue Noiseproofing Sealant.
    - b. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
    - c. Sherwin Williams; 950A.
    - d. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

2.06 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) as approved in writing by joint-sealant manufacturer for joint application indicated, 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 where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.07 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

3.01 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 joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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, blast cleaning, 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.
    - c. Unglazed surfaces of ceramic tile.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous 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.
    - c. Porcelain enamel.
    - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on 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 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.

3.03 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 type 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 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 configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
- G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, 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 recommendations.

3.04 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.

3.05 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 and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.06 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 1. Joint Locations:
    - a. Perimeter joints at frames of steel framed doors and openings.
  - 2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50.
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
  - 1. Joint Locations:
    - a. Penetrations in concrete slabs on grade.
    - b. Control and expansion joints in tile flooring.
    - c. Other joints as indicated.
  - 2. Urethane Joint Sealant: Multicomponent, pourable, traffic grade, Class 25.
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors, for each material.
- C. Joint-Sealant Application: Interior joints in all other vertical surfaces and horizontal nontraffic surfaces.
  - 1. Joint Locations:
    - a. Control and expansion joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints of exterior openings where indicated.
    - c. Tile control and expansion joints.
    - d. Vertical joints on exposed surfaces of interior unit masonry walls and partitions.
    - e. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
    - f. Other joints as indicated.
  - 2. Joint Sealant: 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 Sealant Location:
    - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - b. Other joints as indicated.
  - 2. Joint Sealant: Single component, nonsag, mildew resistant, acid curing silicone.

3. Joint-Sealant Color: White.
- E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces at counters and backsplashes.
1. Joint Sealant Location:
    - a. Joints between counters and walls.
    - b. Joints between backsplashes and walls.
    - c. Joints between counters and backsplashes.
    - d. Other joints as indicated.
  2. Joint Sealant: Single component, nonsag, mildew resistant, acid curing silicone.
  3. Joint-Sealant Color: Clear.
- F. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Location:
    - a. Acoustical joints where indicated.
    - b. Other joints as indicated.
  2. Joint Sealant: Acoustical.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 07 92 00



## **PART 1 - GENERAL**

### **1.1 RELATED DOCUMENTS**

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

### **1.2 SUMMARY**

- A. Section includes hollow-metal work.
- B. Related Requirements:
  - 1. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
  - 2. Division 09 Section "Painting" for field painting hollow metal doors and frames.

### **1.3 DEFINITIONS**

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

### **1.4 COORDINATION**

- A. Coordinate anchorage installation 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.

### **1.5 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Meet with Architect, electrical contractor, security systems supplier, and hardware installers whose work interfaces with or affects hollow metal doors and frames.
  - 2. Review requirements for type of cut-out and back-box as part of the door and frame assembly.
  - 3. Document proceedings, including receipt of samples and approved shop drawings of security contact devices which accurately represent the installation of the device, back-box, and conduit terminations required.
  - 4. Distribute an installation book, including all manuals and instructions.

### **1.6 ACTION SUBMITTALS**

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

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
  1. Elevations of each door type.
  2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
  3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  4. Locations of reinforcement and preparations for hardware.
  5. Details of each different wall opening condition.
  6. Details of anchorages, joints, field splices, and connections.
  7. Details of accessories.
  8. Details of moldings, removable stops, and glazing.
  9. Details of conduit and preparations for power, signal, and control systems.
- C. 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 final Door Hardware Schedule.

## **1.7 INFORMATIONAL SUBMITTALS**

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

## **1.8 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
  1. Provide additional protection to prevent damage to 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 vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Ceco Door; ASSA ABLOY.
  2. Curries Company; ASSA ABLOY.

3. DE LA FONTAINE.
4. Steelcraft; an Allegion brand.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

## 2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

## 2.3 INTERIOR & EXTERIOR DOORS AND FRAMES

A. Construct interior and exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified. All doors and frames shall be shop galvanized

A. Heavy-Duty Doors and Frames: SDI A250.8, Level 2; SDI A250.4, Level B.

1. Doors:

- a. Type: As indicated in the Door and Frame Schedule.
- b. Thickness: 1-3/4 inches (44.5 mm).
- c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm), with minimum A60 (ZF180) galvanized coating.
- d. Edge Construction: Model 1, Full Flush.
- e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
- f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
- g. Bottom Edges: Close bottom edges of doors as required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
- h. Core: Polyisocyanurate.

2. Frames:

- a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A60 (ZF180) galvanized coating.
- b. Construction: Full profile welded.

3. Exposed Finish: Primer compatible with galvanized coating.

## 2.4 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry-Wall Type: Designed to engage CMU, welded to back of frames; not less than 0.042 inch thick.

- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
  - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

## **2.5 MATERIALS**

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- E. Power-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 maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- G. Glazing: Comply with Division 08 Section "Glazing."

## **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 metal thickness. 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. Hollow-Metal Doors:
  - 1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
  - 2. Fire Door Cores: As required to provide fire-protection ratings indicated.
  - 3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
  - 4. Top Edge Closures: Close top edges of doors with inverted closures.
  - 5. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.

6. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- 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. Sidelite 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.
  2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
  4. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Masonry-Wall Type: Locate anchors not more than 16 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.
  5. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
  6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Fabricate concealed stiffeners and edge channels 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 SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
  2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- F. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with manufacturer's standard gauges and sizes, but not less than the following minimum sizes.
1. Hinges: Minimum 10 gauge by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.

2. Lock Face, Flush and Surface Bolts, Closers, and Concealed Holders: Minimum 14 gauge.
  3. Pull Plates and Bar: Minimum 16 gauge.
- G. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with 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 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 glazing and installation types indicated.

## **2.7 STEEL FINISHES**

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## **2.8 ACCESSORIES**

- A. Mullions: Join to adjacent members by welding or rigid mechanical anchors.

## **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. 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. Drill and tap doors and frames to receive nontemplated, 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 for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
  - 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. At fire-rated openings, install frames according to NFPA 80.
    - b. 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.
    - c. Install frames with removable stops located on secure side of opening.
    - d. Install door silencers in frames before grouting.
    - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    - g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
  - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
    - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
  - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
  - 4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. 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. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
- 1. Non-Fire-Rated Steel Doors:
    - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
    - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
    - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
    - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
    - e. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
  - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80, and the following:
    - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
    - c. Between Bottom of Door and Top of noncombustible Threshold: Maximum 3/8 inch.
    - d. Between Bottom of Door and Top of noncombustible Finish Floor (No Threshold): Maximum 3/4 inch.
    - e. Between Bottom of Door and all other Finish Floor Coverings: Maximum 1/2 inch.
- D. 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. 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.
- C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in Division 09 Section "Painting."

**END OF SECTION 08 11 13**



SECTION 08 41 13 – ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Exterior swing entrance doors and door-frame units.
- 2. Exterior storefront framing.
- 3. Storefront framing for punched openings.

B. Related Sections:

- 1. Division 07 Section "Joint Sealants" for installation of joint sealants installed with aluminum-framed systems and for sealants to the extent not specified in this Section.
- 2. Division 08 Section "Door Hardware" for hardware to the extent not specified in this Section.
- 3. Division 08 Section "Glazing" for glazing requirements to the extent not specified in this Section.

1.3 PREINSTALLATION MEETINGS

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

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

- 1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
- 2. Dimensional tolerances of building frame and other adjacent construction.
- 3. Failure includes the following:
  - a. Deflection exceeding specified limits.
  - b. Thermal stresses transferring to building structure.
  - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
  - d. Glazing-to-glazing contact.

- e. Noise or vibration created by wind and by thermal and structural movements.
  - f. Loosening or weakening of fasteners, attachments, and other components.
  - g. Sealant failure.
  - h. Failure of operating units.
- B. Structural Loads:
- 1. Wind Loads: Provide entrance systems capable of withstanding wind-load design pressures calculated using a “design wind pressure” as determined from the Rhode Island State Building Code, and as determined by the Fabricator’s design engineer.
    - a. Ultimate Wind Speed: See Structural Drawings.
    - b. Exposure Category: B.
    - c. Risk Category: II.
  - 2. Seismic Loads: Provide entrance systems capable of withstanding the effects of earthquake motions calculated according to the Rhode Island State Building Code, as determined by the Fabricator’s design engineer.
- C. Deflection of Framing Members:
- 1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
  - 2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below them to less than 1/8 inch and clearance between members and operable units directly below them to less than 1/16 inch.
- D. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
- 1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
  - 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
  - 3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.
- E. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft.
- F. Air Infiltration for Swinging Doors: Provide aluminum-framed entrance doors with maximum air leakage through fixed glazing and framing areas of 1.00 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft.
- G. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331

at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

- H. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
  - 2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
- I. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 55 when tested according to AAMA 1503.
- J. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than **0.38** Btu/sq. ft. x h x deg F when tested according to AAMA 1503, and glazed with 1-inch insulated glass units.
- K. Thermal Conductance for Swinging Doors: Provide aluminum-framed entrance doors with fixed glazing and framing areas having an average U-factor of not more than **0.77** Btu/sq. ft. x h x deg F when tested according to AAMA 1503, and glazed with 1-inch insulated glass units.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
  - 2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
    - a. With the exception of weatherstripping, hardware is furnished under Division 08 Section "Door Hardware."
    - b. Indicate coordination of security door contacts with security system requirements.
      - 1) Do not prepare doors and frames without an approved security systems shop drawing and sample of the Contract.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

- E. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch lengths of full-size components and showing details of the following:
  - 1. Joinery, including concealed welds.
  - 2. Anchorage.
  - 3. Expansion provisions.
  - 4. Glazing.
  - 5. Flashing and drainage.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Seismic Qualification Certificates: For aluminum-framed systems, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
- C. Welding certificates.
- D. Preconstruction Test Reports: For sealant.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.
- F. Source quality-control reports.
- G. Field quality-control reports.
- H. Warranties: Sample of special warranties.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

#### 1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by

dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, and in-service performance.

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.
- D. Accessible Entrances: Comply with applicable provisions in the 2010 ADA Standards and ICC/ANSI A117.1.
- E. Source Limitations for Aluminum-Framed Systems: Obtain aluminum-framed entrance and storefront systems from a single source from a single manufacturer.
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockup of typical wall area as directed by the 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. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- G. Preinstallation Conference: Conduct conference at Project site.

#### 1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

#### 1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Noise or vibration caused by thermal movements.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    - d. Adhesive or cohesive sealant failures.
    - e. Water leakage through fixed glazing and framing areas.
    - f. Failure of operating components.
  2. Warranty Period: 10 years from date of Substantial Completion.

- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.
  - 1. Warranty Period: 20 years from date of Substantial Completion.
- C. Special Warranty: Installer's warranty, in which installer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  - 1. Sheet and Plate: ASTM B 209.
  - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
  - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
  - 4. Structural Profiles: ASTM B 308/B 308M.
  - 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
  - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
  - 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
  - 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

### 2.2 FRAMING SYSTEMS, GENERAL

- A. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
  - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
  - 2. Reinforce members as required to receive fastener threads.
  - 3. Use exposed fasteners with countersunk Phillips screw heads to install hardware only, finished to match framing system.
- C. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

- D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- E. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.
- F. Provide UL listed electrical back boxes of suitable size to allow termination of 1/2-inch EMT or 3/4-inch flexible metallic conduit at the following locations:
  - 1. Openings to receive security system devices.
  - 2. Openings to receive electrified locksets.
  - 3. Openings to receive electrified power transfer hinges.

### 2.3 EXTERIOR FRAMING SYSTEMS

- 1. Basis of Design Product: Subject to compliance with requirements, provide **Kawneer; Trifab VG 601T** or one of the following:
  - a. EFCO; Series 406T.
  - b. YKK; YES 60 TU.
- B. Framing Members: Manufacturer's standard extruded-aluminum framing members, minimum wall thickness of .080", and reinforced as required to support imposed loads.
  - 1. Construction: Thermally improved.
  - 2. Glazing System: Retained mechanically with gaskets on four sides.
  - 3. Glazing Plane: Center Plane.
  - 4. Depth of Frame: Not less than 6".
  - 5. Face of Frame: Not less than 2".

### 2.4 GLAZING SYSTEMS

- A. Glazing: As specified in Division 08 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

### 2.5 INTERIOR & EXTERIOR ENTRANCE DOOR SYSTEMS

- A. Basis of Design Product: Subject to compliance with requirements, provide **Kawneer; 500 Tuffline Entrance Door** or one of the following
  - 1. EFCO; D518 Heavy Duty Entrance Door.
  - 2. YKK; 50M Monumental Entrance Door.
- B. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 2-inch overall thickness, with minimum 0.188-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
2. Door Design: Wide stile; 5-inch nominal width.
  - a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.
3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
  - a. Provide nonremovable glazing stops on outside of door.
4. Door Frames: Provide **Kawneer 500 Tuffline** framing at all exterior doors.
5. Provide an integral 1/2-inch diameter wire tube in doors to receive electrified locksets, panic bars, mortised electric locksets, or electric strikes in the inactive leaf of pairs of doors to accommodate wiring associated with power transfer hinges, knuckles, and electrified hardware within the door.

2.6 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: For hardware furnished by this Section, in the hardware sets included.
- B. Weather Stripping: Manufacturer's standard replaceable components.
  1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
  2. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- C. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- D. Silencers: BHMA A156.16, Grade 1.

2.7 ENTRANCE DOOR HARDWARE

NOTE: Provide permanent cores for all door hardware locksets based on City of East Providence requirements.

A. Entrance Door Hardware: Door #101 [Clam Shack/Restaurant]			
1	Overhead Concealed Closer	LCN 2030 with hold open and track bumper	LCN 084113
1	Exit Device, Concealed Rod	Falcon 1690	Falcon 084113



1 Pull & Cylinder	Falcon 1690	Falcon	084113
1 Cylinder	To size	Corbin-Russwin	
1 Threshold	to architect detail	Pemko	087100

Notes: Door always free for egress.

B. Entrance Door Hardware: Door #108 [office]

1 Overhead Concealed Closer	LCN 2030 with hold open and track bumper	LCN	084113
1 Exit Device, Concealed Rod	Falcon 1690	Falcon	084113
1 Pull & Cylinder	Falcon 1690	Falcon	084113
1 Cylinder	To size	Corbin-Russwin	
1 Threshold	to architect detail	Pemko	087100

Notes: Door always free for egress.

2.8 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Retain first option in "Glazing Sealants" Paragraph below for products based on manufacturer's standard systems, or retain second option and specify sealants for glazing systems in Section 088000 "Glazing."
- D. Glazing Sealants: As recommended by manufacturer.
  - 1. Sealant shall have a VOC content of 250 g/L or less.
  - 2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in storefront system indicated.
  - 1. Color: As selected by Architect from manufacturer's full range of colors.
  - 2. Weatherseal sealants in "Weatherseal Sealants" Paragraph below provide weather resistance for structural-glazed sealants. Delete if not required or where structural sealant is also weatherseal sealant.

- F. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.

- 1. Color: Match structural sealant.

## 2.9 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

- 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
  - 2. Reinforce members as required to receive fastener threads.
  - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

- 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

## PART 3 - EXECUTION

### 3.1 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, furnished and installed by Division 07 Section "Joint Sealants."

- B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

### 3.2 FABRICATION

- A. Form or extrude aluminum shapes before finishing.

- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
1. Profiles that are sharp, straight, and free of defects or deformations.
  2. Accurately fitted joints with ends coped or mitered.
  3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
  4. Physical and thermal isolation of glazing from framing members.
  5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  6. Provisions for field replacement of glazing from exterior.
  7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Storefront Framing: Fabricate components for assembly using screw-spline system.
1. Mullions: Provide mullions and cover plates as shown, matching curtainwall units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of curtainwall units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of curtainwall units.
- F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
1. At exterior doors, provide compression weather stripping at fixed stops.
  2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
  2. At exterior doors, provide weather sweeps applied to door bottoms.
- H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- I. Prepare doors and frames to receive security systems hardware in accordance with final security systems shop drawings and templates provided by security systems hardware supplier.
- J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

3.3 ALUMINUM FINISHES

- A. Provide the following finish for exterior framing and entrance doors, and interior vestibule framing and entrance doors.
  - 1. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    - a. Color: As selected by Architect manufacturer's full range.

PART 4 - EXECUTION

4.1 EXAMINATION

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

4.2 INSTALLATION

- A. General:
  - 1. Comply with manufacturer's written instructions.
  - 2. Do not install damaged components.
  - 3. Fit joints to produce hairline joints free of burrs and distortion.
  - 4. Rigidly secure nonmovement joints.
  - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
  - 6. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
  - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
  - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

- E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- F. Furnish and install glazing as specified in Division 08 Section "Glazing."
- G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
  - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
  - 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.
- H. Install perimeter joint sealants to comply with Division 07 Section "Joint Sealants", to produce weathertight installation.

#### 4.3 ERECTION TOLERANCES

- A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
  - 1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
  - 2. Alignment:
    - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
    - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
- B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

#### 4.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
  - 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
    - a. Perform a minimum of three tests in areas as directed by Architect.
    - b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
- C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
- D. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- F. Prepare test and inspection reports.

**4.5 ADJUSTING, CLEANING, AND PROTECTION**

- A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
  - 1. For entrance doors indicated to be accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.
- B. Clean aluminum surfaces immediately after installing aluminum-framed systems. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- C. Clean glass immediately after installation. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- E. Protect aluminum framed surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION 08 41 13

SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
  - 1. Swinging doors.
- B. Door hardware includes, but is not necessarily limited to, the following:
  - 1. Mechanical door hardware.
  - 2. Cylinders specified for doors in other sections.
- C. Related Sections:
  - 1. Division 08 Section “Door Hardware Schedule”.
  - 2. Division 08 Section “Hollow Metal Doors and Frames”.

Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

- 3. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
  - 4. ICC/IBC - International Building Code.
  - 5. NFPA 70 - National Electrical Code.
  - 6. NFPA 80 - Fire Doors and Windows.
  - 7. NFPA 101 - Life Safety Code.
  - 8. NFPA 105 - Installation of Smoke Door Assemblies.
  - 9. State Building Codes, Local Amendments.
- D. Standards: All hardware specified herein shall comply with the following industry standards:
    - 1. ANSI/BHMA Certified Product Standards - A156 Series
    - 2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
  - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
  - 3. Content: Include the following information:
    - a. Type, style, function, size, label, hand, and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
    - h. Warranty information for each product.
  - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
  - 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
    - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    - b. Complete (risers, point-to-point) access control system block wiring diagrams.



- c. Wiring instructions for each electronic component scheduled herein.
  - D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
  - E. Informational Submittals:
    - 1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
  - F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.
- 1.4 QUALITY ASSURANCE
- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
  - B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
  - C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
  - D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
  - E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
  - F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
    - 1. Function of building, purpose of each area and degree of security required.

2. Plans for existing and future key system expansion.
  3. Requirements for key control storage and software.
  4. Installation of permanent keys, cylinder cores and software.
  5. Address and requirements for delivery of keys.
- G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
  2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
  3. Review sequence of operation narratives for each unique access controlled opening.
  4. Review and finalize construction schedule and verify availability of materials.
  5. Review the required inspecting, testing, commissioning, and demonstration procedures
- H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

#### 1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to

source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

- C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

## 1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
  - 1. Structural failures including excessive deflection, cracking, or breakage.
  - 2. Faulty operation of the hardware.
  - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
  - 1. Ten years for mortise locks and latches.
  - 2. Five years for exit hardware.
  - 3. Twenty five years for manual overhead door closer bodies.

## 1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

## PART 2 - PRODUCTS

### 2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

## 2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
1. Quantity: Provide the following hinge quantity:
    - a. Two Hinges: For doors with heights up to 60 inches.
    - b. Three Hinges: For doors with heights 61 to 90 inches.
    - c. Four Hinges: For doors with heights 91 to 120 inches.
    - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
  2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
    - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
    - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
  3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
    - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
  4. Hinge Options: Comply with the following:
    - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
  5. Manufacturers:
    - a. Best, dormakaba Group (BD)

- b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
  - c. Stanley Door Hardware (ST)
- B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
1. Manufacturers:
- a. Best; dormakaba Group (BD)
  - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
  - c. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
  - d. Stanley Door Hardware (ST)
  - e. See Division 08, Section “Door Hardware Schedule” for others where applicable.

### 2.3 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
- 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
  - 2. Furnish dust proof strikes for bottom bolts.
  - 3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
  - 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
- B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
- 1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
  - 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
  - 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
  - 4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

### 2.4 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
- C. Cylinders: Original manufacturer cylinders complying with the following:
1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
  2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
  4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
  5. Keyway: Manufacturer's Standard.
- D. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
1. Removable Cores: Core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware. Provide removable core (small or large format) as specified in Hardware Sets.
- E. Patented Cylinders: ANSI/BHMA A156.5, Grade 1, certified cylinders employing a utility patented and restricted keyway requiring the use of patented controlled keys. Provide bump resistant, fixed core cylinders as standard with solid recessed cylinder collars. Cylinders are to be factory keyed where permanent keying records will be established and maintained.
1. Provide a 6 pin multi-level master key system comprised of patented controlled keys and security and high security cylinders operated by one (1) key of the highest level. Geographical exclusivity to be provided for all security and high security cylinders and UL437 certification where specified.
    - a. Level 1 Cylinders: Provide utility patented controlled keyway cylinders that are furnished with patented keys available only from authorized distribution.
    - b. Level 2 Cylinders: Provide utility patented controlled keyway and side bar locking incorporating unique angled bottom pins for geographical exclusivity. Cylinders constructed to provide protection against bumping and picking.
    - c. Level 3 Cylinders: Provide utility patented controlled keyway and side bar locking incorporating unique angled bottom pins for geographical exclusivity. Cylinders to be UL437 certified and constructed to provide protection against bumping, picking, and drilling.
    - d. Refer to hardware sets for specified levels.
  2. Manufacturers:
    - a. Best; dormakaba Group (BD), **type as required by the City of East Providence.**
- F. Keying System: Each type of lock and cylinders to be factory keyed.
1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
  2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.

3. New System: Key locks to a new key system as directed by the Owner.
- G. Key Quantity: Provide the following minimum number of keys:
1. Change Keys per Cylinder: Three (3).
  2. Master Keys (per Master Key Level/Group): Five (5).
  3. Construction Keys (where required): Ten (10).
  4. Construction Control Keys (where required): Two (2).
  5. Permanent Control Keys (where required): Two (2).
- H. Construction Keying: Provide temporary keyed construction cores.
- I. Key Registration List (Bitting List):
1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
  2. Provide transcript list in writing or electronic file as directed by the Owner.

## 2.5 KEY CONTROL

- A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
1. Manufacturers
    - a. Lund Equipment (LU).
    - b. MMF Industries (MM).
    - c. Telkee (TK).

## 2.6 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
1. Manufacturers
    - a. Corbin Russwin Hardware (RU) - ML2000 Series.
    - b. Dormakaba Best (BE) – 45H Series

## 2.7 AUXILIARY LOCKS

- A. Mortise Deadlocks, Small Case: ANSI/BHMA A156.36, Grade 1, small case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. Steel or stainless steel bolts with a 1" throw and hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other specified locksets.
1. Manufacturers
    - a. Corbin Russwin Hardware (RU) – DL4000 Series.
    - b. Dormakaba Best (BE) – 48H Series

## 2.8 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
  2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
  3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
  4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
1. Strikes for Mortise Locks and Latches: BHMA A156.13.
  2. Strikes for Bored Locks and Latches: BHMA A156.2.
  3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
  4. Dustproof Strikes: BHMA A156.16.

## 2.9 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
  2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
  3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
  4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
  5. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in hardware sets. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.



6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
    - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
  7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
  8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
  9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
  10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
  11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
1. Manufacturers:
    - a. Best; dormakaba Group (BD) – Apex 2000 Series
    - b. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
    - c. Sargent Manufacturing (SA) - 80 Series.

## 2.10 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
  2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
  3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
  4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use.

Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
  6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
  7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.
1. Manufacturers:
    - a. Best; dormakaba Group (BD) – 8900 Series
    - b. Corbin Russwin Hardware (RU) - DC8000 Series.
    - c. Norton Door Controls (NO) – 9500 Series.
    - d. Sargent Manufacturing (SA) - 281 Series.

## 2.11 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
  1. Manufacturers:
    - a. Hager Companies (HA).
    - b. Hiawatha, Inc. (HI).
    - c. Rockwood (RO).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
  1. Manufacturers:
    - a. dormakaba (DO).
    - b. Norton Rixson (RF).

c. Sargent Manufacturing (SA).

## 2.12 ARCHITECTURAL SEALS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- C. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
  - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- D. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
  - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- E. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- F. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
  - 1. *Manufacturers:*
    - a. National Guard Products (NG).
    - b. Pemko (PE).
    - c. Reese Enterprises, Inc. (RE).

## 2.13 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

## 2.14 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

#### 3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

#### 3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
  - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
  - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
  - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
  - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into

surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

### 3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

### 3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

### 3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

### 3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.
- C. Refer to Section 087101, Door Hardware Sets, for hardware sets.

END OF SECTION 087100

SECTION 087101 – DOOR HARDWARE SETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section references specification sections relating to commercial door hardware for the following:
  - 1. Swinging doors.
  - 2. Other doors to the extent indicated.
- B. Commercial door hardware includes, but is not necessarily limited to, the following:
  - 1. Mechanical door hardware.
  - 2. Cylinders specified for doors in other sections.
- C. Related Sections:
  - 1. Division 08 Section “Hollow Metal Doors and Frames”.
  - 2. Division 08 Section “Door Hardware”.
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
  - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
  - 2. ICC/IBC - International Building Code.
  - 3. NFPA 70 - National Electrical Code.
  - 4. NFPA 80 - Fire Doors and Windows.
  - 5. NFPA 101 - Life Safety Code.
  - 6. NFPA 105 - Installation of Smoke Door Assemblies.
  - 7. State Building Codes, Local Amendments.
- E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
  - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
  - 3. Content: Include the following information:
    - a. Type, style, function, size, label, hand, and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
  - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.
- D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service



representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

- F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum [5] years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum [3] years documented experience installing both standard and electrified builders hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum [5] years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor in good standing by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- D. Source Limitations: Obtain each type and variety of Door Hardware specified in the Related Sections from a single source, qualified supplier unless otherwise indicated.
- E. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the applicable model building code.
- F. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

## 1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

## 1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

## 1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

## PART 2 - PRODUCTS

### 2.1 SCHEDULED DOOR HARDWARE

- A. Refer to "PART 3 – EXECUTION" for required specification sections.

## PART 3 - EXECUTION

### 3.1 DOOR HARDWARE SETS

- A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a

hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

- B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.
- C. Products listed in the Door Hardware Sets must meet the requirements described in the specification sections noted.
  - 1. Section 08 71 00 – Door Hardware.
- D. Manufacturer’s Abbreviations:
  - 1. BD – Best / dormakaba Group
  - 2. MK – McKinney
  - 3. PE – Pemko
  - 4. RO – Rockwood
  - 5. SA – SARGENT
  - 6. RF – Rixson
  - 7. CW – Corbin Russwin
  - 8. OT - Other

**Hardware Sets**

*NOTE:*

- 1. SEE 084113-Aluminum Framed Entrances & Storefronts for Door Hardware at Doors: 101 and 108.
- 2. Provide permanent cores for all door hardware locksets based on City of East Providence requirements.

**Set: 1.0**

Doors: 103, 105

3 Hinge, Full Mortise, Hvy Wt	<a href="#">T4A3386</a>	US32D	MK	087100
1 Office Lockset	<a href="#">ML2051</a>	US32D	CW	087100
1 Surface Closer	<a href="#">7500</a> 600 x	689	NO	087100
1 Wall Stop	<a href="#">403</a>	US26D	RO	087100
3 Silencer	<a href="#">608</a>		RO	087100
1 Threshold	252x3AFG		PE	087100
1 Gasketing	291APK x 2891APK		PE	087100
1 Sweep	315CN		PE	087100

**Set 2.0**

Doors: Mech/Elec/Storage: 102, 106, 106A\* (\*double door)

3 Hinge, Full Mortise, Hvy Wt	T4A3386	US32D	MK	
1 Storeroom Lock	ML2057 NSA CT6SB	630C		RU
1 Cylinder Lock		US32D		BD
1 Door Closer	281 UO	EN		SA
1 Wall Stop	403 (or) 441CU (As Required)	US26D		RO
1 Threshold	252x3AFG			PE
1 Gasketing	290APK x 2891APK			PE
1 Sweep	315CN			PE

**Set: 3.0**

Doors: Lav 104

3 Hinge, Full Mortise, Hvy Wt	T4A3386	US32D	MK	087100
1 Privacy Lock (Latch w/Occ Ind)	ML2060 NSA V21	US32D	OT	087100
1 Cylinder Lock		US32D	BD	
1 Surface Closer	7500 600 x	689	NO	087100
1 Wall Stop	403	US26D	RO	087100
3 Silencer	608		RO	087100
1 Threshold	252x3AFG		PE	087100
1 Gasketing	291APK x 2891APK		PE	087100
1 Sweep	315CN		PE	087100

**Set: 4.0**

Doors: 101A

1 Continuous Hinge	FM_HD1	C	PE	
1 Concealed Vert Rod Exit, Classroom	ED5860 N955ET M52 CT6SB	630C	RU	087100
2 Permanent Core	Compatible with City's System	626	BE.	087100
1 Surface Closer	7500	600 x 689	NO	087100
3 Silencer	608		RO	087100
1 Threshold	252x3AFG		PE	087100
1 Gasketing	291APK x 2891APK		PE	087100
1 Sweep	315CN		PE	087100

**Set: 5.0**

Door: 109, Lav

3 Hinge, Full Mortise, Hvy Wt	T4A3386	US32D	MK	087100
1 Privacy Lock (Latch w/Occ Ind)	ML2030 NSVN V20	US32D	CR	087100
1 Surface Closer	7500	600 x 689	NO	087100
3 Silencer	608		RO	087100
1 Threshold	252x3AFG		PE	087100
1 Gasketing	291APK x 2891APK		PE	087100
1 Sweep	315CN		PE	087100

**Set: 6.0**

Door: 107, Closet

3 Hinge, Full Mortise, Hvy Wt	T4A3386	US32D	MK	087100
1 Storeroom Lock	ML2057 NSACT65B	630C	RU	087100
1 Surface Closer	7500	600 x 689	NO	087100
1 Permanent Core	Compatible with City's System 626.		BE.	087100
3 Silencer	608		RO	087100
1 Gasketing	291APK x 2891APK		PE	087100
1 Sweep	315CN		PE	087100

END OF SECTION 087101

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
  - 1. Doors.
  - 2. Windows.
  - 3. Glazed entrances and hollow metal framing.
- B. Related Sections include the following:
  - 1. Division 08 Section “Hollow Metal Doors and Frames” for installing glazing in hollow metal doors and frames.

1.3 DEFINITIONS

- A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
  - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

- a. Specified Design Wind Loads: As indicated, but not less than wind loads applicable to Project as required by ASCE 7 "Minimum Design Loads for Buildings and Other Structures": Section 6.0 "Wind Loads", and the Vermont State Building Code.
    - 1) Ultimate Wind Speed: 126 mph.
  - b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
    - 1) Load Duration: 3 seconds or less.
  - c. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
- 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
- 1. Center-of-Glass Values: Based on using LBL-35298 WINDOW 5.2 computer program for the following methodologies:
    - a. Solar Heat Gain Coefficient: NFRC 200.
    - b. Solar Optical Properties: NFRC 300.
- 1.5 PRECONSTRUCTION TESTING
- A. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:
- 1. 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.
  - 2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
  - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  - 4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
  - 5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.



1.6 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For the following products, in the form of 12-inch- square Samples for glass.
  - 1. Insulating glass for each designation indicated.
- C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
  - 1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers.
- B. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- C. Product Test Reports: For each of the following types of glazing products:
  - 1. Coated float glass.
  - 2. Insulating glass.
  - 3. Glazing sealants.
- D. Warranties: Special warranties specified in this Section.

1.8 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: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, coated float glass, laminated glass, and insulating glass.

- D. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.
- E. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- F. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
  - 1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- G. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
  - 1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
  - 2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
- H. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.
  - 1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
  - 2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.
- I. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
- J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:
  - 1. Insulating Glass Certification Council.
- K. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups in the location as directed by Construction Manager.
  2. Build glass mockups by installing the following kinds of glass in mockups specified in Division 08 Section "Aluminum-Framed Entrances and Storefronts" to match glazing systems required for Project, including glazing methods:
    - a. Coated insulating glass.
  3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- L. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.10 PROJECT 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 liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.11 WARRANTY

- A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
  1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
  - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
  - 2. For uncoated glass, comply with requirements for Condition A.
  - 3. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
- C. Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), and complying with other requirements specified.

2.2 TEMPERED LAMINATED GLASS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide **Viracon, Inc. Laminated 9/16” (14mm) with RoomSide Low E, Clear**, or comparable product by one of the following:
  - 1. Guardian Industries Corp.
  - 2. Vitro Architectural, Inc..

2.3 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
  - 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  - 2. 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 50, Use NT.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Dow Corning Corporation; 795.

- b. GE Advanced Materials - Silicones; SilPruf SCS2000.
  - c. Pecora Corporation; 895.
  - d. Tremco Incorporated; Spectrem 2.
2. Type and Grade: S (single component) and NS (nonsag).
  3. Class: 50.
  4. Use Related to Exposure: NT (nontraffic).
  5. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
    - a. Use O Glazing Substrates: Coated glass and aluminum coated with a high-performance coating.

## 2.4 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; 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; packaged on rolls with a release paper backing; 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.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
  1. Type 1, for glazing applications in which tape acts as the primary sealant.
  2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.5 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, 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 with a Shore, Type A durometer 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.

## 2.6 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze 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.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish exposed glass edges and corners.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine framing glazing, 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 system.
  - 3. Minimum required face or 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.

### 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. Glazing channel dimensions provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. 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.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:
  - 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 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.
- H. 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.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

### 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 and then to jambs. Cover horizontal framing joints by applying tapes to jambs and 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 just 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 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.

### 3.6 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. 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; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project 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.

### 3.7 TEMPERED-LAMINATED FLOAT-GLASS UNITS

- A. **Glass Type, Exterior/Interior:** Clear fully tempered float glass layers.
  - 1. Exterior Tempered Glass Thickness: 6.0 mm (1/4 inch.).
  - 2. Laminating Interlayer: 1.5 mm (1/16”).



3. Interior Tempered Glass Thickness: 6.0 mm (1/4 inch) with Low E Coating.
4. Provide safety glazing labeling.

END OF SECTION 08 80 00

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Ceramic wall tile.
  - 2. Crack-suppression membrane for thin-set tile installations.
  - 3. Stone thresholds installed as part of tile installations.
  - 4. Metal edge strips installed as part of tile installations.
  - 5. Tile backing panels.
- B. Related Sections include the following:
  - 1. Division 01 Section "Sustainable Design Requirements."
  - 2. Division 07 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

**1.3 DEFINITIONS**

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.
- D. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

**1.4 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

**1.5 PERFORMANCE REQUIREMENTS**

- A. Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per the DCOF AcuTest in accordance with ANSI A137.1 – 2012 standard.
  - 1. Level Surfaces: Minimum 0.42 wet.

**1.6 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:
  - 1. Product Data for Credit 5d: For adhesives, grouts and sealants, documentation including printed statement of VOC content.
  - 2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
  - 3. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
- C. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- D. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- E. Samples for Verification:
  - 1. Full-size units of each type and composition of tile and for each color and finish required.
  - 2. Full-size units of each type of trim and accessory for each color and finish required.
  - 3. Stone thresholds in 6-inch lengths.
  - 4. Metal edge strips in 6-inch lengths.

**1.7 INFORMATIONAL SUBMITTALS**

- A. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- B. Product Certificates: For each type of product, signed by product manufacturer.
- C. Qualification Data: For Installer.

- D. Material Test Reports: For each tile-setting and -grouting product.

#### **1.8 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

#### **1.9 QUALITY ASSURANCE**

- A. Sample Panel: Build sample panel to verify selections made under Sample submittals and to demonstrate aesthetic effects.
  - 1. Build sample panel for each floor tile pattern indicated, in sizes approximately 36 inches long by 36 inches high. Include the following:
    - a. One outside corner for each unique condition, including metal edge.
    - b. One exposed top edge of tile wainscot condition.
    - c. One exposed end of tile condition, including metal edge.
  - 2. Approval of sample panels is for color, texture, and blending of tile; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
    - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.
- B. Preconstruction Testing Service for Concrete: Engage a qualified independent testing agency to perform moisture vapor emission testing indicated below.
  - 1. ASTM F 1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
  - 2. ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes.
- C. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
  - 1. Build mockup of each type of floor tile installation.
  - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### **1.10 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store liquid latexes and emulsion adhesives in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

#### **1.11 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.
  - 1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:
  - 1. Stone thresholds.
  - 2. Crack suppression membrane.
  - 3. Metal edge strips.
  - 4. Tile backing panels.

#### **2.2 PRODUCTS, GENERAL**

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
  2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.
- C. ISO 13007 Standards for Ceramic Tile, Adhesives and Grouts.
- D. FloorScore Compliance: Tile for floors shall comply with requirements of FloorScore Standard.
- E. Low-Emitting Materials: Tile flooring systems shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
1. As indicated by manufacturer's designations.
- G. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- H. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

## 2.3 TILE PRODUCTS

- A. **Manufacturers: Basis of Design is Dal-Tile. See finish schedule and floor finish plans on drawings for locations.**
1. Field/Cove base Wall: Classic, Color Wheel Collection, Glazed Ceramic. 3x6, 6x6, (2 colors), Semi-Gloss, (price groups 1&2)
  2. Floor: Core Fundamentals Prime, Matte Ceramic, 12x24 (Colors from all available manufacturer's options).

## 2.4 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.

- B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish.

- 1. Description: Uniform, fine- to medium-grained grey marble.

## 2.1 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, Type A, in maximum lengths available to minimize end-to-end butt joints.

- 1. Products: Subject to compliance with requirements, provide one of the following or equal:
    - a. National Gypsum; PermaBase Cement Board.
    - b. USG Corporation; DUROCK Cement Board.
  - 2. Thickness: 5/8 inch.

## 2.2 SETTING AND GROUTING MATERIALS

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

- 1. Custom Building Products.
    - 2. LATICRETE International Inc.
    - 3. MAPEI Corporation.

- B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4 and ISO 13007 C2EP1, consisting of the following:

- 1. Prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site.
    - a. Product: Subject to compliance with requirements, provide one of the following:
      - 1) Custom Building Products; Versa Bond.
      - 2) LATICRETE International, Inc.; 253 Gold.
      - 3) MAPEI Corporation; Ultraflex 2.

- 2. For wall applications, provide nonsagging mortar that complies with Paragraph F-4.6.1 in addition to the other requirements in ANSI A118.4 and ISO 13007 C2TES1.

- a. Product: Subject to compliance with requirements, provide one of the following, or equal:

- 1) Custom Building Products; LFT.
      - 2) MAPEI Corporation; Ultraflex LFT.

- C. Medium-Bed, Latex-Portland Cement Mortar (LHT Mortar): Comply with requirements in ANSI A118.4 and A118.15.

- 1. Products: Subject to compliance with requirements, provide one of the following, or equal:

- a. Custom Building Products; MegaLite Crack Prevention Mortar.
  - b. MAPEI Corporation; Kerabond T/Keralastic System.
- D. Epoxy Based Tile Grout: ANSI A118.3, color as selected by Architect from manufacturer's full range.
- 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Custom Building Products; Ceg-Lite.
    - b. LATICRETE International Inc.; Laticrete SpectraLOCK Pro.
    - c. MAPEI Corporation; MAPEI Kerapoxy CQ.
  - 2. Colors: As selected by Architect from manufacturer's full range for each tile indicated.

### **2.3 CRACK-SUPPRESSION MEMBRANES FOR THIN-SET TILE INSTALLATIONS**

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fabric-Reinforced, Fluid-Applied Product: System consisting of liquid-latex rubber and fabric reinforcement.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Custom Building Products; Custom 9240 Waterproofing and Anti-Fracture Membrane.
    - b. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane.
    - c. MAPEI Corporation; Mapelastic AquaDefense.

### **2.4 ELASTOMERIC SEALANTS**

- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 07 Section "Joint Sealants."
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

### **2.5 MISCELLANEOUS MATERIALS**

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic, designed specifically for flooring and wall applications, exposed-edge material as indicated.



1. Basis of Design Product: Provide products indicated by Schluter Systems, or equal.
- C. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
  1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
  2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

## **2.6 MIXING MORTARS AND GROUT**

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
  1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
  2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
  3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
  4. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
  5. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
    - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 to 5 lb. of

water/1000 sq. ft. in 24 hours, as required by manufacturer's written recommendation for maximum moisture content.

- b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.
- B. Provide concrete substrates for tile floors installed with thin-set mortar that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
  1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
  2. Remove protrusions, bumps, and ridges by sanding or grinding.
- C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

### **3.3 INSTALLATION, GENERAL**

- A. Comply with the latest TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
  1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
    - a. Tile floors in wet areas.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight

aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

- D. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
  - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
- E. Lay out tile wainscots to next full tile beyond dimensions indicated.
- F. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  - 1. Locate joints in tile surfaces directly above joints in concrete substrates.
  - 2. Comply with requirements in TCNA EJ171.
  - 3. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- G. Metal Edge Strips: Install at locations indicated, where exposed edge of tile flooring meets carpet or other flooring that finishes flush with or below top of tile and no threshold is indicated.
- H. Grout tile to comply with requirements of the following tile installation standards:
  - 1. For ceramic tile grouts (sand-portland cement; dry-set, commercial portland cement; and latex-portland cement grouts), comply with ANSI A108.10.

### 3.4 CRACK-SUPPRESSION MEMBRANE INSTALLATION

- A. Install crack-suppression membrane to comply with manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.

### 3.5 TILE BACKING PANEL INSTALLATION

- A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

### 3.6 FLOOR TILE INSTALLATION

- A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.
  - 1. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.

- a. Tile floors composed of tiles 8 by 8 inches or larger.
- B. Joint Widths: Install tile on floors with the following joint widths:
  - 1. Porcelain Tile: 1/8 inch.
- C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.
  - 1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.
- D. Metal Edge Strips: Install at locations indicated.

### 3.7 WALL TILE INSTALLATION

- A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.
- B. Joint Widths: Install tile on walls with the following joint widths:
  - 1. Wall Tile: 1/16 inch.

### 3.8 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  - 1. Remove epoxy and latex-portland cement grout residue from tile as soon as possible.
  - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
  - 3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.
- B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.
- E. Protect all installed floor tile work with heavy duty kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer,

apply coat of neutral protective cleaner to completed tile walls and floors.

1. Protect tile floors with kraft paper and additional hardboard covering during entire construction period and for duration of subsequent phases including but not limited to FF&E and Technology installations.
2. Remove coverings at Substantial Completion for final review by Architect. Reinstall protective coverings following review and correction of punch list items as required.

### **3.9 FLOOR TILE INSTALLATION SCHEDULE**

#### **A. Interior Floor Installations, Concrete Subfloor:**

1. Tile Installation: TCNA F125A; interior floor installation on crack-suppression membrane over concrete; medium-bed mortar (LFT Mortar).
  - a. Tile Type: Porcelain paver tile.
  - b. Medium Bed Cement Mortar: Latex-portland cement mortar.
  - c. Grout: Epoxy based grout.

### **3.10 WALL TILE INSTALLATION SCHEDULE**

#### **A. Interior Wall Installations, Metal Studs:**

1. Tile Installation: TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units.
  - a. Tile Type: Glazed wall tile.
  - b. Thin-Set Mortar: Latex-portland cement mortar.
  - c. Grout: Epoxy based grout.

END OF SECTION 09 3100

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
  - 1. Acoustical panels and exposed suspension systems for ceilings.
- B. Related Sections include the following:
  - 1. Division 01 Section “Sustainable Design Requirements.”
  - 2. Division 07 Section “Joint Sealants” for acoustical sealants furnished and installed by this Section in acoustical panel ceiling assemblies.
  - 3. Division 09 Section “Gypsum Board Assemblies” for drywall suspension system for suspended gypsum board ceilings.

1.3 DEFINITIONS

- A. CAC: Ceiling Attenuation Class.
- B. LR: Light Reflectance coefficient.
- C. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:
  - 1. Product Data for Credit 5d: For sealants, documentation including printed statement of VOC content.
  - 2. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
  - 3. Product Certificates for Credit d10: For products and materials required to comply with

requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

- C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  - 1. Ceiling suspension system members.
  - 2. Method of attaching hangers to building structure.
  - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
  - 4. Minimum Drawing Scale: 1/8 inch = 1 foot.
  
- D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
  - 1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
  - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- long Samples of each type, finish, and color.
  
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.
  
- F. Research/Evaluation Reports: For each acoustical panel ceiling and components.
  
- G. Maintenance Data: For finishes to include in maintenance manuals.
  
- H. Warranties: Special warranties specified in this Section.

## **1.5 QUALITY ASSURANCE**

- A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
  
- B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

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

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they

will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

#### **1.7 PROJECT CONDITIONS**

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

#### **1.8 COORDINATION**

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, and partition assemblies.

#### **1.9 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed, for each ceiling panel type.
  - 2. Suspension System Components: Quantity of each exposed component equal to 2 percent of quantity installed, for each suspension system type.

#### **1.10 WARRANTY**

- A. Special Warranty for Acoustical Panel Ceilings and Suspension Systems: Manufacturer's standard form in which manufacturer agrees to replace acoustical panel ceilings and suspension systems that fail in materials or workmanship within specified warranty period.
  - 1. Failure of ceiling panels includes sagging and warping, and growth of mold, mildew and stain causing bacteria.
  - 2. Failure of suspension systems includes rusting.
  - 3. Warranty does not cover damages that may occur from vibrations, fire, water, freezing temperatures, accident or any form of abuse or exposure to abnormal conditions.
    - a. Warranty Period: 30 years from date of Substantial Completion.



PART 2 - PRODUCTS

2.1 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: Comply with ASTM E 1264 for Class A materials.
  - 2. Smoke-Developed Index: 450 or less.
- B. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and the Connecticut State Building Code.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.
- C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- D. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- E. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance, unless otherwise indicated.
  - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.
- F. Antimicrobial Fungicide Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.3 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products as indicated by Armstrong World Industries, Inc. or a comparable product by one of the following:

1. CertainTeed, Inc.
  2. USG Interiors, Inc.
- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
1. Armstrong - OPTIMA, #3257, 24"x48"
- C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

#### 2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
- C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- D. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
  2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.
- F. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- G. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- H. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- I. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical

panels in-place.

- J. Hold-Down Clips: Provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.
  - 1. Provide hold down clips at all vestibules.

## 2.5 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

- A. Wide-Face, Capped, Double-Web, Hot-Dip Galvanized, G60, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, hot-dip galvanized according to ASTM A 653/A 653M, G60 coating designation, with prefinished, cold-rolled, 15/16-inch- wide, metal caps on flanges.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc.; Interlude, 9/16" Tee System or a comparable product by one of the following:
    - a. CertainTeed
    - b. USG Interiors, Inc
  - 2. Structural Classification: Intermediate duty system.
  - 3. Face Design: Dimensional Tee
  - 4. Face Finish: White, unless otherwise noted.

## 2.6 METAL EDGE MOLDINGS AND TRIM

- A. 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. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.

## 2.7 ACOUSTICAL SEALANT

- A. Products: Comply with Division 07 Section "Joint Sealants."

## 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.
  - 1. 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, and comply with layout shown on reflected ceiling plans.

### **3.3 INSTALLATION**

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- 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, counter splaying, 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 either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
  - 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
  - 7. 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.
  - 8. Do not attach hangers to steel deck tabs.
  - 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.

10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
  11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- 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 post installed 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. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
  2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
    - a. Install moldings in one piece at all walls 12 feet or less in length. Minimize quantity of pieces at longer walls.
    - b. Use factory edges where joining lengths of molding. Abut moldings where joined; do not overlap.
  3. 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 a neat, precise fit.
1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
  2. 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.
  3. 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.
  4. Install hold-down clips in areas indicated.

### **3.4 CLEANING**

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and

suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 09 67 23 – RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes:
  - 1. High-performance resinous flooring systems as shown on the drawings and/or in schedules.
  - 2. Metal edge strips.
  - 3. Floor preparation.
- B. Related Sections include the following:
  - 1. Division 03 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for substrates.
  - 2. Division 07 Section "Joint Sealants" for sealants installed at joints in resinous flooring systems.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. Samples for Initial Selection: For each type of exposed finish required.
- C. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to a rigid backing by Installer for this Project.
- D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- E. Material Test Reports: For each resinous flooring component.
- F. Material Certificates: For each resinous flooring component, signed by manufacturer.
- G. Maintenance Data: For resinous flooring to include in maintenance manuals.
- H. Warranty: Special warranty included in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.
1. Engage an installer who employs only persons trained and approved by resinous flooring manufacturer for applying resinous flooring systems indicated.
  2. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- C. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Apply full-thickness mockups on 48-inch- square floor area selected by Architect.
    - a. Include 48-inch length of integral cove base.
  2. Simulate finished lighting conditions for Architect's review of mockups.
  3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Preconstruction Testing Service: Engage a qualified independent testing agency to perform testing indicated below.
1. ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes.
- E. Preconstruction Testing Service (Alternate): Moisture testing on new concrete slabs on grade that include moisture vapor reduction admixture to be performed by manufacturer of moisture vapor reduction admixture in accordance with Division 03 Section "Concrete Moisture Vapor Reduction Admixture."
- F. Preinstallation Conference: Prior to installation of resinous flooring, conduct preinstallation meeting at Project site in accordance with Division 01 Section "Project Management and Coordination."
1. Review substrate conditions, moisture testing reports, manufacturer's installation instructions, and warranty requirements.
  2. Document proceedings, including corrective measures or actions required, and furnish copy to each participant.



1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
- B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

D. Site Requirements

- 1. Application may proceed while air, material and substrate temperatures are between 55°F and 85°F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
- 2. The relative humidity in the specific location of the application shall be less than 85% and the surface temperature shall be at least 5°F above the dew point.
- 3. The Applicator shall ensure that adequate ventilation is available for the work area. This shall include the use of manufacturers approved high CFM fans (if necessary), smooth bore ducting, and suitable enclosure around the work area, including relevant signage.
- 4. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.

E. Conditions of New Concrete to be Coated with Cementitious Urethane

- 1. Concrete shall be moisture cured for a minimum of 3 days and have fully cured a minimum of 5 days in accordance with ACI-308 prior to the application of the coating system pending moisture tests.
- 2. Concrete shall have a flat rubbed finish, float or light steel trowel finish (a hard steel trowel finish is neither necessary nor desirable).
- 3. Sealers and curing agents should not to be used.
- 4. Concrete surfaces on grade shall have been constructed with a vapor barrier to protect against the effects of vapor transmission and possible delamination of the system.

F. Safety Requirements

- 1. All open flames and spark-producing equipment shall be removed from the work area prior to commencement of application.
- 2. "NO SMOKING" signs shall be posted at the entrances to the work area.
- 3. The Owner shall be responsible for the removal of foodstuffs from the work area.
- 4. Non-related personnel in the work area shall be kept to a minimum.

1.7 WARRANTY

- A. General Warranty: Special warranties specified in this Section shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Limited Warranty: Written warranty, signed by manufacturer agreeing to repair or replace resinous flooring, installed according to manufacturer's written recommendations, that fails in performance, materials, or workmanship within specified warranty period.
  - 1. Warranty Period: One year from date of Substantial Completion.
  - 2. Exclusions from warranty include the following:
    - a. Problems caused by moisture, hydrostatic pressure, or alkali in the subfloor.
    - b. Damage to flooring products from high heels or spiked shoes.

PART 2 - PRODUCTS

2.1 RESINOUS FLOORING, GENERAL

- A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.
- B. System Chemical Resistance: Test specimens of cured resinous flooring system are unaffected when tested according to ASTM C 267 for immersion in the following reagents for not less than 7 days:
  - 1. Acetic Acid 5 percent
  - 2. Acetone
  - 3. Amonimum Hydroxide 10 percent
  - 4. Citric Acid 10 percent
  - 5. Cola
  - 6. Ethylene Glycol
  - 7. Formaldehyde 10 percent
  - 8. Gasoline
  - 9. Hydrochloric Acid 10 percent and 20 percent
  - 10. Lactic Acid 10-50 percent
  - 11. Mineral Spirits
  - 12. Nitric Acid 10 percent
  - 13. Phosphoric Acid 10-80 percent
  - 14. Salad Oil
  - 15. Sodium Carbonate 2 percent and 20 percent
  - 16. Sodium Chloride 10 percent
  - 17. Syrup
  - 18. Urine
  - 19. Xylene

2.2 RESINOUS FLOORING, INTERIOR

- A. Basis of Design Product: Subject to compliance with requirements, provide **ProREZ Performance Resins & Coatings, Inc, 47 Inwood Drive, Rocky Hill, CT; ProKrete SLQ** or comparable product by one of the following, or equal:
1. Dur-A-Flex, Inc.; Hybri-Flex EQ
  2. General Polymers Corporation, a division of the Sherwin-Williams Company.
  3. Tnemec Company, Inc.
- B. System Characteristics:
1. Colors: As selected by Architect from manufacturer’s full range of standard and premium colors.
  2. Wearing Surface: Orange peel texture.
  3. Integral Cove Base: 4- inches high.
  4. Overall System Thickness: 1/4-inch.
- C. System Materials:
1. Topping: ProREZ Performance Resins & Coatings, ProKrete SL Resin, Hardener and SL Aggregate.
  2. Broadcast Media: ProQuartz Colored Quartz Aggregate in 40 mesh size.
  3. 2nd Broadcast Coat: ProREZ Performance Resins & Coatings, ProPoxy CR Resin and Standard or Fast Hardener, or ProREZ Performance Resins & Coatings, ProSpartic S-Resin & Hardener or replace ProSpartic S-Resin with F-Resin for a more Fastrack cure. Broadcast with ProQuartz 40 mesh blended quartz aggregate.
  4. Topcoat: ProREZ Performance Resins & Coatings, ProPoxy CR Epoxy Resin (Clear) and Hardener OR ProREZ Performance Resins & Coatings, ProSpartic Polyaspartic S-Resin (clear) and Hardener, or replace ProSpartic S-Resin with F-Resin (clear) for Fastrack cure.
- D. Patch Materials
1. Shallow/Deep Fill and Patching: ProREZ Performance Resins & Coatings, ProKrete SL (up to ¼”).
  2. Deep Fill and Sloping Material (over ¼”): Use ProREZ Performance Resins & Coatings, ProKrete CM and KreteFill.
- E. System Components: Manufacturer's standard components that are compatible with each other and as follows:
1. Base Coat: ProREZ Coatings, ProKrete SL.
  2. Broadcast aggregate: ProREZ Coatings, Inc. ProQuartz 40 aggregate.
  3. Broadcast epoxy: ProREZ Coatings, Inc. ProPoxy S, epoxy
  4. Broadcast aggregate: ProREZ Coatings, Inc. ProQuartz 40 aggregate.
  5. Grout/Seal Coat: ProREZ Coatings, Inc. ProPoxy S, epoxy
  6. Top coat: ProREZ Coatings, Inc. ProThane S Gloss ultra-high solids urethane topcoat
- F. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
1. Compressive Strength: 9,000 psi per ASTM C 579.
  2. Tensile Strength: 7,000 psi per ASTM C 307.

3. Water Absorption: 0.04% per ASTM D 570.
4. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch permanent indentation per MIL-D-3134.
5. Flammability: Self-extinguishing per ASTM D 570.
6. Bond Strength: 400 psi 100 percent concrete failure per ACI 503R.

## 2.3 ACCESSORY MATERIALS

- A. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
- B. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.
- C. Metal Edge Strips: L-shape, height to match flooring and setting-bed thickness, metallic, designed specifically for flooring applications, exposed-edge material as indicated.
  1. Basis of Design Product: Subject to compliance with requirements, provide Schluter Systems; SCHEINE AE60 or comparable product by one of the following:
    - a. Blanke Corporation.
    - b. Manhattan American; Heavy Top L Angle.
  2. Finish: Satin Anodized Aluminum.
  3. Thickness: To match resilient flooring thickness.
  4. Provide metal edge at the following flooring transitions:
    - a. Resinous flooring to resilient flooring.
    - b. Resinous flooring to concrete.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.

1. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.

### 3.2 PREPARATION

#### A. General

1. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.
2. Verify that the concrete substrate(s) are dry enough to accept the resinous flooring system using one of the following standard test methods for determining relative levels of dryness/wetness:

- a. Perform most current version of internal relative humidity (“in situ”) probe test in general conformance with ASTM F2170.
- b. Perform most current version of anhydrous calcium chloride test in general conformance with ASTM F1869.
- c. If the relative “wetness” of the substrate(s) exceeds the manufacturer’s guidelines for resinous flooring system, then the Owner and/or Engineer shall be notified and advised of any additional measures recommended by the manufacturer to adequately mitigate the substrate or to lower the substrate “wetness” value to the acceptable limit.

### 3. Mechanical surface preparation

- a. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 4-5 as described by the International Concrete Repair Institute.
- b. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.
- c. Where the perimeter of the substrate to be coated is not adjacent to a wall or curb, a minimum 3/16” key cut shall be made to properly seat the system, providing a smooth transition between areas. The detail cut shall also apply to drain perimeters and expansion joint edges.
- d. Cracks and joints (non-moving) greater than 1/8 inch wide are to be chiseled or chipped-out and repaired per manufacturer’s recommendations.

### 4. Patching

- a. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufactures recommendations.

## 3.3 APPLICATION

### A. General

1. The system shall be applied in five distinct steps as listed below:
  - a. Substrate preparation
  - b. Resurfacer application with colored quartz aggregate broadcast
  - c. Second broadcast
  - d. Clear Grout/Topcoat application
  - e. Additional Topcoat
2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer’s recommendations.

4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.
5. A neat finish with well-defined boundaries and straight edges shall be provided by Applicator.

**B. Resurfacer**

1. The resurfacer shall be applied as a self-leveling system as specified by the Architect. The resurfacer shall be applied in one lift with a nominal thickness of 1/8 – 3/16 inch.
2. The topping shall be comprised of three components, a resin, hardener and filler as supplied by the Manufacturer.
3. The hardener shall be added to the resin and thoroughly dispersed by suitably approved mechanical means. SL Aggregate shall then be added to the catalyzed mixture and mixed in a manner to achieve a homogenous blend.
4. The topping shall be applied over horizontal surfaces using 6 inch “v” notched squeegee, trowels or other systems approved by the Manufacturer.
5. Immediately upon placing, the topping shall be degassed with a loop roller.
6. Colored Quartz aggregate shall be broadcasted to excess into the wet material at the rate of .75lbs/s.f.
7. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose flake particle.

**C. 2nd Broadcast Coat and Grout Coat**

1. Sweep and vacuum loose quartz aggregate and repeat steps 1-7 replacing notched squeegee with flat blade squeegee. Average coverage rate is 90-110s.f. per gal.

**D. Grout/Topcoat**

1. The Grout/Topcoat shall be comprised of a Part A Resin and Part B Hardener, which is mixed and installed per the manufacturer’s recommendations.
2. The Grout/Topcoat shall be squeegee applied and back rolled with a coverage rate of 90-110s.f./gal.
3. An optional second Topcoat may be applied if a smoother surface is required. Application will be the same as 1st Grout/Topcoat, coverage rate to be 150-200s.f./gal.

**3.4 FIELD QUALITY CONTROL**

**A. Tests, Inspection**

1. The following tests shall be conducted by the Applicator:
  - a. Temperature
  - b. Air, substrate temperatures and, if applicable, dew point.
  - c. Coverage Rates
2. Rates for all layers shall be monitored by checking quantity of material used against the area covered.

**3.5 CLEANING AND PROTECTION**

- A. Cure flooring material in compliance with manufacturer’s directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.

B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

END OF SECTION 09 67 23

SECTION 09 91 00 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following substrates:

- 1. Cellular PVC trim.
- 2. CMU.
- 3. Hollow metal doors and frames.
- 4. Steel lintels.
- 5. Steel bollards.
- 6. Gypsum board.

- B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.

- 1. Painting includes field painting of exposed bare and covered pipes and ducts, hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

- 1. Prefinished items include the following factory-finished components:

- a. Exterior masonry veneer.
- b. Pre-finished composite siding.
- c. Architectural casework.
- d. Plastic toilet compartments.
- e. Flush wood doors.
- f. Metal lockers.
- g. Finished mechanical and electrical equipment.
- h. Light fixtures and wiring devices.
- i. Switchgear.
- j. Distribution cabinets in closets or equipment rooms.

- 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:



- a. Furred areas.
  - b. Ceiling plenums.
  - c. Pipe spaces.
  - d. Duct shafts.
3. Finished metal surfaces include the following:
- a. Anodized or coated aluminum.
  - b. Stainless steel.
  - c. Chromium plate.
  - d. Copper and copper alloys.
  - e. Bronze and brass.
4. Operating parts include moving parts of operating equipment and the following:
- a. Valve and damper operators.
  - b. Linkages.
  - c. Sensing devices.
  - d. Motor and fan shafts.
5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for shop priming ferrous metal.
2. Division 06 Section "Glass-Reinforced Gypsum Sheathing" for surface preparation of gypsum board.
3. Division 06 Section "Exterior Finish Carpentry" for cellular PVC trim to be field finished by this Section.
4. Division 08 Section "Hollow Metal Doors and Frames" for factory priming steel doors and frames.
5. Divisions 23 and 26 Sections for painting of mechanical and electrical equipment.

### 1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
  - 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
  - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
  - 3. Certification by the manufacturer that products supplied comply with State of Vermont Ozone Transportation Commission (OTC) regulations controlling use of volatile organic compounds (VOCs).
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Step coats on Samples to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
- C. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architects and Owners, and other information specified.
- D. Product List: For each product indicated, include the following:
  - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
  - 2. VOC content.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For coatings to include in maintenance manuals. Include the following:
  - 1. Area summary with Finish Schedule and area detail designating where each product, color, and finish is used.
  - 2. Product data pages.
  - 3. Material safety data sheets.
  - 4. Care and cleaning instructions.
  - 5. Touch-up procedures.
  - 6. Color samples of each color and finish (gloss level) used.
- B. Manual: Provide Sherwin Williams; "Custodian Project Color and Product Information" manual, or equal.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
  - 1. Quantity: Furnish an additional 1 gallon of each material and color applied.

1.7 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Mockups: Apply benchmark samples 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 specified in Part 3.
    - a. Wall Surfaces: Provide samples of at least 100 sq. ft.
  - 2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
  - 3. Final approval of color selections will be based on benchmark samples.
    - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.
  - 4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 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.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

1.9 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Benjamin Moore & Co., including affiliate the following affiliate brands:
    - a. Coronado Paint.
    - b. Insl-X and Corotech.
  - 2. PPG Industries Inc. (PPG).
  - 3. Sherwin-Williams Company.

2.2 PAINT, GENERAL

- A. Material Compatibility:
  - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. VOC Content for Interior Paints and Coatings:
  - 1. All interior paints and coatings shall comply with the VOC content regulations of the Ozone Transportation Commission (OTC) effective in the State of Vermont. For interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
    - a. Flat Coatings: 100 g/L.
    - b. Nonflat Coatings: 150 g/L.
    - c. Nonflat-High Gloss Coatings: 250 g/L.
    - d. Primers, sealers and undercoaters: 200 g/L.
    - e. Anti-corrosive and Anti-rust Paints Applied to Ferrous Metals: 250 g/L.
    - f. Dry-Fog Coatings: 400 g/L.
- C. Colors: As selected by Architect from manufacturer's full range.

2.3 CONCRETE UNIT MASONRY BLOCK FILLERS

- A. Concrete Unit Masonry Block Filler: Factory-formulated high-performance latex block fillers (**50 g/L**).
  - 1. Benjamin Moore; Super Spec Masonry Hi-Build Block Filler 206: Applied at a dry film thickness of not less than 8.5 mils per coat. PROVIDE 2 COATS OR ACHIEVE A DRY FILM THICKNESS OF NOT LESS THAN 15 MILS TOTAL.
  - 2. PPG; 6-7 SpeedHide Interior/Exterior Masonry Latex Block Filler: Applied at a dry film thickness of not less than 7.1 mils. PROVIDE 2 COATS OR ACHIEVE A DRY FILM THICKNESS OF NOT LESS THAN 13 MILS TOTAL.
  - 3. Sherwin-Williams; Prep Rite Block Filler B25W25: Applied at a dry film thickness of not less than 8.0 mils. PROVIDE 2 COATS OR ACHIEVE A DRY FILMS THICKNESS OF NOT LESS THAN 14 MILS TOTAL.
  
- B. Concrete Unit Masonry Block Filler: Factory-formulated high performance block filler for use with epoxy finish coats (**150 g/L**): Benjamin Moore; Super Spec Masonry Hi-Build Block Filler 206: Applied at a dry film thickness of not less than 8.5 mils. PROVIDE 2 COATS OR ACHIEVE A DRY FILM THICKNESS OF NOT LESS THAN 15 MILS TOTAL.
  - 2. PPG; 6-15 Speedhide Interior/Exterior Masonry Hi Fill Latex Block Filler: Applied at a dry film thickness of not less than 7.0 mils. PROVIDE 2 COATS OR ACHIEVE A DRY FILM THICKNESS OF NOT LESS THAN 13 MILS TOTAL.
  - 3. Sherwin-Williams; Loxon Block Surfacer A24W200: Applied at a dry film thickness of not less than 8.0 mils. PROVIDE 2 COATS OR ACHIEVE A DRY FILMS THICKNESS OF NOT LESS THAN 14 MILS TOTAL.

## 2.4 EXTERIOR PRIMERS

- A. Exterior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application.
  - 1. Benjamin Moore; Super Spec HP Acrylic Metal Primer No. P04: Applied at a dry film thickness of not less than 2.0 mils.
  - 2. PPG; 90-912 Pitt-Tech Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils.
  - 3. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Acrylic Primer: Applied at a dry film thickness of not less than 2.0 mils.
  
- B. Exterior Cellular PVC Primer: Factory-formulated primer for exterior application.
  - 1. Benjamin Moore; Fresh Start All-Purpose Alkyd Primer 024: Applied at a dry film thickness of not less than 1.5 mils.
  - 2. PPG; Seal Grip Interior/Exterior Acrylic Universal Primer 17-921 Series: Applied at a dry film thickness of not less than 1.6 mils.
  - 3. Sherwin-Williams; Extreme Bond Primer B51W00150: Applied at a dry film thickness of not less than 0.9 mils.

## 2.5 INTERIOR PRIMERS

- A. General: Provide tinted primers as required for dark colors.

- B. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application (**100 g/L**).
  - 1. Benjamin Moore, Ultra Spec 500 Interior Latex Primer N534: Applied at a dry film thickness of not less than 1.8 mils.
  - 2. PPG; 6-2 Speedhide Interior Latex Sealer Quick-Drying: Applied at a dry film thickness of not less than 1.0 mil.
  - 3. Sherwin-Williams; ProMar 200 Zero VOC Primer B28W2600: Applied at a dry film thickness of not less than 1.5 mils.
  
- C. Interior Gypsum Board Primer for Epoxy Finish Coat: Factory-formulated waterborne acrylic for interior application (**200 g/L**).
  - 1. Benjamin Moore; Fresh Start Multi-Purpose Latex Primer 023: Applied at a dry film thickness of not less than 1.2 mils.
  - 2. PPG; 6-2 Speedhide Interior Latex Sealer Quick-Drying: Applied at a dry film thickness of not less than 1.0 mil.
  - 3. Sherwin-Williams; ProMar 200 Zero VOC Primer B28W2600: Applied at a dry film thickness of not less than 1.5 mils.
  
- D. Interior Metal Primer: Factory-formulated metal primer (**250 g/L**).
  - 1. Benjamin Moore; Super Spec Acrylic Metal Primer No. P04: Applied at a dry film thickness of not less than 1.7 mils.
  - 2. PPG; 90-912 Series Pitt-Tech Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 2.0 mils.
  - 3. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Acrylic Primer B66 Series: Applied at a dry film thickness of not less than 2.0 mils.
  
- E. Interior Metal Primer for Epoxy Finish Coat: Factory-formulated metal primer (**250 g/L**).
  - 1. Benjamin Moore; Super Spec Acrylic Metal Primer No. P04: Applied at a dry film thickness of not less than 1.7 mils.
  - 2. PPG; 90-912 Series Pitt-Tech Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 2.0 mils.
  - 3. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Acrylic Primer B66 Series: Applied at a dry film thickness of not less than 2.0 mils.

## 2.6 EXTERIOR PAINTS

- A. Exterior Full-Gloss Acrylic Enamel: Factory-formulated full-gloss waterborne acrylic-latex enamel for exterior metal application.
  - 1. Benjamin Moore; Ultra Spec HP DTM Acrylic Gloss Enamel, HP28: Applied at a dry film thickness of not less than 2.3 mils.
  - 2. PPG; 90-374 Series Pitt-Tech Interior/Exterior High Gloss DTM Industrial Enamels: Applied at a dry film thickness of not less than 3.0 mils.
  - 3. Sherwin-Williams; Acrylic Coating Gloss (Waterborne) B66 Series: Applied at a dry film thickness of not less than 2.4 mils.

- B. Exterior Satin Acrylic Paint: Factory-formulated satin acrylic-emulsion latex paint for exterior PVC trim application.
  - 1. Benjamin Moore, Ultra Spec EXT Satin Finish N448: Applied at a dry film thickness of not less than 1.5 mils.
  - 2. PPG; 6-2045 Series SpeedHide Exterior Satin 100% Acrylic Latex: Applied at a dry film thickness of not less than 1.2 mils.
  - 3. Sherwin-Williams; Emerald Exterior Latex Satin K48 Series: Applied at a dry film thickness of not less than 2.1 mils.

## 2.7 INTERIOR PAINTS

- A. Interior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for interior application ceilings and soffits (**50 g/L**).
  - 1. Benjamin Moore, Ultra Spec 500 Interior Flat N536: Applied at a dry film thickness of not less than 1.8 mils.
  - 2. PPG; 6-70 Series Speedhide Interior Latex Flat: Applied at a dry film thickness of not less than 1.3 mils.
  - 3. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Flat Wall Paint B30-2600 Series: Applied at a dry film thickness of not less than 1.6 mils.
- B. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel for walls (**100 g/L**).
  - 1. Benjamin Moore, Ultra Spec 500 Interior Eggshell N538: Applied at a dry film thickness of not less than 1.8 mils.
  - 2. PPG; 6-411 Series Speedhide Interior Enamel Latex Eggshell: Applied at a dry film thickness of not less than 1.5 mils.
  - 3. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Egg-Shell Enamel B20-2600 Series: Applied at a dry film thickness of not less than 1.6 mils.
- C. Interior Semi-Gloss Acrylic Enamel for Metal Surfaces: Factory-formulated semi-gloss acrylic interior enamel (**250 g/L**).
  - 1. Benjamin Moore; Ultra Spec HP DTM Acrylic Semi-Gloss Enamel HP29: Applied at a dry film thickness of not less than 1.5 mils.
  - 2. PPG; 4216HP Series Pitt-Tech Plus High Performance Waterborne DTM Acrylic Semi-Gloss: Applied at a dry film thickness of not less than 2.0 mils.
  - 3. Sherwin-Williams; Pro Industrial Acrylic B66 Series Semi-Gloss: Applied at a dry film thickness of not less than 2.5 mils.
- D. Interior Acrylic Enamel for Wood Surfaces: Factory-formulated semi-gloss acrylic latex enamel (**150 g/L**).
  - 1. Benjamin Moore; Advance Waterborne Interior Alkyd Semi-Gloss 793: Applied at a dry film thickness of not less than 1.3 mils.
  - 2. PPG; 6-500 Series SpeedHide Interior Semi-Gloss Acrylic Latex: Applied at a dry film thickness of not less than 1.4 mils.
  - 3. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Semi-Gloss B31-2600 Series: Applied at a dry film thickness of not less than 1.7 mils.

- E. Interior Acrylic Enamel (Flat Dryfall): Factory-formulated enamel for overhead interior application ceilings and structural framing (**150 g/L**).
  - 1. Coronado Paint; Super Kote 5000 Latex Flat Dry Fall 110 Line: Applied at a dry film thickness of not less than 1.5 mils.
  - 2. PPG; SpeedHide Super Tech WB Interior Dry-Fog Flat Latex 6-725XI: Applied at a dry film thickness of not less than 2.2 mils.
  - 3. Sherwin-Williams; Low VOC Waterborne Acrylic Dryfall Flat B42W00081: Applied at a dry film thickness of not less than 1.7 mils.

## 2.8 EPOXY COATING SYSTEM

- A. Epoxy Gloss Coating for Masonry, Steel and Gypsum Board Surfaces (**150 g/L**).
  - 1. Corotech; V341 Pre-Catalyzed Waterborne Epoxy Semi-Gloss, applied at a dry film thickness of not less than 1.5 mils.
  - 2. PPG; 16-510 Series Pitt-Glaze WB1 Interior Semi-Gloss Pre-Catalyzed Water-Borne Acrylic Epoxy: Applied at a dry film thickness of not less than 1.5 mils.
  - 3. Sherwin-Williams; Pro Industrial Water Based Catalyzed Epoxy B73-300 Series: Applied at a dry film thickness of not less than 2.0 mils.

## 2.9 INTERIOR CONCRETE FINISHES

- A. Epoxy Floor Coating: Two-component catalyzed, polyamide epoxy for concrete floors (**400 g/L**).
  - 1. Sherwin-Williams; Armorseal 1000 HS Epoxy Floor Coating B67-2000 Series: Applied at a dry film thickness of not less than 3.0 mils.

## 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 work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Concrete: 12 percent.
  - 2. Masonry (Clay and CMU): 12 percent.
  - 3. Gypsum Board: 12 percent.
  - 4. Wood: 15 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.



- D. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
  - 1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.
- E. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
  - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that 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.
  - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- F. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- G. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.
- H. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

I. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

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.

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 Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:

1. Mechanical Work:

- a. Uninsulated metal piping.
- b. Uninsulated plastic piping.
- c. Pipe hangers and supports.
- d. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical Work:

- a. Switchgear.
- b. Panelboards.
- c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 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.

3.5 EXTERIOR PAINT SCHEDULE

- A. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces including hollow metal doors and frames and steel lintels:
  - 1. Epoxy Finish: Two finish coats over a primer.
    - a. Primer: Metal primer, including factory primed surfaces.
    - b. Finish Coats: Exterior full-gloss acrylic enamel.
- B. Cellular PVC Trim: Provide the following finish systems over exterior cellular PVC trim:
  - 1. Satin Latex Finish: Two finish coats over a wood primer.
    - a. Primer: Exterior acrylic primer.
    - b. Finish Coats: Exterior satin acrylic latex.

3.6 INTERIOR PAINTING SCHEDULE

- A. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry:
  - 1. Low-Luster Acrylic-Enamel Finish: Two finish coats over a filled surface.
    - a. Block Filler: Concrete unit masonry block filler.
    - b. Finish Coats: Interior low-luster acrylic enamel.
  - 2. Low-Luster Epoxy Finish: Two finish coats over a filled surface.
    - a. Block Filler: Concrete unit masonry block filler for epoxy finish
    - b. Finish Coats: Epoxy low-luster finish.
- B. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
  - 1. Flat Acrylic Finish (ceilings): Two finish coats over a primer.
    - a. Primer: Interior gypsum board primer.

- b. Finish Coats: Interior flat acrylic paint.
- 2. Low-Luster Acrylic-Enamel Finish (Walls): Two finish coats over a primer.
  - a. Primer: Interior gypsum board primer.
  - b. Finish Coats: Interior low-luster acrylic enamel.
- 3. Semi-Gloss Epoxy Finish: Two finish coats over a primer.
  - a. Primer: Interior gypsum board primer for epoxy finish.
  - b. Finish Coats: Epoxy semi-gloss finish.
- C. Wood: Provide the following paint finish systems over new interior wood surfaces:
  - 1. Gloss Acrylic-Enamel Finish: Two finish coats over a wood primer.
    - a. Primer: Interior wood primer for acrylic-enamel finishes.
    - b. Finish Coats: Interior acrylic enamel for wood surfaces.
- D. Ferrous and Zinc-Coated Metal: Provide the following finish systems over ferrous metal:
  - 1. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a metal primer.
    - a. Primer: Metal primer, including surfaces with factory prime coat.
    - b. Finish Coats: Interior full-gloss acrylic enamel for metal surfaces.
  - 2. Epoxy Finish: Two finish coats over a primer.
    - a. Primer: Metal primer, including factory primed surfaces.
    - b. Finish Coats: Interior gloss waterborne epoxy.
- E. Concrete: Provide the following finish system over existing concrete slabs scheduled to receive paint:
  - 1. Epoxy: Two finish coats.
    - a. Finish Coats: Full-gloss epoxy floor coating.
- F. Exposed Structure: Provide the following finish system over exposed metal roof deck and steel structure:
  - 1. Flat Dryfall Acrylic-Enamel Finish: One finish coat.
    - a. Primer: None required for DTM products.
    - b. Finish Coats: Interior acrylic dryfall for metal surfaces.

END OF SECTION 09 91 00

## **PART 1 - GENERAL**

### **1.1 RELATED DOCUMENTS**

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

### **1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Exterior Panel signs.
  - 2. Emergency Contact sign.
  - 3. Outdoor enclosed bulletin board with locks.
- B. Related Sections include the following:
  - 1. Division 26 Sections for illuminated Exit signs.

### **1.3 DEFINITIONS**

- A. Accessible: In accordance with the accessibility standard.

### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for signs.
  - 1. Include fabrication and installation details and attachments to other work.
  - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
  - 3. Provide message list, timesteps, graphic elements, including tactile characters and Braille, and layout for each sign.
  - 4. Provide vector images or other digital media that may be required to enlarge small format logos, images, and symbols, furnished by Architect for application on all sign types.
- C. Samples for Initial Selection: For each type of sign material indicated that involves color selection.
  - 1. Include representative Samples of available timesteps and graphic symbols.
- D. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:
  - 1. Panel Signs: Not less than 12 inches square.

- E. Sign Schedule: Use same designations indicated on Drawings.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Warranty: Special warranty specified in this Section.

## 1.6 CLOSEOUT SUBMITTALS

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

## 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative of signage manufacturer.
- B. Fabricator Qualifications: Shop that 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.
- C. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.
- D. Regulatory Requirements: Comply with handicapped accessibility requirements of the 2017 ADA Standards and ICC/ANSI A117.1.

## 1.8 COORDINATION

- A. Coordinate placement of anchorage devices with templates for installing signs.

## 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: One year from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PANEL SIGNS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide **ASI Sign Systems; InTouch**, or a comparable product by one of the following:
  - 1. Advance Corporation; Braille-Tac Division.

2. Best Sign Systems, Inc.
  3. Mohawk Sign Systems, Inc.
  4. Southwell Co. (The)
- B. Exterior Panel Signs (Plastic): Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following requirements:
1. Provide manufacturer’s standard one-piece construction, suitable for exterior application:
    - a. Phenolic-Backed Photopolymer Sheet: Provide light-sensitive, water-wash photopolymer face layer bonded to a phenolic base layer to produce a composite sheet with overall, face-layer, and base-layer thickness of 1/8-inch; and a Type D Shore durometer hardness of 80.
  2. Edge Condition: Square cut.
  3. Corner Condition: Square.
  4. Mounting: Unframed.
    - a. Wall mounted with mechanical fasteners or two-face tape required by substrate.
  5. Color: As selected by Architect from manufacturer's full range.
  6. Font: As selected by Architect from manufacturer’s full range.
  7. Character proportion: Width to height ratio between 3:5 and 1:1, and a stroke-width-to-height ratio between 1:5 and 1:10.
  8. Size of characters and symbols:
    - a. Room numbers: 1-inch.
    - b. Room letters: 5/8-inch minimum.
  9. Pictograms: Accompanied by the equivalent verbal description placed directly below the pictogram. The border dimension of the pictogram to be no less than 6 inches in height.
  10. Finish and Contrast: Characters, symbols and background to be matte or other non-glare finish. Characters and symbols to be in contrasting color to the background; either light characters on a dark background or dark characters on a light background.
  11. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch above surface with contrasting colors. Glue-on characters or etched backgrounds are not permitted.
    - a. Manufacturer's standard process for producing text and symbols complying with 2017 ADA Standards and ICC/ANSI A117.1. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.
    - b. Braille to be separated from corresponding raised characters or symbols by 1/2-inch.

**2.1.A EMERGENCY CONTACT SIGN**

- A. Provide 1 sign indicating Emergency Contact information, to be located by Owner.
1. Include “IN CASE OF EMERGENCY:” in 2” letters, 9-1-1 phone number in bold, high contrast characters, at least 4” tall, with two additional 10-digit numbers and Town department names in 2” letters.

## 2.1.B OUTDOOR NOTICE BOARD

- A. Basis-of-Design Product: Subject to compliance with requirements, provide **EXTREME WeatherPlus™ Enclosed Outdoor Bulletin Boards**, or a comparable product.
  - 1. Provide 1 – aluminum case enclosed cork-tack board with locks, exterior grade with two glass doors (Tempered), include all available options: drip-edge roof, rubber gaskets, side vents, additional weep holes, Forbo Cork Backer (Color selected from full manufacturers available options), and hanging brackets. Made in America. Case finishes options selection from all available options.

## 2.2 ACCESSORIES

- A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors.
- B. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

## 2.3 FABRICATION

- A. General: Provide manufacturer's standard signs of configurations indicated.

## 2.4 FINISHES, GENERAL

- A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 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 signage work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that anchor inserts are correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.



### 3.2 INSTALLATION

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
  2. Where signs are required to be installed on a non-flush or textured surface, a smooth panel or unit of matching or similar material equaling or exceeding +/-1" in each direction must be installed on the wall surface to permit the flush, smooth and level installation of the sign.
  3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
  4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
  5. Exterior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls.
    - a. Locate sign with baseline of the lowest tactile character (Braille) 48" minimum above finish floor and the baseline of the highest tactile character not more than 60" above finish floor.
    - b. Locate signs so that clear floor area 18 inches minimum by 18 inches minimum centered on the tactile character, is provided beyond the arc of any door swing between the closed position and 45 degree open position.
    - c. At double doors with two active leafs, mount sign on wall to the right hand side of the door. At double doors with one inactive leaf, mount sign on inactive leaf unless otherwise indicated.
- B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
1. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
  2. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
    - a. Mount signs to glass only. Do not use this method for any other substrate.
  3. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.

### 3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

**END OF SECTION 10 14 00**

## **PART 1 - GENERAL**

### **1.01 RELATED DOCUMENTS**

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

### **1.02 SUMMARY**

- A. Section Includes:
  - 1. Solid-plastic toilet and changing compartments configured as toilet and changing enclosures and urinal screens.
- B. Related Requirements:
  - 1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking.
  - 2. Division 10 Section "Toilet and Bath Accessories" for toilet tissue dispensers, grab bars, and similar accessories.

### **1.03 REFERENCES**

- A. National Fire Protection Association (NFPA) 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

### **1.04 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.
- B. Shop Drawings: For toilet compartments.
  - 1. Include plans, elevations, sections, details, and attachment details.
  - 2. Show locations of cutouts for compartment-mounted toilet accessories.
  - 3. Show locations of centerlines of toilet fixtures.
  - 4. Show locations of floor drains.
- C. Samples for Initial Selection: For each type of toilet compartment material indicated.
  - 1. Include Samples of hardware and accessories involving material and color selection.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch-square Samples of same thickness and material indicated for Work.
  2. Each type of hardware and accessory.
- E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

#### **1.05 INFORMATIONAL SUBMITTALS**

- A. Product Certificates: For each type of toilet compartment.

#### **1.06 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.
- B. Warranty: Special warranty included in this Section.

#### **1.07 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents and source.
1. Door Hinges: Two hinges with associated fasteners.
  2. Latch and Keeper: Two latches and keepers with associated fasteners.
  3. Door Bumper: Two bumpers with associated fasteners.
  4. Door Pull: Two door pulls with associated fasteners.
  5. Fasteners: Ten fasteners of each size and type.

#### **1.08 QUALITY ASSURANCE**

- A. Coordination: Furnish inserts and anchorages which must be built into other work for installation of toilet compartments and related items. Coordinate delivery with other work to avoid delay.
1. Coordinate with wall finishes indicated on the Finish Schedule. Allow for thickness of ceramic wall tile and tile wainscots as required.

#### **1.09 PROJECT CONDITIONS**

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

## 1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of phenolic partitions, including panels, doors, stiles, and continuous hinges that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Breakage, corrosion, delamination and defects in factory workmanship.
  - 2. Warranty Period: 15 years from date of Substantial Completion.
  - 3. Warranty Period for Stainless Steel hardware: One year from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.01 PERFORMANCE REQUIREMENTS

- A. Fire Hazard Classification: Fire Propagation Characteristics: Passes NFPA 286 testing.
- B. Regulatory Requirements: Comply with applicable provisions in the 2010 ADA Standards and ICC/ANSI A117.1 for toilet compartments designated as accessible.

### 2.02 SOLID-PLASTIC TOILET COMPARTMENTS

- A. Basis of Design Product: Subject to compliance with requirements, provide **Scranton Products; Hiny Hiders** or comparable product by one of the following:
  - 1. Accurate Partitions Corp.; ASI Group.
  - 2. Global Partitions; ASI Group.
- B. Toilet-Enclosure and Changing-Partition Style: Overhead braced.
- C. Urinal-Screen Style: Wall hung, flat panel.
- D. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
  - 1. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless-steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
  - 2. Texture: Orange peel.
  - 3. Color: As selected by Architect from manufacturer's full range.
- E. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.
- F. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

## 2.03 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.
  1. Hinges: Manufacturer's minimum 16 gauge stainless-steel continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door. Mount with through-bolts.
  2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
  3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless-steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
  4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless-steel bumper at out-swinging doors. Mount with through-bolts.
  5. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.
    - a. Mount an additional door pull on inside of handicapped accessible stalls at 36 inches above the floor, located at 6 inches from hinge side of door.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

## 2.04 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ASTM B 221.
- C. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless-Steel Castings: ASTM A 743/A 743M.

## 2.05 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide, in-swinging doors for standard toilet compartments and 36-inch-wide, out-swinging doors with a minimum 32-inch-wide, clear opening for compartments designated as accessible.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
  - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
  - 1. Maximum Clearances:
    - a. Pilasters and Panels: 1/2 inch.
    - b. Panels and Walls: 1 inch.
  - 2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
    - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
    - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

- C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

**3.03 ADJUSTING**

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

**END OF SECTION 10 21 13.19**



## **PART 1 - GENERAL**

### **1.1 RELATED DOCUMENTS**

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

### **1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Washroom accessories.
- B. Related Sections include the following:
  - 1. Division 06 Section “Miscellaneous Rough Carpentry” for wood blocking.
  - 2. Division 22 Section “Plumbing” for underlavatory guards.

### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated. Include the following:
  - 1. Construction details and dimensions.
  - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
  - 3. Material and finish descriptions.
  - 4. Features that will be included for Project.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
  - 1. Identify locations using room designations indicated on Drawings.
  - 2. Identify products using designations indicated on Drawings.

### **1.4 INFORMATIONAL SUBMITTALS**

- A. Warranty: Sample of special warranty.

### **1.5 CLOSEOUT SUBMITTALS**

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

## 1.6 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.
- B. Accessibility: Comply with applicable provisions in ICC/ANSI A117.1 and the 2010 ADA Standards.

## 1.7 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 inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

## 1.8 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 15 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch 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.
- D. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

### 2.2 WASHROOM ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated by **Bobrick Washroom Equipment, Inc.** or a comparable product by one of the following:
  - 1. AJW.
  - 2. American Specialties, Inc.

3. Bradley Corporation.
- B. Grab Bars (**T-1A, T-1B, T-1C**):
1. Basis-of-Design Product: **Bobrick; B-6806.99 Series.**
  2. Mounting: Flanges with concealed fasteners.
  3. Material: Stainless steel, 18 gauge.
    - a. Finish: Smooth, No. 4, satin finish on ends and slip-resistant texture in grip area.
  4. Outside Diameter: 1-1/2 inches.
  5. Configuration and Length: Provide in straight lengths, in sizes indicated.
- C. Toilet Tissue (Roll) Dispenser (**T-2**):
1. Basis-of-Design Product: **Tork Twin Mini Jumbo Toilet Paper Dispenser, Black, T2.**
  2. Description: Double-roll dispenser.
  3. Mounting: Surface mounted.
  4. Operation: Noncontrol delivery with theft-resistant spindle. Tissue rolls are loaded and locked into dispensing mechanism. Extra roll automatically drops in place when bottom roll is depleted. Depleted rolls can only be removed after unlocking door.
  5. Capacity: Designed for up to 5-1/4-inch- diameter, standard core tissue rolls.
  6. Material and Finish: Plastic, black, with heavy-duty one-piece ABS plastic spindles.
    - a. Spindles: Heavy duty, theft resistant, one-piece molded ABS. Spindles are retained in dispensing unit when door is locked.
  7. Lockset: Tumbler type.
- D. Liquid-Soap Dispenser (**T-3**):
1. Basis-of-Design Product: **Genuine Joe 85133**
  2. Description: Designed for dispensing all commercially marketed all-purpose soap in liquid form.
  3. Mounting: Vertically oriented, surface mounted.
  4. Capacity: 46 fl oz.
  5. Material and Finish: White.
    - a. Container: 5.5” x 4.3” x 1.6” white and clear plastic, molded, one-piece seamless construction. Equip with a back plate and attached mounting bracket, and a locked, hinged stainless steel lid for top filling. Furnish with concealed wall plate.
    - b. Valve: Corrosion resistant, black molded plastic push button and spout with soap-holding mushroom valve; stainless steel spring and u-packing seal and duckbill.
  6. Lockset: Tumbler type.
- E. Sink (**T-4**): See Plumbing Drawings and Specifications
- F. Mirror Unit (**T-5**):
1. Basis-of-Design Product: **Bobrick; B-290 Series.**

2. Frame: Stainless-steel angle, 0.05 inch thick, 3/4 inch x 3/4 inch angle with vertical-grain satin finish, one-piece roll-formed construction.
    - a. Corners: Welded and ground smooth.
    - b. Backing: Galvanized steel fastened to frame with concealed screws and equipped with integral horizontal hanging brackets near the top and bottom of the mirror.
  3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
    - a. Wall bracket of 20 gauge galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
  4. Mirror: No. 1 quality, 1/4-inch select float glass, with all edges protected by plastic filler strips. Provide protective backing of full-size, shock absorbing, water resistant, nonabrasive, 3/16-inch thick polyethylene padding.
  5. Size: 18 x 36 inches.
- G. Electrical Hand-Dryer (T-6):
1. Basis-of-Design Product: **XLERATOR Model XL-W-110-120V**
  2. Construction: Integral, Zinc Diecast
  3. Function: Automatic, 8 Second Dry Time
  4. Color: White
  5. Electrical: 11.3 – 12.2 amps – see Electrical Drawings for additional information
- H. Diaper-Changing Stations (T-7):
1. Basis-of-Design Products: Subject to compliance with requirements, provide the following:
    - a. Koala Kare Products, Division of Bobrick.
  2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap, in conformance with ASTM F 2285 Standard Safety Performance Specification for Diaper Changing Tables for Commercial Use.
    - a. Basis-of-Design Product: **Bobrick; KB110-SSRE.**
    - b. Engineered to support a minimum of 200-lb static load when opened.
    - c. Contoured changing surface with nylon safety straps and bag hooks.
  3. Materials: FDA approved blow molded high-density polyethylene (HDPE) clad in 18 gauge Type 304 stainless steel, brushed finish.
  4. Mounting: Recessed mounted.
    - a. Reinforced steel on steel hinge mechanism with 11 gauge steel mounting plates and hardware.
  5. Operation: Concealed pneumatic cylinder providing controlled, slow opening and closing of the changing station bed.
  6. Hinge Mechanism: Reinforced full-length steel-on-steel hinge with integrated steel hook plate.
  7. Changing Surface: Contoured, concave and smooth, 442 sq. in.
  8. Safety Straps: Replaceable, snap-lock, nylon protective holding straps.
  9. Liner Dispenser: Built in, with a minimum 25 liner capacity.
- I. Sanitary-Napkin Disposal Unit (T-8):

1. Basis-of-Design Product: **Bobrick; B-254.**
  2. Mounting: Surface mounted.
  3. Receptacle: Removable.
  4. Material and Finish: Stainless steel, No. 4 finish (satin).
    - a. Cabinet: 22 gauge stainless steel, all-welded construction. Provide towel tray with hemmed opening to dispense towels without tearing.
    - b. Door: 22 gauge stainless steel, secured to cabinet with a full-length stainless steel piano-hinge.
    - c. Disposal Panel: 22 gauge stainless steel with bottom edge hemmed for safety. Panel is secured to door with a spring-loaded, full-length stainless steel piano hinge. Equip with the international handicapped accessible graphic symbol for identifying sanitary napkin disposal.
    - d. Waste Receptacle: Leak-proof, rigid molded polyethylene, with a 1.2 gallon capacity.
- J. Coat Hook (**T-9**):
1. Basis-of-Design Product: **Bobrick; B-6707.**
  2. Mounting: Surface mounted.
  3. Material and Finish: Stainless steel, No. 4 finish (satin).
    - a. Flange and Support Arm: 22 gauge stainless steel with concealed 16 gauge stainless steel mounting bracket, all-welded construction. Secure to wall plate with stainless steel setscrew.
    - b. Concealed Wall Plate: 16 gauge stainless steel.
    - c. Cap: 10 gauge stainless steel, welded to support arm.
- K. Mop and Broom Holder (**Provide one adjacent to laundry sink**):
1. Basis-of-Design Product: **Bobrick; B-239.**
  2. Description: Unit with shelf, hooks, and holders.
  3. Length: 34 inches.
  4. Hooks: Four.
  5. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
  6. Material and Finish: Stainless steel, No. 4 finish (satin).
    - a. Shelf: Not less than 18 gauge stainless steel.

## 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, when tested according to method in ASTM F 446.

**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 recommendations.

**END OF SECTION 10 28 00**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. Section Includes the following:
  - 1. Fire protection cabinets.
  - 2. Portable fire extinguishers.
  - 3. Mounting brackets for fire extinguishers.
- B. Related Sections:
  - 1. Division 01 Section "Sustainable Design Requirements."
  - 2. Division 21 Sections for fire suppression systems.

**1.3 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:
    - a. Schedules and coordination requirements.

**1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets and fire extinguishers.
  - 1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:
  - 1. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

- D. Samples for Initial Selection: For each type of fire protection cabinet indicated.
- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
  - 1. Size: 6 by 6 inches square.
- F. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

**1.5 INFORMATIONAL SUBMITTALS**

- A. Warranty: Sample of special warranty.

**1.6 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For fire protection cabinets and extinguishers to include in maintenance manuals.

**1.7 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Cam Lock: Three cam locks per cabinet.

**1.8 QUALITY ASSURANCE**

- A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.
- B. Source Limitations: Provide fire extinguishers and cabinets from a single source and a single manufacturer.
- C. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- D. Fire Extinguishers: Listed and labeled for type, rating, and classification.
  - 1. Provide fire extinguishers approved, listed, and labeled by UL.

**1.9 COORDINATION**

- A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire protection cabinets with wall depths.



**1.10 SEQUENCING**

- A. Apply decals on field-painted, fire protection cabinets after painting is complete.

**1.11 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure of hydrostatic test according to NFPA 10.
    - b. Faulty operation of valves or release levers.
  - 2. Warranty Period: Manufacturer's warranties shall not start until the date of Substantial Completion, or until all of the commissioning of respective systems are complete and accepted by the Commissioning Authority and the Owner, whichever is later.
    - a. Warranty Period: Six years from date of Substantial Completion.

**PART 2 - PRODUCTS**

**2.1 FIRE PROTECTION CABINETS**

- A. Cabinet Type: Suitable for fire extinguisher and fire blanket where indicated.
  - 1. Basis of Design Product: Subject to compliance with requirements, provide **Larsen's Manufacturing Company; Architectural Series** or comparable product by one of the following:
    - a. J. L. Industries, Inc., a division of Activar Construction Products Group.
    - b. Potter Roemer LLC.
- B. Cabinet Construction: Nonrated.
  - 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch-thick, cold-rolled steel sheet lined with minimum 5/8-inch-thick, fire-barrier material. Provide factory-drilled mounting holes.
- C. Cabinet Material: Steel sheet.
  - 1. Shelf: Same metal and finish as cabinet.
- D. Recessed Cabinet:
  - 1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
  - 2. Provide fire extinguisher is size(s) indicated.
  - 3. Basis of Design Product: Subject to compliance with requirements, provide the following or equal:
    - a. Larsen's; Architectural Series Model 2409-R2.

- E. Cabinet Trim Material: Stainless-steel sheet.
- F. Door Material: Stainless-steel sheet.
- G. Door Style: Vertical duo panel with frame.
- H. Door Glazing: Tempered float glass (clear).
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
  - 1. Provide projecting lever handle with cam-action latch.
  - 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- J. Accessories:
  - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
  - 2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
  - 3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
    - a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
      - 1) Location: Applied to cabinet door.
      - 2) Application Process: Die-cut lettering.
      - 3) Lettering Color: Red.
      - 4) Orientation: Vertical.
- K. Materials:
  - 1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
  - 2. Stainless-Steel Sheet: ASTM A 666, Type 304.
  - 3. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 6 mm thick, Class 1 (clear).
- L. Finishes:
  - 1. Interior: Manufacturer's standard baked-enamel paint.
  - 2. Exterior: Stainless Steel: No. 4.

## 2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.
  - 1. Valves: Manufacturer's standard.
  - 2. Handles and Levers: Manufacturer's standard.
  - 3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:80-B:C, 10-lb. nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.
- C. Regular Dry-Chemical Type in Steel Container: UL-rated 40-B:C, 5.5-lb nominal capacity, with sodium bicarbonate-based dry chemical in enameled-steel container.
  - 1. Provide regular dry-chemical type in Mechanical and Electrical Rooms.
- D. Wet-Chemical Type: UL-rated 2-A:K, 2.5-gal. nominal capacity, with potassium carbonate-based chemical in stainless-steel container; with pressure-indicating gage.
  - 1. Provide K-type extinguisher in kitchens and similar rooms where cooking media is used.
  - 2. Include a Class K placard at each location in size and wording defined in NFPA 10.

### **2.3 MOUNTING BRACKETS**

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure and to prevent accidental dislodging extinguisher, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
  - 1. Provide manufacturer's optional bracket in size required to suit extinguisher, with single or double strap.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
  - 1. Basis of Design Product: Subject to compliance with requirements, provide the following or equal:
    - a. Larsen's: PTD-182.
  - 2. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to triangular profile sign mounted above fire extinguisher at 6'-8" above finished floor to top of sign.
    - a. Orientation: Vertical.

### **2.4 CABINET FABRICATION**

- A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
  - 1. Weld joints and grind smooth.
  - 2. Provide factory-drilled mounting holes.
  - 3. Prepare doors and frames to receive locks.
  - 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
  - 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.

2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

## **2.5 GENERAL FINISH REQUIREMENTS**

- 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 of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire protection cabinets after assembly.
- D. 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.

## **2.6 STEEL FINISHES**

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning."
- B. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
  1. Color: selected by Architect from manufacturer's full range.

## **2.7 STAINLESS-STEEL FINISHES**

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
  1. Run grain of directional finishes with long dimension of each piece.
  2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
  3. Directional Satin Finish: No. 4.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.
- B. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Prepare recesses for recessed fire protection cabinets as required by type and size of cabinet and trim style.

### **3.3 INSTALLATION**

- A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
1. Fire Protection Cabinets: 48 inches above finished floor to top of cabinet.
- B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
1. Unless otherwise indicated, provide recessed fire protection cabinets.
  2. Provide inside latch and lock for break-glass panels.
  3. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.
- C. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
1. Mounting Brackets: 48 inches above finished floor to top of fire extinguisher.
  2. Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
- D. Identification: Apply decals at locations indicated.

### **3.4 ADJUSTING AND CLEANING**

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
- E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION 10 44 00**

**SECTION 220517  
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe sleeves.

**1.02 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.
- B. Section 220553 - Identification for Plumbing Piping and Equipment: Piping identification.
- C. Section 220719 - Plumbing Piping Insulation.

**PART 2 PRODUCTS**

**2.01 PIPE SLEEVES**

- A. Vertical Piping:
  - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
  - 2. Provide sealant for watertight joint.

**PART 3 EXECUTION**

**3.01 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.

**3.02 INSTALLATION**

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- E. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

**3.03 CLEANING**

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

**END OF SECTION**

**SECTION 220519  
METERS AND GAUGES FOR PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pressure gauges.
- B. Thermometers.

**1.02 REFERENCE STANDARDS**

- A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2022.
- B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014 (Reapproved 2020).
- C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014 (Reapproved 2021).
- D. AWWA M6 - Water Meters -- Selection, Installation, Testing, and Maintenance; 2012, with Addendum (2018).

**PART 2 PRODUCTS**

**2.01 PRESSURE GAUGES**

- A. Diaphragm Actuated for Gases:
  - 1. Dial Size and Cover: 3-1/2 inch (90 mm) diameter scale with polycarbonate window.
  - 2. Dial Text and Markings: Black color on white background with scaled cm (cm wg) and inch (in wg) units.
  - 3. Accuracy: ASME B40.100, adjustable commercial grade (B) with 2 percent at mid-range of span.
  - 4. Process Connection: Lower-back, 1/4 inch (8 mm, DN) NPT male except where noted.

**2.02 THERMOMETERS**

- A. General:
  - 1. Product Compliance: ASTM E1.
  - 2. Lens: Clear glass, except where stated.
  - 3. Accuracy: One percent, when tested in accordance with ASTM E77, except where stated.
  - 4. Scale: Black markings depicting single scale in degrees F where expected process value falls half-span of standard temperature range.
- B. Thermometers - Dial Type:
  - 1. Fixed: 5 inch (125 mm) diameter dial with black pointer, stainless steel case, silicone damping bimetal element, hermetically sealed lens, recalibrating screw, and 2-1/2 inch (63.5 mm) NPT stem.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verification of Conditions: Verify Utility Service Provider piping readiness to receive meter.
- B. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports, and test plugs.

**3.02 INSTALLATION**

- A. Install metering products in accordance with manufacturer's instructions for intended fluid type and service.
- B. Install water meters with inlet and outlet isolation valves in compliance with AWWA M6.
- C. Install thermometers as follows:
  - 1. Hot Water Heaters: Place upstream and downstream of heater. Add one on the inlet end when using steam as the water heating medium.

2. Piping: Install thermometers in branch butt weld connection fitting or socket-weld thermowell. Enlarge pipes smaller than 2-1/2 inch (60 mm) to accommodate sockets. Ensure sockets are above insulation clearance.

**END OF SECTION**



**SECTION 220523  
GENERAL-DUTY VALVES FOR PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Angle valves.
- B. Ball valves.
- C. Butterfly valves.
- D. Check valves.
- E. Gate valves.
- F. Globe valves.

**1.02 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.
- B. Section 083100 - Access Doors and Panels.

**1.03 REFERENCE STANDARDS**

- A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.
- C. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.
- D. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2022, with Errata (2023).
- E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- F. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2020.
- G. ASME B31.9 - Building Services Piping; 2020.
- H. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2023).
- I. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).
- J. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.
- K. AWWA C606 - Grooved and Shouldered Joints; 2022.
- L. MSS SP-45 - Drain and Bypass Connections; 2020.
- M. MSS SP-67 - Butterfly Valves; 2022.
- N. MSS SP-70 - Gray Iron Gate Valves, Flanged and Threaded Ends; 2011.
- O. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends; 2018.
- P. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service; 2010a.
- Q. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.
- R. MSS SP-85 - Gray Iron Globe and Angle Valves, Flanged and Threaded Ends; 2011.
- S. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .
- T. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.
- U. NSF 372 - Drinking Water System Components - Lead Content; 2022.

**PART 2 PRODUCTS**

**2.01 APPLICATIONS**

- A. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

- B. Provide the following valves for the applications if not indicated on drawings:
  - 1. Shutoff: Ball, butterfly, gate or plug.
  - 2. Dead-End: Single-flange butterfly (lug) type.
  - 3. Throttling: Provide globe, angle, ball, or butterfly.
- C. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.
- D. Domestic, Hot and Cold Water Valves:
  - 1. 2 inch (50 mm, DN) and Smaller:
    - a. Bronze and Brass: Provide with solder-joint ends.
    - b. Bronze Angle: Class 125, bronze disc.
    - c. Ball: One piece, full port, brass with brass trim.
    - d. Bronze Swing Check: Class 125, bronze disc.
    - e. Bronze Gate: Class 125, NRS.
    - f. Bronze Globe: Class 125, bronze disc.
  - 2. 2-1/2 inch (65 mm, DN) and Larger:
    - a. Iron, 2-1/2 inch (65 mm, DN) to 4 inch (100 mm, DN): Provide with threaded ends.
    - b. Iron Ball: Class 150.
    - c. Iron Single-Flange Butterfly: 200 CWP, EPDM seat, aluminum-bronze disc.
    - d. Iron Grooved-End Butterfly: 175 CWP.
    - e. Iron Swing Check: Class 125, metal seats.
    - f. Iron Swing Check with Closure Control: Class 125, lever and spring.
    - g. Iron Grooved-End Swing Check: 300 CWP.
    - h. Iron Center-Guided Check: Class 125, compact-wafer, metal seat.
    - i. Iron Plate-Type Check: Class 125; single plate; metal seat.
    - j. Iron Gate: Class 125, NRS.
    - k. Iron Globe: Class 125.

## 2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
- D. Valve-End Connections:
  - 1. Threaded End Valves: ASME B1.20.1.
  - 2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
  - 3. Pipe Flanges and Flanged Fittings 1/2 inch (15 mm, DN) through 24 inch (600 mm, DN): ASME B16.5.
  - 4. Solder Joint Connections: ASME B16.18.
  - 5. Grooved End Connections: AWWA C606.
- E. General ASME Compliance:
  - 1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
  - 2. Solder-joint Connections: ASME B16.18.
  - 3. Building Services Piping Valves: ASME B31.9.
- F. Potable Water Use:
  - 1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
  - 2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.
- G. Valve Bypass and Drain Connections: MSS SP-45.
- H. Source Limitations: Obtain each valve type from a single manufacturer.

### 2.03 BRONZE, ANGLE VALVES

- A. Class 125; CWP Rating: 200 psi (1380 kPa):
  - 1. Comply with MSS SP-80, Type 1.
  - 2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
  - 3. End Connections: Pipe thread.
  - 4. Stem: Bronze.
  - 5. Disc: Bronze.
  - 6. Packing: Asbestos free.
  - 7. Handwheel: Bronze or aluminum.

### 2.04 BRASS, BALL VALVES

- A. One Piece, Full Port with Brass Trim and Push-to-fit or Threaded Connections:
  - 1. Comply with MSS SP-110.
  - 2. CWP Rating: 200 psi (1379 kPa).
  - 3. Body: Forged brass.
  - 4. Seats: PTFE.
  - 5. Stem: Brass.
  - 6. Ball: Chrome-plated brass.
  - 7. Operator: Handle.
- B. Two Piece, Full Port with Brass Trim and Female Thread, Male thread, or Solder Connections:
  - 1. Comply with MSS SP-110.
  - 2. WSP Rating: 150 psi (1035 kPa).
  - 3. WOG Rating: 600 psi (4140 kPa).
  - 4. Body: Forged brass.
  - 5. Seats: PTFE.
  - 6. Ball: Chrome-plated brass.
  - 7. Cap: Include cap-gasket and chain for 3/4 inch (20 mm, DN) hose connection.
  - 8. Operator: Lockable handle and memory stop.

### 2.05 IRON, BALL VALVES

- A. Class 125, Full Port, Stainless Steel Trim:
  - 1. Comply with MSS SP-72.
  - 2. CWP Rating: 200 psi (1380 kPa).
  - 3. Body: ASTM A536 Grade 65-45-12, ductile iron.
  - 4. End Connections: Flanged.
  - 5. Seats: PTFE.
  - 6. Operator: Lever with locking handle.

### 2.06 IRON, SINGLE FLANGE BUTTERFLY VALVES

- A. Wafer Style:
  - 1. Class 125, or Class 150 flanges.
  - 2. Comply with MSS SP-67, Type I.
  - 3. Wafer Style, Service Pressure Ratings:
    - a. 150 psi (1034 kPa) for sizes 14 to 24 inch (350 to 600 mm, DN).
  - 4. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.
  - 5. Stem: One or two-piece stainless steel.
  - 6. Seat: EPDM.
  - 7. Disc: Aluminum-bronze.
  - 8. Finish: Epoxy coated.
  - 9. Operator: Gear operator with handwheel over direct-mount actuator base.

### 2.07 IRON, GROOVED-END BUTTERFLY VALVES

- A. CWP Rating: 175 psi (1200 kPa).

1. Comply with MSS SP-67, Type I.
2. Body: Coated ductile iron.
3. Stem: Two-piece stainless steel.
4. Disc: Coated ductile iron.
5. Disc Seal: EPDM.

#### **2.08 BRONZE, SWING CHECK VALVES**

- A. General:
1. Fabricate from dezincification resistant material.
  2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. Class 125:
1. Pressure and Temperature Rating: MSS SP-80, Type 3.
  2. Design: Y-pattern, horizontal or vertical flow.
  3. WOG Rating: 200 psi (1380 kPa).
  4. Body: Bronze, ASTM B62.
  5. End Connections: Threaded.
  6. Disc: Bronze.

#### **2.09 IRON, HORIZONTAL SWING CHECK VALVES**

#### **2.10 IRON, SWING CHECK VALVES WITH CLOSURE CONTROL**

- A. Class 125 with Lever and Spring-Closure Control.
1. Comply with MSS SP-71, Type I.
  2. Description:
    - a. CWP Rating: 200 psi (1380 kPa).
    - b. Design: Clear or full waterway.
    - c. Body: ASTM A126, gray iron with bolted bonnet.
    - d. Ends: Flanged as indicated.
    - e. Trim: Bronze.
    - f. Gasket: Asbestos free.
    - g. Closer Control: Factory installed, exterior lever, and weight.

#### **2.11 IRON, GROOVED-END SWING CHECK VALVES**

- A. Class 300:
1. CWP Rating: 300 psi (2070 kPa).
  2. Body: ASTM A536, Grade 65-45-12 ductile iron.
  3. Seal: EPDM.
  4. Disc: Ductile iron.
  5. Coating: Black, non-lead paint.

#### **2.12 IRON, CENTER-GUIDED CHECK VALVES**

#### **2.13 IRON, PLATE TYPE CHECK VALVES**

#### **2.14 BRONZE, GATE VALVES**

- A. General:
1. Fabricate from dezincification resistant material.
  2. Copper alloys containing more than 15 percent zinc are not permitted.

#### **2.15 IRON, GATE VALVES**

- A. Bolted Bonnet: OS&Y; Rising Stem:
1. Pressure and Temperature Rating: MSS SP-70, Type I.
  2. Class 125: WOG Rating; 200 psi (1380 kPa).
  3. Body: ASTM A126, gray iron with bolted bonnet.
  4. End Connections: Flanged.
  5. Trim: Bronze.

6. Disc: Solid wedge.
7. Packing and Gasket: Asbestos free.

#### **2.16 BRONZE, GLOBE VALVES**

- A. General:
  1. Fabricate from dezincification resistant material.
  2. Copper alloys containing more than 15 percent zinc are not permitted.

#### **2.17 IRON, GLOBE VALVES**

- A. Class 125 and Class 250:
  1. Class 125, WOG Rating: 200 psi (1380 kPa).
  2. Class 250, WOG Rating: 500 psi (3450 kPa).
  3. Comply with MSS SP-85, Type I.
  4. Body: Gray iron; ASTM A126, with bolted bonnet.
  5. Connection Ends: Flanged.
  6. Trim: Bronze.
  7. Packing and Gasket: Asbestos free, adjustable.
  8. Operator: Handwheel or chainwheel.
  9. Pressure and Temperature Rating: ASME B16.1.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

**END OF SECTION**

**SECTION 220529  
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe hangers.
- B. Nonpenetrating rooftop supports for low-slope roofs.

**1.02 RELATED REQUIREMENTS**

- A. Section 055000 - Metal Fabrications.

**1.03 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- D. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.
- E. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- F. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

**PART 2 PRODUCTS**

**2.01 GENERAL REQUIREMENTS**

- A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.
- B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.
- C. Materials for Metal Fabricated Supports: Comply with Section 055000.
  - 1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
  - 2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.
- D. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

**2.02 PIPE HANGERS**

- A. Band Hangers, Adjustable:
  - 1. MSS SP-58 type 7 or 9, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
- B. J-Hangers, Adjustable:
  - 1. Manufacturers:
  - 2. MSS SP-58 type 5, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

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

- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Equipment Support and Attachment:
  - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- G. Secure fasteners according to manufacturer's recommended torque settings.
- H. Remove temporary supports.

**END OF SECTION**

**SECTION 220553**  
**IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Nameplates.
- B. Pipe markers.
- C. Underground warning tape.

**1.02 RELATED REQUIREMENTS**

- A. Section 099123 - Interior Painting: Identification painting.

**1.03 REFERENCE STANDARDS**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

**PART 2 PRODUCTS**

**2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE**

- A. Nameplates:
  - 1. Heat exchangers, water heaters, and other heat transfer products.
  - 2. Control panels, transducers, and other related control equipment products.
  - 3. Pumps, tanks, filters, water treatment devices, and other plumbing equipment products.
- B. Pipe Markers: 3/4 inch (20 mm) diameter and higher.

**2.02 NAMEPLATES**

- A. Description: Laminated piece with up to three lines of text.
  - 1. Letter Color: White.
  - 2. Letter Height: 1/4 inch (6 mm).

**2.03 PIPE MARKERS**

- A. Comply with ASME A13.1.
- B. Identification Scheme, ASME A13.1:
  - 1. Primary: External Pipe Diameter, Uninsulated or Insulated.
    - a. 3/4 to 1-1/4 inches (19 to 32 mm): Use 8 inch (203 mm) field-length with 1/2 inch (13 mm) text height.
    - b. 1-1/2 to 2 inches (38 to 51 mm): Use 8 inch (203 mm) field-length with 3/4 inch (19 mm) text height.
    - c. 2-1/2 to 6 inches (64 to 152 mm): Use 12 inch (305 mm) field-length with 1-1/4 inch (32 mm) text height.
  - 2. Secondary: Color scheme per fluid service.
    - a. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.

**2.04 UNDERGROUND WARNING TAPE**

- A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil, 0.004 inch (0.10 mm).
- C. Legend: Type of service, continuously repeated over full length of tape.
- D. Color:

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.



- B. Install tags in clear view and align with axis of piping
- C. Apply stencil painted identification in compliance with Section 099123 requirements. Identify unit with assigned id-number and area being served using pipe marking rules.
- D. Install plastic pipe markers in accordance with manufacturer's instructions.
- E. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.
- F. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- G. Apply ASME A13.1 Pipe Marking Rules:
  - 1. Place pipe marker adjacent to changes in direction.
  - 2. Place pipe marker adjacent each valve port and flange end.
  - 3. Place pipe marker at both sides of floor and wall penetrations.
  - 4. Place pipe marker every 25 to 50 feet (7.6 to 15.2 m) interval of straight run.

**END OF SECTION**

**SECTION 220719  
PLUMBING PIPING INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Cellular glass insulation.
- B. Glass fiber insulation.

**1.02 REFERENCE STANDARDS**

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).
- B. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.
- C. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2022.
- D. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

**PART 2 PRODUCTS**

**2.01 REGULATORY REQUIREMENTS**

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

**2.02 GLASS FIBER INSULATION**

- A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
  - 1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
  - 2. Maximum Service Temperature: 850 degrees F (454 degrees C).
  - 3. Maximum Moisture Absorption: 0.2 percent by volume.

**2.03 CELLULAR GLASS INSULATION**

- A. Insulation: ASTM C552, Type II, Grade 6.
  - 1. K (Ksi) Value: 0.35 (0.050) at 100 degrees F (38 degrees C).
  - 2. Service Temperature Range: From 250 degrees F (121 degrees C) to 800 degrees F (427 degrees C).
  - 3. Water Vapor Permeability: 0.005 perm inch (0.007 ng/(Pa s m)) maximum per inch.
  - 4. Water Absorption: 0.5 percent by volume, maximum.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.

**3.02 SCHEDULES**

- A. Plumbing Systems:
  - 1. Domestic Hot Water Supply:
    - a. Glass Fiber Insulation:

**END OF SECTION**

**SECTION 221005  
PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Sanitary waste piping, buried within 5 feet (1500 mm) of building.
- B. Sanitary waste piping, above grade.
- C. Domestic water piping, buried within 5 feet (1500 mm) of building.
- D. Domestic water piping, above grade.
- E. Pipe flanges, unions, and couplings.
- F. Pipe hangers and supports.
- G. Pipe sleeve-seal systems.
- H. Ball valves.
- I. Balancing valves.

**1.02 RELATED REQUIREMENTS**

- A. Section 330110.58 - Disinfection of Water Utility Piping Systems.

**1.03 REFERENCE STANDARDS**

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- C. ASME B31.9 - Building Services Piping; 2020.
- D. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- E. ASTM B32 - Standard Specification for Solder Metal; 2020.
- F. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2020.
- G. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- H. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- I. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.
- J. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2023.
- K. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.
- L. ASTM C1277 - Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.
- M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- N. AWWA C606 - Grooved and Shouldered Joints; 2022.
- O. AWWA C651 - Disinfecting Water Mains; 2023.
- P. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.
- Q. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.
- R. IAPMO IGC 361 - Continuous Flexible Self-Plunging Waste Pipes; 2019.

- S. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).
- T. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).
- U. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).
- V. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.
- W. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- X. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .
- Y. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.
- Z. NSF 372 - Drinking Water System Components - Lead Content; 2022.
- AA. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

## **PART 2 PRODUCTS**

### **2.01 GENERAL REQUIREMENTS**

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

### **2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING**

- A. Cast Iron Pipe: CISPI 301, hubless.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

### **2.03 SANITARY WASTE PIPING, ABOVE GRADE**

- A. Continuous Flexible Self-Plunging Waste Pipes: IAPMO IGC 361, provide to connect lavatories and sink tail piece to PVC sanitary waste piping.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

### **2.04 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING**

- A. Copper Pipe: ASTM B42, hard drawn.
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
  - 2. Joints: ASTM B32, alloy Sn95 solder.

### **2.05 DOMESTIC WATER PIPING, ABOVE GRADE**

- A. Copper Pipe: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, alloy Sn95 solder.

### **2.06 PIPE FLANGES, UNIONS, AND COUPLINGS**

- A. Unions for Pipe Sizes 3 inch (80 mm, DN) and Under:
  - 1. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Sizes Over 1 inch (25 mm, DN):
  - 1. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

- C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
  - 1. Dimensions and Testing: In accordance with AWWA C606.
  - 2. Housing Material: Provide ASTM A47/A47M malleable iron, ductile iron, or \_\_\_\_\_, galvanized.
  - 3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
  - 4. When pipe is field grooved, provide coupling manufacturer's grooving tools.
- D. No-Hub Couplings:
  - 1. Testing: In accordance with ASTM C1277 and CISPI 310.
  - 2. Gasket Material: Neoprene complying with ASTM C564.
  - 3. Band Material: Stainless steel.
  - 4. Eyelet Material: Stainless steel.

## 2.07 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
  - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
  - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
  - 4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Drain, Waste, and Vent:
  - 1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
  - 2. Hangers for Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
  - 3. Wall Support for Pipe Sizes to 3 inch (80 mm, DN): Cast iron hook.
  - 4. Wall Support for Pipe Sizes 4 inch (100 mm, DN) and Over: Welded steel bracket and wrought steel clamp.
- C. Plumbing Piping - Water:
  - 1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
  - 2. Hangers for Cold Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
  - 3. Hangers for Hot Pipe Sizes 2 to 4 inch (50 to 100 mm, DN): Carbon steel, adjustable, clevis.
  - 4. Hangers for Hot Pipe Sizes 6 inch (150 mm, DN) and Larger: Adjustable steel yoke, cast iron pipe roll, double hanger.
  - 5. Wall Support for Pipe Sizes Up to 3 inch (80 mm, DN): Cast iron hook.
  - 6. Wall Support for Pipe Sizes 4 inch (100 mm, DN) and Larger: Welded steel bracket and wrought steel clamp.
  - 7. Wall Support for Hot Pipe Sizes 6 inch (150 mm, DN) and Larger: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
- D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
  - 1. Concrete Wedge Expansion Anchors: Comply with ICC-ES AC193.
  - 2. Masonry Wedge Expansion Anchors: Comply with ICC-ES AC01.
  - 3. Concrete Screw Type Anchors: Comply with ICC-ES AC193.
  - 4. Masonry Screw Type Anchors: Comply with ICC-ES AC106.
  - 5. Concrete Adhesive Type Anchors: Comply with ICC-ES AC308.

## 2.08 PIPE SLEEVE-SEAL SYSTEMS

- A. Modular Mechanical Seals:

1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
3. Size and select seal component materials in accordance to service requirements.
4. Glass reinforced plastic pressure end plates.

## 2.09 BALL VALVES

- A. Construction, 4 inch (100 mm, DN) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

## 2.10 BALANCING VALVES

- A. Construction: Class 125, brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
- B. Manual Operated Y-Pattern Globe, Size 1/2 to 2 inch (15 to 50 mm, DN):
  1. Class 125, brass or bronze body, multi-turn handwheel, memory stop, variable orifice, soldered connections, dual PT (hot and cold pressure-temperature) test ports for 300 psi (2,068 kPa), minus 4 to 250 deg F (minus 20 to 121.1 deg C) WOG service.
- C. Calibration: Control flow within five percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

## PART 3 EXECUTION

### 3.01 PREPARATION

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

### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- C. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
- D. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- E. Pipe Hangers and Supports:
  1. Install in accordance with ASME B31.9.
  2. Support horizontal piping as indicated.
  3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
  4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
  5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
- F. Pipe Sleeve-Seal Systems:
  1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
  2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
  3. Locate piping in center of sleeve or penetration.
  4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.

5. Tighten bolting for a watertight seal.
6. Install in accordance with manufacturer's recommendations.

### 3.03 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect water distribution system in accordance with Section 330110.58.
- B. Prior to starting work, verify system is complete, flushed, and clean.
- C. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

### 3.04 SERVICE CONNECTIONS

- A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.
  1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
  2. Provide 18 gauge, 0.0478-inch (1.21 mm) galvanized sheet metal sleeve around service main to 6 inch (150 mm) above floor and 6 feet (1800 mm) minimum below grade. Size for minimum of 2 inches (50 mm) of loose batt insulation stuffing.

### 3.05 SCHEDULES

- A. Pipe Hanger Spacing:
  1. Metal Piping:
    - a. Pipe Size: 1/2 inch (15 mm, DN) to 1-1/4 inch (32 mm, DN):
      - 1) Maximum Hanger Spacing: 6.5 ft (2 m).
      - 2) Hanger Rod Diameter: 3/8 inches (9 mm).
    - b. Pipe Size: 1-1/2 inch (40 mm, DN) to 2 inch (50 mm, DN):
      - 1) Maximum Hanger Spacing: 10 ft (3 m).
      - 2) Hanger Rod Diameter: 3/8 inch (9 mm).
    - c. Pipe Size: 2-1/2 inch (65 mm, DN) to 3 inch (80 mm, DN):
      - 1) Maximum Hanger Spacing: 10 ft (3 m).
      - 2) Hanger Rod Diameter: 1/2 inch (13 mm).
  2. Plastic Piping:
    - a. All Sizes:
      - 1) Maximum Hanger Spacing: 6 ft (1.8 m).
      - 2) Hanger Rod Diameter: 3/8 inch (9 mm).

**END OF SECTION**

**SECTION 223000  
PLUMBING EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Commercial electric water heaters.

**1.02 REFERENCE STANDARDS**

- A. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**PART 2 PRODUCTS**

**2.01 WATER HEATERS**

- A. Manufacturers:
  - 1. Bradford White Corporation; ALL SUBSTITUTIONS REQUIRE APPROVAL BY AGE: [www.bradfordwhite.com/#sle](http://www.bradfordwhite.com/#sle).
- B. Commercial Electric Water Heaters:
  - 1. Manufacturers:
    - a. Bradford White Corporation; ElectriFLEX Series: [www.bradfordwhite.com/#sle](http://www.bradfordwhite.com/#sle).
    - b. Substitutions: See Section 016000 - Product Requirements.
  - 2. Type: Factory-assembled and wired, electric, vertical storage.
  - 3. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
  - 4. Performance:
  - 5. Electrical Characteristics:
  - 6. Tank: Glass lined welded steel; 4 inch (100 mm) diameter inspection port, thermally insulated with minimum 2 inches (50 mm) glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
  - 7. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F (16 to 82 degrees C), flanged or screw-in nichrome elements, high temperature limit thermostat.
  - 8. Accessories:
    - a. Water Connections: Brass.
    - b. Dip Tube: Brass.
    - c. Drain valve.
    - d. Anode: Magnesium.
    - e. Temperature and Pressure Relief Valve: ASME labeled.
  - 9. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 W/sq in (11.6 W/sq m).

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions required for applicable certifications.
- B. Coordinate system, equipment, and piping work with applicable electrical, fuel, gas, vent, drain, and waste support interconnections as included or provided by other trades.

**3.02 SCHEDULES**

- A. Water Heaters: REFER TO AGE PLUMBING AND ELECTRICAL DRAWINGS

**END OF SECTION**



**SECTION 224000  
PLUMBING FIXTURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Flush valve water closets.
- B. Wall hung urinals.
- C. Lavatories.
- D. Wall-hung, solid surface, multistation lavatory units.
- E. Sinks.
- F. Mop sinks.
- G. Service sinks.

**1.02 REFERENCE STANDARDS**

- A. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).
- B. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.
- C. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures; 2024.
- D. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2018, with Errata.
- E. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2022.
- F. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- H. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.
- I. NSF 372 - Drinking Water System Components - Lead Content; 2022.

**PART 2 PRODUCTS**

**2.01 GENERAL REQUIREMENTS**

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

**2.02 FLUSH VALVE WATER CLOSETS**

- A. Water Closets:
  - 1. Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
  - 2. Bowl: ASME A112.19.2; 16.5 inches (420 mm) high with elongated rim.
  - 3. Flush Valve: Exposed (top spud).
  - 4. Flush Operation: Sensor operated.
  - 5. Handle Height: 44 inches (1117 mm) or less.
- B. Flush Valves:
  - 1. Valve Supply Size: 1 inch (25 mm, DN).
  - 2. Valve Outlet Size: 1-1/2 inches (40 mm, DN).
  - 3. Sensor-Operated:
    - a. Type: ASME A112.19.5; chloramine-resistant clog-resistant dual-seat diaphragm valve complete with vacuum breaker, stops and accessories.
    - b. Mechanism: Solenoid-operated piston or electronic motor-actuated operator with low-voltage powered infrared sensor, and mechanical override or override push button.
    - c. Supplied Volume Capacity: 1.2 gal (4.5 L) per flush.
- C. Toilet Seats:

1. Plastic: Solid, white finish, elongated shape, open front, slow-closing hinged seat cover, extended back complete with self-sustaining hinges, and brass bolts with covers.
  2. Plastic: Black finish, open front, extended back, self-sustaining hinge, brass bolts, with cover.
- D. Water Closet Carriers:
1. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

## 2.03 LAVATORIES

- A. Wall-Hung Basin:
1. Porcelain-Enamelled Cast Iron: ASME A112.19.1; white, rectangular basin with splash lip, front overflow, soap depression, and hanger. Size as indicated on drawings with 4-inch (100 mm) centerset spacing.
  2. Vitreous China: ASME A112.19.2; white, rectangular basin with splash lip, front overflow, soap depression, and hanger. Size as indicated on drawings with 4-inch (100 mm) centerset spacing.
  3. Vitreous China, Grade A: ASME A112.19.2; white, rectangular commercial-grade sink with predrilled holes, rear-center drain, front overflow, and hanger. Size as indicated on drawings with 4-inch (100 mm) centerset spacing.
  4. Carrier:
    - a. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.
- B. Supply Faucet:
1. ASME A112.18.1; chrome plated combination supply fitting with pop-up waste, water economy aerator with maximum flow of 2.2 gpm (8.3 L/min), indexed handles.
- C. Sensor Operated Faucet:
1. Spout Style: Standard.
  2. Mixing Valve: None, single line for tempered water.
  3. Water Supply: 3/8 inch (9 mm) compression connections.
  4. Aerator: Vandal resistant, 0.5 gpm (1.89 L/min), laminar flow device.
  5. Finish: Polished chrome.
- D. Thermostatic Mixing Valve:
1. ASSE 1070 listed with combination stop, strainer, and check valves, and flexible stainless steel connectors.
- E. Lavatory Carrier:
1. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.
- F. Accessories:
1. Offset waste with perforated open strainer.
  2. Combination stop and strainer.
  3. Soap Dispenser: Manual or sensor-based.
  4. Wheel handle stops.
  5. Rigid supplies.

## 2.04 WALL-HUNG, SOLID SURFACE, MULTISTATION LAVATORY UNITS

- A. Description: Rectilinear, level-surface deck, seamless and integral elongated basin, with stainless steel enclosed pedestal cabinet.
- B. Deck and Bowl Material: Fabricate from molded engineered stone material consisting of natural quartz, granite, and other minerals in a matrix of thermoset acrylic modified bio-based polyester resin and meeting requirements of IAPMO Z124.
- C. Surface Burning Characteristics: Smoke developed index less than 450, and flame spread index less than 25, Class A, when tested in accordance with ASTM E84.

- D. Number of Wash Stations: Three.
- E. Unit Length: \_\_\_\_\_ inches (\_\_\_\_\_ mm).
- F. Soap Dispenser:
- G. Color: As selected by Architect from manufacturer's full line.
- H. Faucet Drilling: 4 inch (100 mm) centerset drilling.
- I. Access Panel: Stainless steel.
- J. Support Frame: Wall-mounted, heavy gauge, stainless steel.

## 2.05 MOP SINKS

- A. Material: Stainless steel.
- B. Type: Rectilinear.
- C. Tiling Flange Construction: Galvanized steel.
- D. Grid Strainer: Stainless steel; integral; removable.
- E. Dimensions: As indicated on drawings.
- F. Accessories:
  - 1. 5 feet (1.5 m) of 1/2 inch (13 mm) diameter plain end reinforced plastic hose.
  - 2. Hose clamp hanger.

## 2.06 SERVICE SINKS

- A. Bowl: ASME A112.19.1; 22 by 18 by 12 inches (560 by 460 by 300 mm) deep, porcelain enameled interior cast iron roll-rim sink, with 12-inch (300 mm) high back, concealed hanger, chrome-plated strainer, stainless steel rim guard, cast iron P-trap with adjustable floor flange.
- B. Bowl: 36 by 24 by 10 inches (900 by 600 by 250 mm) high, white molded stone, floor mounted, with 1-inch (25 mm) wide shoulders, vinyl bumper guard, stainless steel strainer.
- C. Drop-In, Single-Bowl, Laundry Sink: Two-hole, white finished, plastic-molded bowl, 20 gal (76 L) capacity, and fitted drain with stopper. Size as indicated on drawings.
- D. Wall-Mount, Single-Bowl, Laundry Sink: Two-hole, white finished, plastic-molded bowl, 20 gal (76 L) capacity with integral-molded drain and stopper. Size as indicated on drawings.
- E. Accessories:
  - 1. 5 feet (1.5 m) of 1/2 inch (13 mm) diameter plain end reinforced plastic hose.
  - 2. Hose clamp hanger.
  - 3. Mop hanger.

## PART 3 EXECUTION

### 3.01 EXAMINATION

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

### 3.02 PREPARATION

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

### 3.03 INSTALLATION

- A. Install components level and plumb.
- B. Install and secure fixtures in place with wall supports and bolts.
- C. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.

**3.04 ADJUSTING**

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

**3.05 CLEANING**

- A. Clean plumbing fixtures and equipment.

**3.06 PROTECTION**

- A. Protect installed products from damage due to subsequent construction operations.
- B. Repair or replace damaged products before Date of Substantial Completion.

**3.07 SCHEDULES**

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
  - 1. Water Closet:
    - a. Standard: 15 inches (380 mm) to top of bowl rim.
    - b. Accessible: 18 inches (455 mm) to top of seat.
  - 2. Water Closet Flush Valves:
    - a. Standard: 11 inches (280 mm) min. above bowl rim.
    - b. Recessed: 10 inches (255 mm) min. above bowl rim.
  - 3. Lavatory:
    - a. Standard: 31 inches (785 mm) to top of basin rim.
    - b. Accessible: 34 inches (865 mm) to top of basin rim.
- B. Fixture Rough-In
  - 1. Water Closet (Flush Valve Type):
    - a. Cold Water: 1 Inch (25 mm).
    - b. Waste: 4 Inch (100 mm).
    - c. Vent: 2 Inch (50 mm).
  - 2. Lavatory:
    - a. Hot Water: 1/2 Inch (15 mm).
    - b. Cold Water: 1/2 Inch (15 mm).
    - c. Waste: 1-1/2 Inch (40 mm).
    - d. Vent: 1-1/4 Inch (32 mm).
  - 3. Sink:
    - a. Hot Water: 1/2 Inch (15 mm).
    - b. Cold Water: 1/2 Inch (15 mm).
    - c. Waste: 1-1/2 Inch (40 mm).
    - d. Vent: 1-1/4 Inch (32 mm).

**END OF SECTION**

**SECTION 230553  
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Adhesive-backed duct markers.
- D. Pipe markers.

**1.02 REFERENCE STANDARDS**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

**PART 2 PRODUCTS**

**2.01 IDENTIFICATION APPLICATIONS**

- A. Air Handling Units: Nameplates.
- B. Air Terminal Units: Tags.
- C. Ductwork: Nameplates.
- D. Piping: Tags.
- E. Thermostats: Nameplates.

**2.02 NAMEPLATES**

- A. Letter Color: White.
- B. Letter Height: 1/4 inch (6 mm).
- C. Background Color: Black.
- D. Plastic: Comply with ASTM D709.

**2.03 TAGS**

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.
- C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

**2.04 ADHESIVE-BACKED DUCT MARKERS**

- A. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch (0.76 mm); printed with UV and chemical resistant inks.
- B. Style: Individual Label.
- C. Color: Yellow/Black.

**2.05 PIPE MARKERS**

- A. Color: Comply with ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.
- D. Underground Plastic Pipe Markers: Bright-colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil, 0.004 inch (0.10 mm) thick, manufactured for direct

burial service.

- E. Color code as follows:
  - 1. Heating, Cooling, and Boiler Feedwater: Green with white letters.
  - 2. Toxic and Corrosive Fluids: Orange with black letters.
  - 3. Compressed Air: Blue with white letters.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
  - 1. Identify service, flow direction, and pressure.
  - 2. Install in clear view and align with axis of piping.
  - 3. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- D. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- E. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

**END OF SECTION**

**SECTION 230593  
TESTING, ADJUSTING, AND BALANCING FOR HVAC**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Testing, adjustment, and balancing of air systems.
- B. Commissioning activities.

**1.02 RELATED REQUIREMENTS**

- A. Section 019113 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.
- B. Section 230800 - Commissioning of HVAC.

**1.03 REFERENCE STANDARDS**

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).
- C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2023.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 GENERAL REQUIREMENTS**

- A. Perform total system balance in accordance with one of the following:
  - 1. AABC (NSTSB), AABC National Standards for Total System Balance.
  - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
  - 3. SMACNA (TAB).
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. TAB Agency Qualifications:
  - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
  - 2. Certified by one of the following:
    - a. AABC, Associated Air Balance Council: [www.aabc.com/#sle](http://www.aabc.com/#sle); upon completion submit AABC National Performance Guaranty.
    - b. NEBB, National Environmental Balancing Bureau: [www.nebb.org/#sle](http://www.nebb.org/#sle).
    - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: [www.tabbcertified.org/#sle](http://www.tabbcertified.org/#sle).
- D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

**3.02 EXAMINATION**

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
  - 1. Systems are started and operating in a safe and normal condition.
  - 2. Temperature control systems are installed complete and operable.
  - 3. Proper thermal overload protection is in place for electrical equipment.
  - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  - 5. Duct systems are clean of debris.
  - 6. Fans are rotating correctly.
  - 7. Fire and volume dampers are in place and open.
  - 8. Air outlets are installed and connected.

9. Duct system leakage is minimized.
10. Proper strainer baskets are clean and in place.
11. Service and balance valves are open.

### 3.03 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches (12.5 Pa) positive static pressure near the building entries.
- M. Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.
- N. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

### 3.04 COMMISSIONING

- A. See Sections 019113 - General Commissioning Requirements and 230800 for additional requirements.
- B. Perform prerequisites prior to starting commissioning activities.
- C. Fill out Prefunctional Checklists for:
  1. Air side systems.
  2. Water side systems.
- D. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.
- E. Re-check minimum outdoor air intake flows and maximum and intermediate total airflow rates for \_\_\_ percent of the air handlers plus a random sample equivalent to \_\_\_\_ percent of the final TAB report data as directed by Commissioning Authority.



1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Authority.
  2. Use the same test instruments as used in the original TAB work.
  3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.
  4. For purposes of re-check, failure is defined as follows:
    - a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.
    - b. Minimum Outside Air Flow: Deviation of more than 20 percent of instrument reading; for inlet vane or VFD OSA compensation system using linear proportional control, deviation of more than 30 percent at intermediate supply flow.
    - c. Temperatures: Deviation of more than one degree F (0.5 degree C).
    - d. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.
    - e. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.
  5. For purposes of re-check, a whole system is defined as one in which inaccuracies will have little or no impact on connected systems; for example, the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system.
- F. In the presence of the Commissioning Authority, verify that:
1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
  2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.
  3. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.

### 3.05 SCOPE

- A. Test, adjust, and balance the following:

### 3.06 MINIMUM DATA TO BE REPORTED

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

5. Serial number.
  6. Entering DB air temperature, design and actual.
  7. Leaving DB air temperature, design and actual.
  8. Number of compressors.
- C. Sound Level Reports:
1. Location.
  2. Octave bands - equipment off.
  3. Octave bands - equipment on.

**END OF SECTION**

**SECTION 230713  
DUCT INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Duct insulation.

**1.02 REFERENCE STANDARDS**

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).
- C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- E. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

**PART 2 PRODUCTS**

**2.01 REGULATORY REQUIREMENTS**

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

**2.02 GLASS FIBER, FLEXIBLE**

- A. Manufacturer:
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
  - 1. K (Ksi) value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.
  - 2. Maximum Service Temperature: 1,200 degrees F (649 degrees C).
  - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.

**2.03 GLASS FIBER, RIGID**

- A. Insulation: ASTM C612; rigid, noncombustible blanket.
  - 1. K (Ksi) Value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C518.
  - 2. Maximum Service Temperature: 450 degrees F (232 degrees C).
  - 3. Maximum Water Vapor Absorption: 5.0 percent.
  - 4. Maximum Density: 8.0 pcf (128 kg/cu m).

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.

**3.02 SCHEDULES**

- A. Exhaust Ducts Within 10 ft (3 m) of Exterior Openings:
- B. Exhaust Ducts Exposed to Outdoor Air:
- C. Outside Air Intake Ducts:
- D. Supply Ducts:

**END OF SECTION**

**SECTION 230993**  
**SEQUENCE OF OPERATIONS FOR HVAC CONTROLS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.
- B. Sequence of operation for:
  - 1. Air terminal units.
  - 2. Refrigeration systems.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 REFRIGERATION SYSTEMS**

- A. Maintain constant supply air duct temperature of 55 degrees F (13 degrees C) by cycling refrigeration system and signalling step capacity, minimum of \_\_\_\_\_ steps.

**END OF SECTION**

**SECTION 232300  
REFRIGERANT PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Piping.
- B. Refrigerant.
- C. Moisture and liquid indicators.
- D. Valves.
- E. Strainers.
- F. Filter-driers.

**1.02 REFERENCE STANDARDS**

- A. AHRI 710 (I-P) - Performance Rating of Liquid-Line Driers; 2009.
- B. AHRI 711 (SI) - Performance Rating of Liquid-Line Driers; 2009.
- C. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- E. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2018.
- F. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2022.
- G. ASME B31.9 - Building Services Piping; 2020.
- H. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- I. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- J. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- K. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2023.
- L. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.
- M. ICC (IMC)-2018 - International Mechanical Code; 2018.
- N. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- O. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

**PART 2 PRODUCTS**

**2.01 SYSTEM DESCRIPTION**

- A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure integrity of system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.
- C. Liquid Indicators:
  - 1. Use line size liquid indicators in main liquid line leaving condenser.
  - 2. If receiver is provided, install in liquid line leaving receiver.
  - 3. Use line size on leaving side of liquid solenoid valves.
- D. Filter-Driers:

1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

## 2.02 REGULATORY REQUIREMENTS

- A. Comply with ASME B31.9 for installation of piping system.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

## 2.03 PIPING

- A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
  1. Fittings: ASME B16.22 wrought copper.
  2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.
  3. Mechanical Press Fittings: Double-pressed type complying with UL 207 and ICC (IMC)-2018.
- B. Copper Tube to 7/8-inch (22 mm) OD: ASTM B88 (ASTM B88M), Type K (A), annealed.
  1. Fittings: ASME B16.26 cast copper.
  2. Joints: Flared.
  3. Push-to-Connect Fittings: Complying with UL 207.
  4. Mechanical Press Sealed Fittings: Double pressed type complying with UL 207 and ICC (IMC)-2018.
- C. Pipe Supports and Anchors:
  1. Provide hangers and supports that comply with MSS SP-58.
    - a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch (13 to 38 mm): Malleable iron adjustable swivel, split ring.
  3. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
  4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
  5. Wall Support for Pipe Sizes to 3 Inches (75 mm): Cast iron hook.
  6. Vertical Support: Steel riser clamp.
  7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
  8. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
  9. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.
  10. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
    - a. Bases: High density, UV tolerant, polypropylene or reinforced PVC.
    - b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
    - c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
    - d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
    - e. Height: Provide minimum clearance of 6 inches (150 mm) under pipe to top of roofing.

## 2.04 REFRIGERANT

- A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

## 2.05 MOISTURE AND LIQUID INDICATORS

- A. Indicators: Single port type, UL listed, with copper or brass body, flared or soldered ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F (93 degrees C) and maximum working pressure of 500 psi (3450 kPa).

## 2.06 VALVES

- A. Ball Valves:
  - 1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi (3450 kPa) and maximum temperature of 300 degrees F (149 degrees C).

## 2.07 STRAINERS

### 2.08 FILTER-DRIERS

- A. Performance:
  - 1. Flow Capacity - Liquid Line: \_\_\_\_ ton (\_\_\_\_ kW), minimum, rated in accordance with AHRI 710 (I-P) (AHRI 711 (SI)).
  - 2. Pressure Drop: 2 psi (14 kPa), maximum, when operating at full connected evaporator capacity.
  - 3. Design Working Pressure: 350 psi (2410 kPa), minimum.
- B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.
- C. Construction: UL listed.
  - 1. Connections: As specified for applicable pipe type.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install refrigeration specialties in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and avoid interference with use of space.
- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

### 3.02 SCHEDULES

- A. Hanger Spacing for Copper Tubing.
  - 1. 1/2 inch (13 mm), 5/8 inch (16 mm), and 7/8 inch (22 mm) OD: Maximum span, 5 feet (1500 mm); minimum rod size, 1/4 inch (6.3 mm).
  - 2. 1-1/8 inch (29 mm) OD: Maximum span, 6 feet (1800 mm); minimum rod size, 1/4 inch (6.3 mm).
  - 3. 1-3/8 inch (35 mm) OD: Maximum span, 7 feet (2100 mm); minimum rod size, 3/8 inch (9.5 mm).
  - 4. 1-5/8 inch (41 mm) OD: Maximum span, 8 feet (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
  - 5. 2-1/8 inch (54 mm) OD: Maximum span, 8 feet (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
  - 6. 3-1/8 inch (79 mm) OD: Maximum span, 10 feet (3.0 m); minimum rod size, 3/8 inch (9.5 mm).

**END OF SECTION**

**SECTION 233100  
HVAC DUCTS AND CASINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Metal ducts.
- B. Flexible ducts.

**1.02 RELATED REQUIREMENTS**

- A. Section 230130.51 - HVAC Air-Distribution System Cleaning: Post install duct cleaning.
- B. Section 233319 - Duct Silencers.
- C. Section 233700 - Air Outlets and Inlets: Fabric air distribution devices.

**1.03 REFERENCE STANDARDS**

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- E. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.
- F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- G. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

**PART 2 PRODUCTS**

**2.01 GENERAL REQUIREMENTS**

- A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.
- B. Provide metal duct unless otherwise indicated. Fibrous glass duct can be substituted at the Contractor's option.
- C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 233319.
- D. Duct Shape and Material in accordance with Allowed Static Pressure Range:
- E. Duct Sealing and Leakage in accordance with Static Pressure Class:
  - 1. Duct Pressure Class and Material for Common Mechanical Ventilation Applications:
    - a. Supply Air: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
    - b. Return and Relief Air: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
    - c. General Exhaust Air: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
- F. Duct Fabrication Requirements:
  - 1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
  - 2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
  - 3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
  - 4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.



5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

## 2.02 METAL DUCTS

- A. Material Requirements:
  1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Round Spiral Duct:
  1. Round spiral lock seam duct with galvanized steel outer wall.
- C. Connectors, Fittings, Sealants, and Miscellaneous:
  1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
  2. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
    - a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
    - b. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
  3. Gasket Tape:
    - a. Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle ring connections.
  4. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

## 2.03 FLEXIBLE DUCTS

- A. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form spiral helix.
  1. Insulation: R6 insulation with polyethylene vapor barrier film.
  2. Pressure Rating: 10 in-wc (2.50 kPa) positive and 5 in-wc (1.25 kPa) negative.
  3. Maximum Velocity: 5500 fpm (27.9 m/sec).
  4. Temperature Range: Minus 20 degrees F to 250 degrees F (Minus 28 degrees C to 121 degrees C).
- B. Acoustic Flexible Ducts: UL 181, Class 1, spunbond nylon, mechanically fastened and rolled using galvanized steel to form spiral helix.
  1. Inner Core: Spunbonded, nonwoven inner core.
  2. Pressure Rating: 6 in-wc (1.5 kPa) positive and 5 in-wc (1.25 kPa) negative.
  3. Maximum Velocity: 4000 fpm (20.3 m/sec).
  4. Temperature Range: Minus 20 degrees F to 250 degrees F (Minus 28 degrees C to 121 degrees C).
- C. Flexible Air Ducts:
  1. UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound spring steel wire.
  2. Pressure Rating: From 10 in-wc (2.5 kPa) positive to 1 in-wc (250 Pa) negative.
  3. Maximum Velocity: 4,000 fpm (20.3 m/s).
  4. Temperature Range: Minus 20 to 210 degrees F (Minus 28 to 99 degrees C).

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Comply with safety standards NFPA 90A and NFPA 90B.
- C. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- E. Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.
- F. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

**3.02 CLEANING**

- A. Clean thoroughly each duct system. See Section 230130.51.

**END OF SECTION**

**SECTION 233501  
DRYER-VENT EXHAUST COLLECTION SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Laundry exhaust systems.

**1.02 RELATED REQUIREMENTS**

- A. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

**1.03 REFERENCE STANDARDS**

- A. AMCA 99 - Standards Handbook; 2016.
- B. ANSI Z223.1 - National Fuel Gas Code; 2024.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 378 - Standard for Draft Equipment; Current Edition, Including All Revisions.
- E. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

**PART 2 PRODUCTS**

**2.01 GENERAL REQUIREMENTS**

- A. Regulatory Requirements:
  - 1. Comply with ANSI Z223.1.
  - 2. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**2.02 LAUNDRY EXHAUST SYSTEMS**

- A. Fabrication: Direct-drive, backward-curved fan enclosed in galvanized steel housing.
- B. Comply with AMCA 99, UL 378, and UL 705.
- C. Maximum Fan Temperature Rating: 480 degrees F (248 degrees C) of exhaust gas.
- D. Electrical Characteristics:
  - 1. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Coordinate installation of dampers and induced draft fans; see Section 260583.

**END OF SECTION**

**SECTION 233700  
AIR OUTLETS AND INLETS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Diffusers:
- B. Rectangular ceiling diffusers.
- C. Registers/grilles:
  - 1. Ceiling-mounted, exhaust and return register/grilles.
  - 2. Ceiling-mounted, supply register/grilles.
- D. Duct-mounted supply and return registers/louvers.
- E. Door grilles.
- F. Louvers:
- G. Goosenecks.

**1.02 REFERENCE STANDARDS**

- A. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

**PART 2 PRODUCTS**

**2.01 RECTANGULAR CEILING DIFFUSERS**

- A. Type: Provide rectangular and square formed adjustable, backpan stamped, core removable, and multi-louvered ceiling diffusers constructed to maintain 360 degree discharge air pattern with sectorizing baffles where indicated.
- B. Connections: Round.
- C. Frame: Provide surface mount, snap-in, inverted T-bar, and spline type. In plaster ceilings, provide plaster frame and ceiling frame.
- D. Fabrication: Steel with baked enamel finish.
- E. Accessories: Provide radial opposed blade, butterfly, and combination splitter volume control damper; removable core, sectorizing baffle, safety chain, wire guard, equalizing grid, operating rod extension, anti-smudging device, and gaskets for surface mounted diffusers with damper adjustable from diffuser face.

**2.02 DUCT-MOUNTED SUPPLY AND RETURN REGISTERS/LOUVERS**

- A. Type: Duct-mounted, rectangular register for round-spiral duct with adjustable pivot-ended blades, end caps, built-in volume damper, and dual cover flanges to lay flush on duct surface regardless of diameter. Performance to match manufacturer's catalog data.
- B. Material: 22 gauge, 0.0299 inch (0.76 mm).

**2.03 CEILING SUPPLY REGISTERS/GRILLES**

- A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, one-way deflection.
- B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting and gasket.

**2.04 CEILING EXHAUST AND RETURN REGISTERS/GRILLES**

- A. Type: Streamlined blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing, with blades set at 45 degrees, vertical face.
- B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting.
- C. Fabrication: Steel with 20 gauge, 0.0359 inch (0.91 mm) minimum frames and 22 gauge, 0.0299 inch (0.76 mm) minimum blades, steel and aluminum with 20 gauge, 0.0359 inch (0.91 mm) minimum frame, or aluminum extrusions, with factory baked enamel finish.

## 2.05 LOUVERS

- A. Type: 4 inch (100 mm) deep frame with blades on 45 degree slope with center baffle and return bend, heavy channel frame, 1/2 inch (13 mm) square mesh screen over intake or exhaust end.
- B. Fabrication: 16 gauge, 0.0598 inch (1.52 mm) thick galvanized steel thick galvanized steel welded assembly, with factory prime coat finish.
- C. Mounting: Furnish with interior flat flange for installation.

## 2.06 GOOSENECKS

- A. Fabricate in accordance with of minimum 18 gauge, 0.0598 inch (1.21 mm) galvanized steel.
- B. Mount on minimum 12 inch (300 mm) high curb base where size exceeds 9 by 9 inch (230 by 230 mm).

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

**END OF SECTION**

**SECTION 238129  
VARIABLE REFRIGERANT FLOW HVAC SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Air-source outdoor units.
- B. Refrigerant piping.
- C. Refrigerant branch units.
- D. Indoor units.

**1.02 RELATED REQUIREMENTS**

- A. Section 230529 - Hangers and Supports for HVAC Piping and Equipment.
- B. Section 230719 - HVAC Piping Insulation.
- C. Section 232300 - Refrigerant Piping.
- D. Section 284400 - Refrigerant Detection and Alarm.

**1.03 REFERENCE STANDARDS**

- A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.
- B. AHRI 1230 - Performance Rating of Variable Refrigerant Flow (VRF) Multi-Split Air-Conditioning and Heat Pump Equipment; 2021.
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2022, with Addendum (2024).
- E. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2022, with Errata (2024).
- F. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. ITS (DIR) - Directory of Listed Products; Current Edition.
- H. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Pre-Bid Submittals: For proposed substitute systems/products, as defined in PART 2, and alternate systems/products, as defined above, proposer shall submit all data described in this article, under the terms given for substitutions stated in PART 2.
- C. Product Data: Submit manufacturer's standard data sheets showing the following for each item of equipment, marked to correlate to equipment item markings indicated in Contract Documents:
  - 1. Outdoor Units:
    - a. Refrigerant Type and Size of Charge.
    - b. Output and Input Cooling Capacity: Btu/h (W).
    - c. Output and Input Heating Capacity: Btu/h (W).
    - d. Operating Temperature Range, Cooling and Heating.
    - e. Fan Capacity: Flow in cfm (L/sec) with respective fan curves.

- f. External Static Pressure (ESP): In-wc (Pa).
  - g. Sound Pressure Level: dB(A).
  - h. Electrical Data: Complete including motor size.
  - i. Maximum number of indoor units that can be served.
  - j. Maximum refrigerant piping run from outdoor unit to indoor unit(s).
  - k. Maximum height difference between outdoor unit to Indoor unit(s), both above and below.
2. Indoor Units:
    - a. Output and Input Cooling Capacity: Btu/h (W).
    - b. Output and Input Heating Capacity: Btu/h (W).
    - c. Fan Capacity: Flow in cfm (L/sec) with respective fan curves.
    - d. External Static Pressure (ESP): In-wc (Pa).
    - e. Electrical Data: Complete including motor size.
    - f. Maximum Lift of Built-in Condensate Pump.
  3. Control Panels: Complete data of controllers, input-output points, and zones.
- D. Shop Drawings: Installation drawings custom-made for this project; include as-designed HVAC layouts, locations of equipment items, refrigerant piping sizes and locations, condensate piping sizes and locations, remote sensing devices, control components, electrical connections, control wiring connections. Include:
1. Detailed piping diagrams, with branch balancing devices.
  2. Condensate piping routing, size, and pump connections.
  3. Detailed power wiring diagrams.
  4. Detailed control wiring diagrams.
  5. Locations of required access through fixed construction.
  6. Drawings required by manufacturer.
- E. Design Data:
1. Provide design calculations showing that system will achieve performance specified.
  2. Provide design data with respective calculations for respective climate zone in accordance with ASHRAE Std 90.1 I-P, ASHRAE Std 15, and ASHRAE Std 34.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Mitsubishi Electric Trane HVAC US, LLC; BASIS OF DESIGN IS TRANE/ MITSU, ALTERNATES SHALL BE APPROVED BY ENGINEER OF RECORD AGE FOLLOWING REVIEW OF DOCUMENTATION PROVIDED BY CONTRACTOR.+ : [www.metahvac.com/#sle](http://www.metahvac.com/#sle).
- B. Substitutions: Systems designed and manufactured by other manufacturers will be considered by Owner under the terms described for substitutions with the following exceptions:
  1. Substitutions: See Section 016000 - Product Requirements.
  2. Substitution requests will be considered only if received at least 10 days prior to the bid date.
  3. Substitution requests will be considered only if submitted data meets or exceed requirements listed in this section.
  4. Contractor (not equipment supplier) shall certify that the use of the substitute system and equipment will not require changes to other work or re-design by ENGINEER OF RECORD AGE.
  5. Contractor or HVAC subcontractor shall certify that the substitute system will achieve the performance specified.
  6. Do not assume substitution has been accepted until formal written notice has been issued by ENGINEER OF RECORD AGE.

### **2.02 VARIABLE REFRIGERANT FLOW SYSTEM**

- A. Minimum System Requirements:
  1. System Testing, Capacity Rating, and Performance:

- a. AHRI 1230 when cooling capacity is equal or greater than 65,000 Btu/h (19 kWh).
- b. AHRI 210/240 when cooling capacity is below 65,000 Btu/h (19 kWh).
2. Safety Certification: Bear UL 1995 tested and ITS (DIR) listed certification label.
3. Outdoor Units: Furnish installation and surface support hardware products in accordance with ASCE 7 for wind restraint.
4. Cooling Mode Interior Performance:
  - a. Daytime Setpoint: 68 degrees F (20 degrees C), plus or minus 2 degrees F (1 degrees C).
  - b. Setpoint Range: 57 degrees F (14 degrees C) to 77 degrees F (25 degrees C).
  - c. Night Setback: 78 degrees F (25 degrees C).
  - d. Interior Relative Humidity: 20 percent, maximum.
5. Heating Mode Interior Performance:
  - a. Setpoint: 68 degrees F (20 degrees C), plus or minus 2 degrees F (2 degrees C).
  - b. Setpoint Range: 59 to 80 degrees F (15 to 27 degrees C).
  - c. Night Setback: 60 degrees F (15 degrees C).
  - d. Minimum Interior Relative Humidity: 10 percent RH.

### 2.03 AIR-SOURCE OUTDOOR UNITS

- A. Manufacturers:
  1. Air Conditioner, Cooling Outdoor Units:
    - a. Mitsubishi Electric Trane HVAC US, LLC; \_\_\_\_\_: [www.metahvac.com/#sle](http://www.metahvac.com/#sle).
- B. Air Conditioning Type:
  1. DX refrigeration unit piped to one or more compatible indoor units either directly or indirectly through one or more intermediate refrigeration branch units.
- C. Unit Cabinet:
  1. Capable of being installed with wiring and piping to the left, right, rear or bottom.
  2. Designed to allow side-by-side installation with minimum spacing and vibration isolation.
  3. Weatherproof and corrosion resistant; rust-proofed mild steel panels coated with baked enamel finish.
  4. Sound Pressure Level: 55 dB measured at 3 feet (one meter) from front of unit.
- D. Heat Sink Side:
  1. Condenser Fans:
    - a. Provide minimum of 2 fans for each condenser within the outdoor unit.
    - b. Minimum External Static Pressure: Factory set at 0.12 in-wc (30 Pa).
    - c. Fan Type: Vertical discharging, direct-driven propeller type with variable speed operation using DC-controlled ECM motors mechanically connected using permanently lubricated bearings having whole assembly protected with fan guards.
  2. Condenser Coils:
    - a. Hi-X seamless copper tubes expanded into aluminum fins to form mechanical bond; waffle louver fin and rifled bore tube design to ensure high efficiency performance.
- E. Refrigeration Side:
  1. Factory assembled and wired with instrumentation, switches, and controller(s) to handle unit specifics with direct coordination of remote controller(s) from indoor unit(s).
  2. Refrigeration Circuit: ECM driven dual scroll compressors, fans, condenser heat sink coil, expansion valves, solenoid valves, distribution headers, capillaries, filters, shutoff valves, oil separators, service ports, and refrigerant regulator.
  3. Refrigerant: R-410a factory charged. Controller to alarm when charge is below capacity.
  4. Variable Volume Control: Modulate compressed refrigerant capacity automatically to maintain constant suction and condensing pressures under varying refrigerant volume required to handle remote loads. Include defrost control.
  5. Provide refrigerant subcooling to ensure the liquid refrigerant does not flash when supplying to use indoor units.



6. Capable of heating operation at low end of operating range as specified, without additional low ambient controls or auxiliary heat source; during heating operation, reverse cycle, oil return, or defrost is not permitted due to potential reduction in space temperature.
  7. Power Failure Mode: Automatically restarts operation after power failure without loss of programmed settings.
  8. Safety Devices: High pressure sensor with cut-out switch, low pressure sensor with cut-out switch, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, overcurrent protection for the inverter and antirecycling timers.
  9. Oil Recovery Cycle: Automatic, occurring 2 hours after start of operation and then every 8 hours of operation; maintain continuous heating during oil return operation.
- F. Local Controls:
- G. Power:
1. Electrical Requirement: 208 to 230 VAC, 3-phase, 60 Hz.
  2. Outdoor Mounted: Provide fused NEMA 250 Type 4X disconnect switch.

#### **2.04 REFRIGERANT PIPING**

- A. Two-Pipe Run: Provide low-pressure vapor and high-pressure vapor gas pipes for each indoor unit selected for seasonal heating or cooling service.
- B. Three-Pipe Run: Provide low-pressure vapor, high-pressure vapor gas, and liquid pipes for each indoor unit selected for off-season heating and cooling changeover service.
- C. Refrigerant Flow Balancing: Provide refrigerant piping joints and headers specifically designed to ensure proper refrigerant balance and flow for optimum system capacity and performance; T-style joints are prohibited.

#### **2.05 REFRIGERANT BRANCH UNITS**

- A. Outdoor unit interface to handle two or more indoor units required to do automatic off-season heating and cooling changeover.
- B. Concealed box consisting internally-piped refrigeration loops, subcooling heat exchanger, and other devices coordinated by electronic valves to facilitate off-season load management between outdoor and indoor units.
- C. Minimum Requirements:
  1. Control direction of refrigerant flow using electronic expansion valves; use of solenoid valves for changeover and pressure equalization is not permitted due to refrigerant noise; use of multi-port branch selector boxes is not permitted unless spare ports are provided for redundancy.
  2. Provide one electronic expansion valve for each downstream indoor unit served except when multiple indoor units are connected, provide balancing joints in downstream piping to keep total capacity within branch unit capacity.
  3. Energize subcooling heat exchanger during simultaneous heating and cooling service.
  4. Casing: Galvanized steel sheet with flame and heat resistant foamed polyethylene sound and thermal insulation.
  5. Refrigerant Connections: Braze type.
  6. Condensate Drainage: Provide unit that does not require condensate drainage.

#### **2.06 INDOOR UNITS**

- A. Minimum Unit Requirements:
  1. DX Evaporator Coil:
    - a. Copper tubes expanded into aluminum fins to form a mechanical bond; waffle louver fin and high heat exchange, rifled bore tube design; factory tested.
    - b. 2-, 3-, or 4-row cross fin design with 14 to 17 fins per inch and flare end-connections.
    - c. Provide thermistor on liquid and gas lines wired into local controller.
    - d. Refrigerant circuits factory-charged with dehydrated air for field charging.

2. Fan Section:
    - a. Variable or three-speed ECM fan with automatic airflow adjustment; external static pressure selectable during commissioning.
    - b. Thermally protected, direct-drive motor with statically and dynamically balanced fan blades.
    - c. Minimum-adjustable external static pressure 0.32 in-wc (80 Pa); provide for mounting of field-installed ducts.
  3. Local Unit Controls:
    - a. Temperature Control: Return air control using thermistor tied to computerized Proportional-Integral-Derivative (PID) control of superheat.
    - b. Temperature Zones:
      - 1) Single Indoor Unit: Set served space(s) as the local temperature zone.
      - 2) Multiple Indoor Units: For large zones, group and coordinate related indoor units with served spaces as the local temperature zone with each indoor unit as sub-zone.
  4. Return Air Filter:
  5. Condensate:
    - a. Built-in condensate drain pan with PVC drain connection for drainage.
    - b. Units With Built-In Condensate Pumps: Provide condensate safety shutoff and alarm.
    - c. Units Without Built-In Condensate Pump: Provide built-in condensate float switch and wiring connections.
  6. Cabinet Insulation: Sound absorbing foamed polystyrene and polyethylene insulation.
- B. Ceiling-Concealed Ducted Indoor Units:
1. Type: Ducted unit with DX coil, tubed drain pan, and built-in controls with thermostat remotely coordinated by outdoor air unit to maintain local air temperature setpoint.
  2. Ducted horizontal discharge and side or back-end return; galvanized steel cabinet.
  3. Variable or three-speed ECM fan with automatic airflow adjustment; external static pressure selectable during commissioning.
  4. Return Air Filter: Manufacturer's standard.
  5. Sound Pressure: Measured at low speed at 5 feet (1.5 m) below unit.
  6. Provide external static pressure switch adjustable for high efficiency filter operation
  7. Condensate Pump: Built-in, with lift of 9 inches (229 mm), minimum.
  8. Switchbox accessible from side or bottom.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install refrigerant piping in accordance with equipment manufacturer's instructions.
- C. Perform wiring in accordance with NFPA 70, National Electric Code (NEC).
- D. Coordinate with installers of systems and equipment connecting to this system.
- E. Refrigerant Piping: See Section 232300 with Section 230719 for insulation, and Section 230529 for hangers and supports unless following specific manufacturer recommendations.
- F. Connect indoor units to condensate piping.

### **3.02 SYSTEM STARTUP**

- A. Prepare and start equipment and system in accordance with manufacturer's instructions and recommendations.
- B. Adjust equipment for proper operation within manufacturer's published tolerances.

### **3.03 MAINTENANCE**

- A. Provide a separate maintenance contract for specified maintenance service.

- B. Provide a separate maintenance contract for the service and maintenance of \_\_\_\_\_ for \_\_\_\_\_ years from Date of Substantial Completion.

**END OF SECTION**

**SECTION 260519**  
**LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Single conductor building wire.
- B. Metal-clad cable.
- C. Wiring connectors.
- D. Electrical tape.
- E. Heat shrink tubing.
- F. Wire pulling lubricant.
- G. Cable ties.

**1.02 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.
- B. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- H. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.
- I. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.
- J. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- M. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- N. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.
- O. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- P. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- Q. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

- R. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- S. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
  - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### 1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

### PART 2 PRODUCTS

#### 2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Service entrance cable is not permitted.
- F. Armored cable is not permitted.
- G. Metal-clad cable is permitted only as follows:
  - 1. Where not otherwise restricted, may be used:
    - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
      - 1) Maximum Length: 6 feet (1.8 m).
    - b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
  - 2. In addition to other applicable restrictions, may not be used:
    - a. Unless approved by Owner.
    - b. Where not approved for use by the authority having jurisdiction.
    - c. Where exposed to damage.
    - d. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.
- H. Manufactured wiring systems are not permitted.

#### 2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

- G. Conductors for Grounding and Bonding: Also comply with Section 260526.
- H. Conductor Material:
  - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
  - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
  - 3. Tinned Copper Conductors: Comply with ASTM B33.
- I. Minimum Conductor Size:
  - 1. Branch Circuits: 12 AWG.
    - a. Exceptions:
      - 1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
      - 2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
  - 2. Control Circuits: 14 AWG.
- J. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- K. Conductor Color Coding:
  - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
  - 2. Color Coding Method: Integrally colored insulation.
    - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
  - 3. Color Code:
    - a. 208Y/120 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Phase C: Blue.
      - 4) Neutral/Grounded: White.
    - b. 240/120 V, 1 Phase, 3 Wire System:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Neutral/Grounded: White.
    - c. Equipment Ground, All Systems: Green.
    - d. Travelers for 3-Way and 4-Way Switching: Pink.
    - e. For control circuits, comply with manufacturer's recommended color code.

### 2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
  - 1. Feeders and Branch Circuits:
    - a. Size 10 AWG and Smaller: Solid.
    - b. Size 8 AWG and Larger: Stranded.
  - 2. Control Circuits: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
  - 1. Copper Building Wire: Type THHN/THWN-2 or XHHW-2.

### 2.04 METAL-CLAD CABLE

- A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- B. Conductor Stranding:

1. Size 10 AWG and Smaller: Solid.
  2. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation: Type THHN/THWN-2.
- E. Provide dedicated neutral conductor for each phase conductor.
- F. Grounding: Full-size integral equipment grounding conductor.
- G. Armor: Steel, interlocked tape.
- H. Provide PVC jacket applied over cable armor.

## **2.05 WIRING CONNECTORS**

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 260526.
- C. Wiring Connectors for Splices and Taps:
1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
  2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
  2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
  3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
  4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
  5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
  6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
  7. Conductors for Control Circuits: Use crimped terminals for all connections.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
- J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

## **2.06 ACCESSORIES**

- A. Electrical Tape:
1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
  3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
  4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
  5. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil (0.18 mm); suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
  6. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
- C. Wire Pulling Lubricant:
1. Listed and labeled as complying with UL 267.
  2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
  3. Suitable for use at installation temperature.
- D. Cable Ties: Material and tensile strength rating suitable for application.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 PREPARATION**

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

#### **3.03 INSTALLATION**

- A. Circuiting Requirements:
  1. Unless dimensioned, circuit routing indicated is diagrammatic.
  2. When circuit destination is indicated without specific routing, determine exact routing required.
  3. Arrange circuiting to minimize splices.
  4. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
  5. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
  6. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:
    - a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
    - b. Increase size of conductors as required to account for ampacity derating.



- c. Size raceways, boxes, etc. to accommodate conductors.
- 7. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install metal-clad cable (Type MC) in accordance with NECA 120.
- E. Installation in Raceway:
  - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
  - 2. Pull all conductors and cables together into raceway at same time.
  - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
  - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
  - 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
- H. Terminate cables using suitable fittings.
  - 1. Metal-Clad Cable (Type MC):
    - a. Use listed fittings.
    - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- I. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- L. Make wiring connections using specified wiring connectors.
  - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
  - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  - 3. Do not remove conductor strands to facilitate insertion into connector.
  - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
  - 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  - 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
    - b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
  2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
    - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
  3. Wet Locations: Use heat shrink tubing.
- N. Insulate ends of spare conductors using vinyl insulating electrical tape.
- O. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- P. Identify conductors and cables in accordance with Section 260553.
- Q. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- R. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

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

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is only required for services and feeders. The resistance test for parallel conductors listed as optional is not required.
  1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

**END OF SECTION**

**SECTION 260526  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground rod electrodes.

**1.02 RELATED REQUIREMENTS**

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.
- C. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Verify exact locations of underground metal water service pipe entrances to building.
  - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
  - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

**1.05 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

**PART 2 PRODUCTS**

**2.01 GROUNDING AND BONDING REQUIREMENTS**

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- D. Grounding Electrode System:
  - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
    - a. Provide continuous grounding electrode conductors without splice or joint.

- b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
    2. Metal Underground Water Pipe(s):
      - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet (3.0 m) at an accessible location not more than 5 feet (1.5 m) from the point of entrance to the building.
      - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
      - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
    3. Metal In-Ground Support Structure:
      - a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
    4. Concrete-Encased Electrode:
      - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet (6.0 m) of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
    5. Ground Rod Electrode(s):
      - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
      - b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
  - E. Service-Supplied System Grounding:
    1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
    2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.
  - F. Bonding and Equipment Grounding:
    1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
    2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
    3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
    4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
    5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
    6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
    7. Provide bonding for interior metal air ducts.
    8. Provide bonding for metal building frame.

## 2.02 GROUNDING AND BONDING COMPONENTS

### A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
  1. Use insulated copper conductors unless otherwise indicated.
    - a. Exceptions:
      - 1) Use bare copper conductors where installed underground in direct contact with earth.
      - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
  1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
  2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
  3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
- D. Ground Rod Electrodes:
  1. Comply with NEMA GR 1.
  2. Material: Copper-bonded (copper-clad) steel.
  3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
  1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches (150 mm) below finished grade.
- D. Make grounding and bonding connections using specified connectors.
  1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
  2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
  3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
  4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- E. Identify grounding and bonding system components in accordance with Section 260553.

**3.03 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

**END OF SECTION**

**SECTION 260529  
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 RELATED REQUIREMENTS**

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- C. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- D. Section 265100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

**1.02 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
  - 2. Coordinate work to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
  - 4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
  - 5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 033000.

**1.04 QUALITY ASSURANCE**

- A. Maintain at project site one copy of each referenced document that prescribes execution requirements.
- B. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

**PART 2 PRODUCTS**

**2.01 SUPPORT AND ATTACHMENT COMPONENTS**

- A. General Requirements:

1. Comply with the following. Where requirements differ, comply with most stringent.
  - a. NFPA 70.
  - b. Applicable building code.
  - c. Requirements of authorities having jurisdiction.
2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of 2. Include consideration for vibration, equipment operation, and shock loads where applicable.
5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
  - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
  - b. Outdoor and Damp or Wet Indoor Locations: Use stainless steel or approved equivalent unless otherwise indicated.
  - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
  - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
  1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
  2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
- D. Metal Channel/Strut Framing Systems:
  1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
  2. Comply with MFMA-4.
- E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
  1. Minimum Size, Unless Otherwise Indicated or Required:
    - a. Equipment Supports: 1/2-inch (13 mm) diameter.
    - b. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch (6 mm) diameter.
    - c. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch (10 mm) diameter.
    - d. Trapeze Support for Multiple Conduits: 3/8-inch (10 mm) diameter.
    - e. Outlet Boxes: 1/4-inch (6 mm) diameter.
    - f. Luminaires: 1/4-inch (6 mm) diameter.
- F. Anchors and Fasteners:
  1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
  2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
  3. Hollow Stud Walls: Use toggle bolts.
  4. Steel: Use beam clamps, machine bolts, or welded threaded studs.
  5. Sheet Metal: Use sheet metal screws.
  6. Powder-actuated fasteners are not permitted.
  7. Hammer-driven anchors and fasteners are not permitted.
  8. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.



- a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
- b. Comply with MFMA-4.
- c. Channel Material: Use galvanized steel.
- d. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm) minimum base metal thickness.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install hangers and supports in accordance with NECA 1.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
  1. Use supports assembled from metal channel/strut to support equipment as required.
  2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Conduit Support and Attachment: See Section 260533.13 for additional requirements.
- I. Box Support and Attachment: See Section 260533.16 for additional requirements.
- J. Interior Luminaire Support and Attachment: See Section 265100 for additional requirements.
- K. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- L. Secure fasteners in accordance with manufacturer's recommended torque settings.
- M. Remove temporary supports.

#### **3.03 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

**END OF SECTION**

**SECTION 260533.13  
CONDUIT FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**4.01 SECTION INCLUDES**

- A. Galvanized steel rigid metal conduit (RMC).
- B. Stainless steel rigid metal conduit (RMC).
- C. Galvanized steel intermediate metal conduit (IMC).
- D. Stainless steel intermediate metal conduit (IMC).
- E. PVC-coated galvanized steel rigid metal conduit (RMC).
- F. Flexible metal conduit (FMC).
- G. Liquidtight flexible metal conduit (LFMC).
- H. Galvanized steel electrical metallic tubing (EMT).
- I. Stainless steel electrical metallic tubing (EMT).
- J. Rigid polyvinyl chloride (PVC) conduit.
- K. Liquidtight flexible nonmetallic conduit (LFNC).

**4.02 RELATED REQUIREMENTS**

- A. Section 033000 - Cast-in-Place Concrete: Concrete encasement of conduits.
- B. Section 078400 - Firestopping.
- C. Section 260526 - Grounding and Bonding for Electrical Systems.
  - 1. Includes additional requirements for fittings for grounding and bonding.
- D. Section 260529 - Hangers and Supports for Electrical Systems.
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.
- G. Section 312316 - Excavation.
- H. Section 312323 - Fill: Bedding and backfilling.

**4.03 REFERENCE STANDARDS**

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.
- I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
- J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

- L. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- M. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- N. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.
- O. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.
- P. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- Q. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- R. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- S. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- T. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel; Current Edition, Including All Revisions.
- U. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
- V. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.
- W. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

#### **4.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
  - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
  - 4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
  - 5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

#### **4.05 QUALITY ASSURANCE**

- A. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions and shop drawings.
- B. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **4.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **5.01 CONDUIT APPLICATIONS**

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

- C. Underground:
  - 1. Under Slab on Grade: Use PVC-coated galvanized steel rigid metal conduit (RMC) or rigid PVC conduit.
  - 2. Exterior, Direct-Buried: Use PVC-coated galvanized steel rigid metal conduit, galvanized steel electrical metallic tubing (EMT), or rigid PVC conduit.
  - 3. Exterior, Embedded Within Concrete: Use PVC-coated galvanized steel rigid metal conduit (RMC) or rigid PVC conduit.
  - 4. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), PVC-coated galvanized steel rigid metal conduit (RMC), or schedule 80 rigid PVC conduit where emerging from underground.
  - 5. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows, stainless steel rigid metal conduit (RMC) elbows, PVC-coated galvanized steel rigid metal conduit (RMC) elbows, or concrete-encased PVC elbows for bends.
- D. Embedded Within Concrete:
  - 1. Within Slab on Grade: Not permitted.
  - 2. Within Slab Above Ground: Not permitted.
  - 3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC) or stainless steel rigid metal conduit (RMC) where emerging from concrete.
  - 4. Where aluminum rigid metal conduit (RMC) and aluminum electrical metallic tubing (EMT) is installed in concrete, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.
- E. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- F. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC) or stainless steel rigid metal conduit (RMC).
  - 1. Locations subject to physical damage include, but are not limited to:
    - a. Where exposed below 8 feet (2.4 m), except within electrical and communication rooms or closets.
    - b. Where exposed below 20 feet (6.1 m) in warehouse areas.
- J. Exposed, Interior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), or stainless steel intermediate metal conduit (IMC).
- K. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- L. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), or galvanized steel intermediate metal conduit (IMC).

1. Exterior locations subject to severe physical damage include, but are not limited to:
  - a. Where exposed to vehicular traffic below 20 feet (6.1 m).
- M. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- N. Corrosive Locations Above Ground: Use stainless steel rigid metal conduit (RMC) or stainless steel electrical metallic tubing (EMT).
  1. Corrosive locations include, but are not limited to:
    - a. Marine environments.
- O. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).
  1. Maximum Length: 6 feet (1.8 m).
- P. Flexible Connections to Vibrating Equipment:
  1. Dry Locations: Use flexible metal conduit (FMC).
  2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
  3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
  4. Vibrating equipment includes, but is not limited to:
    - a. Transformers.
    - b. Motors.

## 5.02 CONDUIT - GENERAL REQUIREMENTS

- A. Comply with NFPA 70.
- B. Electrical Service Conduits: See Section 262100 for additional requirements.
- C. Fittings for Grounding and Bonding: See Section 260526 for additional requirements.
- D. Provide conduit, fittings, supports, and accessories required for complete raceway system.
- E. Provide products listed, classified, and labeled as suitable for purpose intended.
- F. Minimum Conduit Size, Unless Otherwise Indicated:
  1. Branch Circuits: 3/4-inch (21 mm) trade size.
  2. Branch Circuit Homeruns: 3/4-inch (21 mm) trade size.
  3. Control Circuits: 1/2-inch (16 mm) trade size.
  4. Flexible Connections to Luminaires: 3/8-inch (12 mm) trade size.
  5. Underground, Interior: 3/4-inch (21 mm) trade size.
  6. Underground, Exterior: 1-inch (27 mm) trade size.
- G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

## 5.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
  1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
  2. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.
  3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

## 5.04 STAINLESS STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC stainless steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6A.
- B. Fittings:

1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
2. Material: Use stainless steel with corrosion resistance equivalent to conduit.
3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

**5.05 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)**

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
  1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
  2. Material: Use steel or malleable iron.
  3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

**5.06 STAINLESS STEEL INTERMEDIATE METAL CONDUIT (IMC)**

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
  1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.

**5.07 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
- B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch (1.02 mm).
- C. PVC-Coated Boxes and Fittings:
  1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
  2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
  3. Material: Use steel or malleable iron.
  4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch (1.02 mm).
- D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch (0.38 mm).

**5.08 FLEXIBLE METAL CONDUIT (FMC)**

- A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.
- B. Fittings:
  1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.

**5.09 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)**

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
  1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel or malleable iron.
  - a. Do not use die cast zinc fittings.

#### **5.10 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)**

- A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
  1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.
  3. Connectors and Couplings: Use compression/gland or set-screw type.
    - a. Do not use indenter type connectors and couplings.
  4. Damp or Wet Locations, Where Permitted: Use fittings listed for use in wet locations.

#### **5.11 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)**

- A. Description: NFPA 70, Type EMT stainless steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797A.
  1. Material: Type 304 or 316 stainless steel.
- B. Fittings:
  1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Connectors and Couplings: Use compression/gland or set-screw type.
  3. Damp or Wet Locations, Where Permitted: Use fittings listed for use in wet locations.

#### **5.12 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT**

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- B. Fittings:
  1. Manufacturer: Same as manufacturer of conduit to be connected.
  2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

#### **5.13 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)**

- A. Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660.
- B. Fittings:
  1. Manufacturer: Same as manufacturer of conduit to be connected.
  2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for type of conduit to be connected.

#### **5.14 ACCESSORIES**

- A. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.
- B. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- C. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf (5.6 kN).
- D. Foam Conduit Sealant:
  1. Removable, two-part, closed-cell foam, specifically designed for sealing conduit openings against water, moisture, gases, and dust.

2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
  3. Rated to hold minimum of 10 ft (3.0 m) water head pressure.
- E. Sealing Systems for Concrete Penetrations:
1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
  2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.
- F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.

### **PART 3 EXECUTION**

#### **6.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### **6.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in accordance with NECA 1.
- C. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.
- D. Intermediate Metal Conduit (IMC): Install in accordance with NECA 101.
- E. PVC-Coated Galvanized Steel Rigid Metal Conduit (RMC): Install using only tools approved by manufacturer.
- F. Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.
- G. Liquidtight Flexible Nonmetallic Conduit (LFNC): Install in accordance with NECA 111.
- H. Conduit Routing:
  1. Unless dimensioned, conduit routing indicated is diagrammatic.
  2. When conduit destination is indicated without specific routing, determine exact routing required.
  3. Conceal conduits unless specifically indicated to be exposed.
  4. Conduits in the following areas may be exposed, unless otherwise indicated:
    - a. Electrical rooms.
    - b. Mechanical equipment rooms.
    - c. Within joists in areas with no ceiling.
  5. Unless otherwise approved, do not route exposed conduits:
    - a. Across floors.
    - b. Across roofs.
    - c. Across top of parapet walls.
    - d. Across building exterior surfaces.
  6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
  7. Arrange conduit to maintain adequate headroom, clearances, and access.
  8. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
  9. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
  10. Route conduits above water and drain piping where possible.



11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
  12. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
  13. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
    - a. Heaters.
    - b. Hot water piping.
    - c. Flues.
  14. Group parallel conduits in same area on common rack.
- I. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 260529.
  2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
  3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
  4. Use conduit strap to support single surface-mounted conduit.
    - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
  5. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
  6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
  7. Use of spring steel conduit clips for support of conduits is not permitted.
  8. Use of wire for support of conduits is not permitted.
  9. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.
- J. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
  2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
  3. Use suitable adapters where required to transition from one type of conduit to another.
  4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
  5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
  6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
  7. Secure joints and connections to provide mechanical strength and electrical continuity.
- K. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
  2. Make penetrations perpendicular to surfaces unless otherwise indicated.
  3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
  4. Conceal bends for conduit risers emerging above ground.
  5. Provide suitable sealing system where conduits penetrate exterior wall below grade.
  6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
  7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and

- maintain roof warranty.
8. Provide metal escutcheon plates for conduit penetrations exposed to public view.
  9. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.
- L. Underground Installation:
1. Provide trenching and backfilling; see Section 312316 and Section 312323.
  2. Minimum Cover, Unless Otherwise Indicated or Required:
    - a. Underground, Exterior: 24 inches (610 mm).
    - b. Under Slab on Grade: 12 inches (300 mm) to bottom of slab.
  3. Provide underground warning tape along entire conduit length for service entrance where not concrete-encased; see Section 260553.
- M. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide minimum concrete cover of 3 inches (76 mm) on all sides unless otherwise indicated; see Section 033000.
- N. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
  2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
  3. Where conduits are subject to earth movement by settlement or frost.
- O. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
    - a. Where conduits enter building from outside.
    - b. Where service conduits enter building from underground distribution system.
    - c. Where conduits enter building from underground.
    - d. Where conduits may transport moisture to contact live parts.
  2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
    - a. Where conduits pass from outdoors into conditioned interior spaces.
    - b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- P. Provide grounding and bonding; see Section 260526.

### 6.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- D. Correct deficiencies and replace damaged or defective conduits.

### 6.04 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

### 6.05 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

**END OF SECTION**

**SECTION 260533.16**  
**BOXES FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).
- C. Underground boxes/enclosures.

**1.02 RELATED REQUIREMENTS**

- A. Section 033000 - Cast-in-Place Concrete.
- B. Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260533.13 - Conduit for Electrical Systems:
  - 1. Conduit bodies and other fittings.
  - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 262726 - Wiring Devices:
  - 1. Wall plates.
  - 2. Additional requirements for locating boxes for wiring devices.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. SCTE 77 - Specifications for Underground Enclosure Integrity; 2023.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
  1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.

#### 1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### PART 2 PRODUCTS

#### 2.01 BOXES

- A. General Requirements:
  1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
  2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  3. Provide products listed, classified, and labeled as suitable for the purpose intended.
  4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
  5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
  1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
  3. Use suitable concrete type boxes where flush-mounted in concrete.
  4. Use suitable masonry type boxes where flush-mounted in masonry walls.
  5. Use raised covers suitable for the type of wall construction and device configuration where required.
  6. Use shallow boxes where required by the type of wall construction.
  7. Do not use "through-wall" boxes designed for access from both sides of wall.
  8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.

9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
  10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
  11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
  12. Wall Plates: Comply with Section 262726.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    - a. Indoor Clean, Dry Locations: Type 1, painted steel.
    - b. Outdoor Locations: Type 3R, painted steel.
  3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
    - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
    - b. Boxes 6 square feet (0.56 sq m) and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
  4. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
- D. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
  2. Size: As indicated on drawings.
  3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches (300 mm).
  4. Applications:
    - a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.
    - b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 15 load rating.
    - c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
  5. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
    - a. Combination fiberglass/polymer concrete boxes/enclosures are not acceptable. Use all-polymer concrete boxes/enclosures.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

- D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- F. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- G. Box Locations:
  - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.
  - 2. Unless dimensioned, box locations indicated are approximate.
  - 3. Locate boxes as required for devices installed under other sections or by others.
    - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.
  - 4. Locate boxes so that wall plates do not span different building finishes.
  - 5. Locate boxes so that wall plates do not cross masonry joints.
  - 6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
  - 7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
  - 8. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
  - 9. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.
  - 10. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
    - a. Concealed above accessible suspended ceilings.
    - b. Within joists in areas with no ceiling.
    - c. Electrical rooms.
    - d. Mechanical equipment rooms.
- H. Box Supports:
  - 1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
  - 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
  - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
  - 4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
- I. Install boxes plumb and level.
- J. Flush-Mounted Boxes:
  - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
  - 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
  - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- K. Install boxes as required to preserve insulation integrity.
- L. Underground Boxes/Enclosures:
  - 1. Install enclosure on gravel base, minimum 6 inches (150 mm) deep.

2. Flush-mount enclosures located in concrete or paved areas.
  3. Mount enclosures located in landscaped areas with top at 1 inch (25 mm) above finished grade.
  4. Provide cast-in-place concrete collar constructed in accordance with Section 033000, minimum 10 inches wide by 12 inches deep (250 mm wide by 300 mm deep), around enclosures that are not located in concrete areas.
  5. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
- M. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- N. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- O. Close unused box openings.
- P. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- Q. Provide grounding and bonding in accordance with Section 260526.
- R. Identify boxes in accordance with Section 260553.

**3.03 CLEANING**

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

**3.04 PROTECTION**

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

**END OF SECTION**

**SECTION 260553  
IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**4.01 SECTION INCLUDES**

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Underground warning tape.
- E. Warning signs and labels.

**4.02 RELATED REQUIREMENTS**

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- B. Section: Device and wallplate finishes; factory pre-marked wallplates.

**4.03 REFERENCE STANDARDS**

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.
- C. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

**4.04 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

**4.05 FIELD CONDITIONS**

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

**PART 2 PRODUCTS**

**5.01 IDENTIFICATION REQUIREMENTS**

- A. Identification for Equipment:
  - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    - a. Panelboards:
      - 1) Identify ampere rating.
      - 2) Identify power source and circuit number. Include location when not within sight of equipment.
      - 3) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
      - 4) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
  - 2. Service Equipment:
    - a. Use identification nameplate to identify each service disconnecting means.
    - b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
  - 3. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
  - 4. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.



5. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
  6. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
  7. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
    - a. Service equipment.
    - b. Industrial control panels.
    - c. Motor control centers.
    - d. Elevator control panels.
    - e. Industrial machinery.
  8. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
    - a. Minimum Size: 3.5 by 5 inches (89 mm by 127 mm).
    - b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
    - c. Service Equipment: Include the following information in accordance with NFPA 70.
      - 1) Nominal system voltage.
      - 2) Available fault current.
      - 3) Date label applied.
  9. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
- B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
  2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
  3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
    - a. Within boxes when more than one circuit is present.
- C. Identification for Boxes:
1. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
    - a. For exposed boxes in public areas, use only identification labels.
- D. Identification for Devices:
1. Wiring Device and Wallplate Finishes: Comply with Section 262726.
  2. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
    - a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.
  3. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
- E. Identification for Luminaires:

1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

## 5.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
  1. Materials:
    - a. Indoor Clean, Dry Locations: Use plastic nameplates.
    - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
  2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
    - a. Exception: Provide minimum thickness of 1/8 inch (3 mm) when any dimension is greater than 4 inches (100 mm).
  3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
  4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
  5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.
- B. Identification Labels:
  1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
  2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Caution and Warning Messages:
  1. Minimum Size: 2 inches (51 mm) by 4 inches (100 mm).
  2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 1/2 inch (13 mm).
  5. Color: Black text on yellow background unless otherwise indicated.
- D. Format for Receptacle Identification:
  1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
  2. Legend: Power source and circuit number or other designation indicated.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 3/16 inch (5 mm).
  5. Color: Black text on clear background.

## 5.03 WIRE AND CABLE MARKERS

- A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
  1. Do not use handwritten text.
- E. Minimum Text Height: 1/8 inch (3 mm).
- F. Color: Black text on white background unless otherwise indicated.

#### 5.04 UNDERGROUND WARNING TAPE

- A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).
- C. Legend: Type of service, continuously repeated over full length of tape.
- D. Color:

#### 5.05 WARNING SIGNS AND LABELS

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:
  - 1. Materials:
    - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
    - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
  - 2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
  - 3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- C. Warning Labels:
  - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
  - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
  - 3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

### PART 3 EXECUTION

#### 6.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

#### 6.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
  - 1. Surface-Mounted Equipment: Enclosure front.
  - 2. Flush-Mounted Equipment: Inside of equipment door.
  - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
  - 4. Elevated Equipment: Legible from the floor or working platform.
  - 5. Branch Devices: Adjacent to device.
  - 6. Interior Components: Legible from the point of access.
  - 7. Boxes: Outside face of cover.
  - 8. Conductors and Cables: Legible from the point of access.
  - 9. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.

- G. Secure rigid signs using stainless steel screws.
- H. Mark all handwritten text, where permitted, to be neat and legible.

**6.03 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

**END OF SECTION**

**SECTION 260923  
LIGHTING CONTROL DEVICES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Occupancy sensors.

**1.02 RELATED REQUIREMENTS**

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 260529 - Hangers and Supports for Electrical Systems
- C. Section 260533.16 - Boxes for Electrical Systems.
- D. Section 262726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.
  - 1. Includes finish requirements for wall controls specified in this section.
- E. Section 265100 - Interior Lighting.

**1.03 REFERENCE STANDARDS**

- A. 47 CFR 15 - Radio Frequency Devices; current edition.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate placement of lighting control devices with millwork, furniture, equipment and other potential conflicts.
  - 2. Coordinate placement of wall switch occupancy sensors with installed door swings.
  - 3. Coordinate placement of occupancy sensors with millwork, furniture, equipment and other potential obstructions to motion detection coverage.
  - 4. Coordinate lighting control device product selections with luminaire characteristics; see Section 265100 and lighting fixture schedule.
  - 5. Notify Architect of conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.
- B. Sequencing:
  - 1. Do not install lighting control devices until final surface finishes and painting are complete.

**1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include ratings, operating modes or sequence of functions, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
  - 1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.
- C. Shop Drawings:
  - 1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
- D. Field quality control reports.
- E. Project Record Documents: Record actual installed locations and settings for lighting control devices.

### 1.06 QUALITY ASSURANCE

- A. Comply with NFPA 70.

### 1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store products in clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

### 1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

### 1.09 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for occupancy sensors.

## PART 2 PRODUCTS

### 2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for purpose intended.
- B. Unless specifically indicated as excluded, provide components necessary for complete operating system including, but not limited to, conduit, wiring, connectors, hardware, and accessories.

### 2.02 OCCUPANCY SENSORS

- A. General Requirements:
  - 1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
  - 2. Sensor Technology:
    - a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using combination of both passive infrared and ultrasonic technologies.
    - b. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using combination of both passive infrared and audible sound sensing technologies.
  - 3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
  - 4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during adjustable turn-off delay time interval.
  - 5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
  - 6. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
  - 7. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
  - 8. Where wired sensors are indicated, wireless sensors are acceptable provided that components and wiring modifications necessary for proper operation are included.
  - 9. Wireless Sensors:
    - a. RF Range: 30 feet (9 m) through typical construction materials.
    - b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
    - c. Power: Battery-operated with minimum ten-year battery life.

- B. Wall Switch Occupancy Sensors:
  - 1. General Requirements:
    - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
    - b. Unless otherwise indicated or required to control load indicated on drawings, provide line voltage units with self-contained relay.
    - c. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
    - d. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during delayed-off time interval.
    - e. Finish: Match finishes specified for wiring devices in Section 262726, unless otherwise indicated.
    - f. Provide vandal resistant lenses for passive infrared (PIR) and dual technology wall switch occupancy sensors located in public bathrooms.
  - 2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within area of 900 square feet (83.6 sq m).
- C. Wall Dimmer Occupancy Sensors:
  - 1. General Requirements:
    - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated dimming control capability, and no leakage current to load in off mode.
    - b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
    - c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during delayed-off time interval.
    - d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
    - e. Provide fade-to-off operation to notify occupant of impending load turn-off.
    - f. Finish: Match finishes specified for wiring devices in Section 262726, unless otherwise indicated.
- D. Ceiling Mounted Occupancy Sensors:
  - 1. General Requirements:
    - a. Description: Low profile occupancy sensors designed for ceiling installation.
    - b. Unless otherwise indicated or required to control load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
    - c. Provide field selectable setting for disabling LED motion detector visual indicator.
    - d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
  - 2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
    - a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet (41.8 sq m) at mounting height of 9 feet (2.7 m), with field of view of 360 degrees.
  - 3. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:
    - a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet (41.8 sq m) at mounting height of 9 feet (2.7 m), with field of view of 360 degrees.
- E. Luminaire Mounted Occupancy Sensors: Designed for direct luminaire installation and control, suitable for use with specified luminaires.

- F. Power Packs for Low-Voltage Occupancy Sensors:
  - 1. Description: Plenum rated, self-contained low-voltage class 2 transformer and relay compatible with specified low-voltage occupancy sensors for switching of line-voltage loads.
  - 2. Provide quantity and configuration of power and slave packs with associated wiring and accessories as required to control load indicated on drawings.
  - 3. Input Supply Voltage: Dual rated for 120/277 V ac.
  - 4. Load Rating: As required to control load indicated on drawings.
- G. Power Packs for Wireless Occupancy Sensors:
  - 1. Description: Plenum rated, self-contained relay compatible with specified wireless occupancy sensors for switching of line-voltage loads.
  - 2. Input Supply Voltage: Dual rated for 120/277 V ac.
  - 3. Load Rating: As required to control load indicated on drawings.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that service voltage and ratings of lighting control devices are appropriate for service voltage and load requirements at location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes as required for installation of lighting control devices; see Section 260533.16.
  - 1. Mounting Heights: Unless otherwise indicated, as follows:
    - a. Wall Switch Occupancy Sensors: 48 inches (1.2 m) above finished floor.
  - 2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
- C. Maintain separation of remote-control, signaling, and power-limited circuits.
  - 1. See manufacturer instructions and Section 260519 for control wiring conductors, wiring methods, and identification requirements.
- D. Install lighting control devices in accordance with manufacturer's instructions.
- E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- F. Install lighting control devices plumb and level, and held securely in place.
- G. Where required and not furnished with lighting control device, provide wall plate; see Section 262726.
- H. Provide required supports; see Section 260529.



- I. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- J. Occupancy Sensor Locations:
  - 1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
  - 2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
- K. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near sensor location.
- L. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

### 3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect each lighting control device for damage and defects.
- C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
- D. Correct wiring deficiencies and replace damaged or defective conductors, cables, and lighting control devices.

### 3.04 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.
- C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

### 3.05 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### 3.06 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals, for closeout submittals.
- B. See Section 017900 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.
- D. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
  - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
  - 2. Location: At project site.

**END OF SECTION**

**SECTION 262100**  
**LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Electrical service requirements.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 312316 - Excavation.
- E. Section 312323 - Fill: Bedding and backfilling.

**1.03 REFERENCE STANDARDS**

- A. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.
- B. Coordination:
  - 1. Verify the following with Utility Company representative:
    - a. Utility Company requirements, including division of responsibility.
    - b. Exact location and details of utility point of connection.
    - c. Utility easement requirements.
    - d. Utility Company charges associated with providing service.
  - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
  - 3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.
- D. Utility Company charges associated with providing permanent service to be paid by Contractor and reimbursed by Owner.
- E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.
- F. Scheduling:
  - 1. Arrange for inspections necessary to obtain Utility Company approval of installation.

**1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product. Include ratings, configurations, standard wiring diagrams, outline and support point dimensions, finishes, weights, service condition requirements, and installed features.
- C. Shop Drawings: Include dimensioned plan views and sections indicating locations and arrangement of Utility Company and service entrance equipment, metering provisions, required

clearances, and proposed service routing.

### 1.06 QUALITY ASSURANCE

- A. Comply with the following:
  - 1. IEEE C2 (National Electrical Safety Code).
  - 2. NFPA 70 (National Electrical Code).
  - 3. The requirements of the Utility Company.
  - 4. The requirements of the local authorities having jurisdiction.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

## PART 2 PRODUCTS

### 2.01 ELECTRICAL SERVICE REQUIREMENTS

- A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.
- B. Electrical Service Characteristics: As indicated on drawings.
- C. Utility Company: As indicated on drawings.
- D. Division of Responsibility: As indicated on drawings.
- E. Products Furnished by Contractor: Comply with Utility Company requirements.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions and Utility Company requirements.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances and required maintenance access.
- D. Provide required trenching and backfilling in accordance with Section 312316 and Section 312323.
- E. Provide required support and attachment components in accordance with Section 260529.
- F. Provide grounding and bonding for service entrance equipment in accordance with Section 260526.
- G. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 260553.

**3.03 PROTECTION**

- A. Protect installed equipment from subsequent construction operations.

**END OF SECTION**

**SECTION 262416  
PANELBOARDS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Lighting and appliance panelboards.
- B. Overcurrent protective devices for panelboards.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 264300 - Surge Protective Devices.

**1.03 REFERENCE STANDARDS**

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- E. NEMA PB 1 - Panelboards; 2011.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000 Volts or Less; 2023.
- G. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 67 - Panelboards; Current Edition, Including All Revisions.
- L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- M. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
- N. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
  - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
  1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
  1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
  2. Include wiring diagrams showing all factory and field connections.
  3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
  4. Include documentation of listed series ratings upon request.
- D. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.
- E. Field Quality Control Test Reports.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

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

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

#### **1.08 FIELD CONDITIONS**

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
  1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. ABB: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
- B. Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
- C. Schneider Electric: [www.se.com/#sle](http://www.se.com/#sle).
- D. Siemens Industry, Inc: [www.new.siemens.com/#sle](http://www.new.siemens.com/#sle).
- E. Source Limitations: Provide panelboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from a single supplier.

#### **2.02 PANELBOARDS - GENERAL REQUIREMENTS**

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.

- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet (2,000 m).
  - 2. Ambient Temperature:
    - a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- C. Short Circuit Current Rating:
  - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
  - 2. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.
  - 3. Label equipment utilizing series ratings as required by NFPA 70.
- D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
  - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
  - 2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
    - b. Outdoor Locations: Type 3R.
  - 2. Boxes: Galvanized steel unless otherwise indicated.
    - a. Provide wiring gutters sized to accommodate the conductors to be installed.
  - 3. Fronts:
    - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
    - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
    - c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
  - 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 264300, list and label panelboards as a complete assembly including surge protective device.

### 2.03 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  - 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  - 2. Main and Neutral Lug Type: Mechanical.

- C. Bussing:
  - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
  - 2. Phase and Neutral Bus Material: Aluminum.
  - 3. Ground Bus Material: Aluminum.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
  - 1. Provide surface-mounted or flush-mounted enclosures as indicated.
  - 2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
  - 3. Provide clear plastic circuit directory holder mounted on inside of door.

#### **2.04 OVERCURRENT PROTECTIVE DEVICES**

- A. Molded Case Circuit Breakers:
  - 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
  - 2. Interrupting Capacity:
    - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
    - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
    - c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
  - 3. Conductor Terminations:
    - a. Provide mechanical lugs unless otherwise indicated.
    - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  - 4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
    - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
  - 5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
  - 6. Provide the following circuit breaker types where indicated:
    - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
  - 7. Do not use tandem circuit breakers.
  - 8. Do not use handle ties in lieu of multi-pole circuit breakers.
  - 9. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

#### **2.05 SOURCE QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Factory test panelboards according to NEMA PB 1.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.



- D. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 260529.
- F. Install panelboards plumb.
- G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- I. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- J. Provide grounding and bonding in accordance with Section 260526.
  - 1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
- K. Install all field-installed branch devices, components, and accessories.
- L. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- M. Provide filler plates to cover unused spaces in panelboards.
- N. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
  - 1. Emergency and night lighting circuits.
  - 2. Fire detection and alarm circuits.
- O. Identify panelboards in accordance with Section 260553.

### 3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.
- D. Test GFCI circuit breakers to verify proper operation.
- E. Correct deficiencies and replace damaged or defective panelboards or associated components.

### 3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.

### 3.05 CLEANING

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

**SECTION 262726  
WIRING DEVICES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Receptacles.
- B. Wall plates and covers.

**1.02 RELATED REQUIREMENTS**

- A. Section 260533.16 - Boxes for Electrical Systems.
- B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- D. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).
- E. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- H. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- I. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
  - 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
  - 4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
  - 5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

**1.05 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

**1.06 DELIVERY, STORAGE, AND PROTECTION**

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

**PART 2 PRODUCTS**

**2.01 WIRING DEVICES - GENERAL REQUIREMENTS**

- A. Provide wiring devices suitable for intended use with ratings adequate for load served.
- B. Wiring Device Applications:
  - 1. Receptacles Installed Outdoors or in Damp or Wet Locations: Use weather-resistant GFCI receptacles with weatherproof covers.
  - 2. Provide GFCI protection for:

- a. Receptacles installed within 6 feet (1.8 m) of sinks.
  - b. Receptacles installed in kitchens.
  - c. Receptacles serving electric drinking fountains.
- C. Wiring Device Finishes:
1. Provide wiring device finishes as described below, unless otherwise indicated.
  2. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.
  3. Wiring Devices Installed in Wet or Damp Locations: White with weatherproof cover.

## 2.02 RECEPTACLES

- A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
  2. NEMA configurations specified are according to NEMA WD 6.
- B. Convenience Receptacles:
1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
  2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
- C. GFCI Receptacles:
1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
    - a. Provide test and reset buttons of same color as device.
  2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
  3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

## 2.03 WALL PLATES AND COVERS

- A. Manufacturers:
- B. Wall Plates: Comply with UL 514D.
1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
  2. Size: Standard; \_\_\_\_\_.
  3. Screws: Metal with slotted heads finished to match wall plate finish.
- C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- D. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- E. Weatherproof Receptacle Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.
- F. Weatherproof Receptacle Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.

- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### 3.03 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.
  - 1. Mounting Heights: Unless otherwise indicated, as follows:
    - a. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter.
  - 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- I. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- J. Install wall switches with OFF position down.
- K. Install vertically mounted receptacles with grounding pole on bottom and horizontally mounted receptacles with grounding pole on left.
- L. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- N. Identify wiring devices in accordance with Section 260553.

### 3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch with circuit energized to verify proper operation.

- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Correct wiring deficiencies and replace damaged or defective wiring devices.

**3.05 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.

**3.06 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

**END OF SECTION**

**SECTION 264300  
SURGE PROTECTIVE DEVICES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surge protective devices for service entrance locations.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 262416 - Panelboards.

**1.03 ABBREVIATIONS AND ACRONYMS**

- A. EMI/RFI: Electromagnetic Interference/Radio Frequency Interference.
- B. SPD: Surge Protective Device.

**1.04 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 1283 - Standard for Electromagnetic Interference Filters; Current Edition, Including All Revisions.
- E. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

**1.05 ADMINISTRATIVE REQUIREMENTS**

**1.06 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.
- C. Certificates: Manufacturer's documentation of listing for compliance with the following standards:
  - 1. UL 1449.
  - 2. UL 1283 (for Type 2 SPDs).

**1.07 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

**1.08 DELIVERY, STORAGE, AND PROTECTION**

- A. Store in a clean, dry space in accordance with manufacturer's written instructions.

**1.09 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Field-Installed, Externally Mounted Surge Protective Devices:
  - 1. ABB: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
  - 2. Intermatic, Inc: [www.intermatic.com/#sle](http://www.intermatic.com/#sle).

3. nVent ERICO: [www.nvent.com/#sle](http://www.nvent.com/#sle).
  4. Schneider Electric: [www.se.com/#sle](http://www.se.com/#sle).
  5. Surge Suppression, LLC (SSI): [www.surgesuppression.com/#sle](http://www.surgesuppression.com/#sle).
- B. Factory-installed, Internally Mounted Surge Protective Devices:
1. Same as manufacturer of equipment containing surge protective device, to provide complete listed assembly including SPD.

## 2.02 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

- A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.
- B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mounted SPDs.
- C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.
- D. Protected Modes:
1. Wye Systems: L-N, L-G, N-G, L-L.
  2. Single Split Phase Systems: L-N, L-G, N-G, L-L.
- E. UL 1449 Voltage Protection Ratings (VPRs):
1. 208Y/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.
  2. 240/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.
- F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.
- G. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
1. Indoor clean, dry locations: Type 1.
  2. Outdoor locations: Type 3R.
- H. Equipment Containing Factory-installed, Internally Mounted SPDs: Listed and labeled as a complete assembly including SPD.
1. Panelboards: See Section 262416.

## 2.03 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

- A. Surge Protective Device:
1. Protection Circuits: Field-replaceable modular or non-modular.
  2. Surge Current Rating: Not less than 120 kA per mode/240 kA per phase.
  3. UL 1449 Nominal Discharge Current (I-n): 20 kA.
  4. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
  5. EMI/RFI Filtering: Provide EMI/RFI filter to attenuate electrical noise; listed as complying with UL 1283 for Type 2 SPDs (UL 1283 listing not available for Type 1 SPDs).
  6. Diagnostics:
    - a. Protection Status Monitoring: Provide indicator lights to report the protection for each phase.
    - b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.

- B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.
- C. Verify system grounding and bonding is in accordance with Section 260526, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.
- D. Verify that conditions are satisfactory for installation prior to starting work.

**3.02 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- C. Unless indicated otherwise, connect service entrance surge protective device on load side of service disconnect main overcurrent device.
- D. Install conductors between SPD and equipment terminations as short and straight as possible, not exceeding manufacturer's recommended maximum conductor length. Breaker locations may be reasonably rearranged in order to provide leads as short and straight as possible. Twist conductors together to reduce inductance.
- E. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 260526 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.
- F. Disconnect SPD prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPD connected.

**3.03 CLEANING**

- A. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**



**SECTION 265100  
INTERIOR LIGHTING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts and drivers.

**1.02 RELATED REQUIREMENTS**

- A. Section 260529 - Hangers and Supports for Electrical Systems.
- B. Section 260533.16 - Boxes for Electrical Systems.

**1.03 REFERENCE STANDARDS**

- A. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019.
- B. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.
- C. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- E. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems; 2006.
- F. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- G. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2023.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- K. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- L. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
  - 2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
  - 3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
  - 4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

**1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
  - 1. LED Luminaires:
    - a. Include estimated useful life, calculated based on IES LM-80 test data.
  - 2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
- C. Certificates for Dimming Ballasts: Manufacturer's documentation of compatibility with dimming controls to be installed.
- D. Field quality control reports.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.07 DELIVERY, STORAGE, AND PROTECTION**

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

#### **1.08 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

#### **1.09 WARRANTY**

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide 3-year manufacturer warranty for LED luminaires, including drivers.

### **PART 2 PRODUCTS**

#### **2.01 LUMINAIRE TYPES**

- A. Furnish products as indicated in luminaire schedule included on the drawings.

#### **2.02 LUMINAIRES**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating

system.

- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Recessed Luminaires:
  - 1. Ceiling Compatibility: Comply with NEMA LE 4.
  - 2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
- H. LED Luminaires:
  - 1. Components: UL 8750 recognized or listed as applicable.
  - 2. Tested in accordance with IES LM-79 and IES LM-80.
  - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

### 2.03 EMERGENCY LIGHTING UNITS

- A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- C. Battery:
  - 1. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

### 2.04 EXIT SIGNS

- A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
  - 1. Number of Faces: Single- or double-face as indicated or as required for installed location.
  - 2. Directional Arrows: As indicated or as required for installed location.

### 2.05 BALLASTS AND DRIVERS

- A. Ballasts/Drivers - General Requirements:
  - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
  - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
- B. Dimmable LED Drivers:
  - 1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
  - 2. Control Compatibility: Fully compatible with the dimming controls to be installed.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

- E. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install products in accordance with manufacturer's instructions.
- D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- E. Provide required support and attachment in accordance with Section 260529.
- F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- G. Suspended Ceiling Mounted Luminaires:
  - 1. Do not use ceiling tiles to bear weight of luminaires.
  - 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
  - 3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
  - 4. Secure pendant-mounted luminaires to building structure.
  - 5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
  - 6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.
  - 7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
- H. Recessed Luminaires:
  - 1. Install trims tight to mounting surface with no visible light leakage.
  - 2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
  - 3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
- I. Suspended Luminaires:
  - 1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
  - 2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
  - 3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet (1.2 m) between supports.
  - 4. Install canopies tight to mounting surface.
  - 5. Unless otherwise indicated, support pendants from swivel hangers.
- J. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- K. Install accessories furnished with each luminaire.
- L. Bond products and metal accessories to branch circuit equipment grounding conductor.
- M. Emergency Lighting Units:
  - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- N. Exit Signs:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- O. Install lamps in each luminaire.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
- E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

### **3.04 ADJUSTING**

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.
- C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

### **3.05 CLEANING**

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

### **3.06 CLOSEOUT ACTIVITIES**

- A. See Section 017800 - Closeout Submittals, for closeout submittals.
- B. See Section 017900 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

### **3.07 PROTECTION**

- A. Protect installed luminaires from subsequent construction operations.

**END OF SECTION**

**SECTION 284400**  
**REFRIGERANT DETECTION AND ALARM**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Diffusion refrigerant detection systems.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. ANSI/IIAR 2 - American National Standard for Design of Safe Closed-Circuit Ammonia Refrigeration Systems; 2021.
- B. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2022, with Addendum (2024).
- C. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2022, with Errata (2024).
- D. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NFPA 704 - Standard System for the Identification of the Hazards of Materials for Emergency Response; 2022.

**PART 2 PRODUCTS**

**2.01 REFRIGERANT DETECTION APPLICATIONS**

- A. Machinery Rooms with Refrigerants Other than Ammonia:
  - 1. Requirements are not applicable to rooms containing only systems using water.
  - 2. Automatic Sequence of Operations:
    - a. Low Alarm:
      - 1) Report alarm to approved monitored location.
      - 2) Activate audible and visible notification of alarm both inside machinery room and outside at each entrance to machinery room.
      - 3) Alarm to be unlatched, with automatic reset if concentration drops below setpoint for this alarm level.
    - b. Intermediate Alarm:
      - 1) Report alarm to approved monitored location.
      - 2) Activate audible and visible notification of alarm both inside machinery room and outside at each entrance to machinery room.
      - 3) Alarm to be latched, requiring manual reset from within machinery room.
    - c. High Alarm:
      - 1) Report alarm to approved monitored location.
      - 2) Activate audible and visible notification of alarm both inside machinery room and outside at each entrance to machinery room.
      - 3) Shut down combustion processes in machinery room.
      - 4) Alarm to be latched, requiring manual reset from within machinery room.

## 2.02 REFRIGERANT DETECTION SYSTEMS - GENERAL REQUIREMENTS

- A. Provide new refrigerant detection systems consisting of required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, and system programming as necessary for complete operating system that provides functional intent indicated.
- B. Provide products listed, classified, and labeled as suitable for purpose intended.
- C. Comply with the following:
  - 1. Applicable mechanical code.
  - 2. Refrigeration Systems with Refrigerant Other than Ammonia: ASHRAE Std 15.
  - 3. Refrigeration Systems with Ammonia: ANSI/IIAR 2.
  - 4. ASHRAE Std 34.
  - 5. NFPA 70.
  - 6. Applicable state and local codes.
  - 7. Requirements of local authorities having jurisdiction.
- D. Service Conditions: Provide products suitable for operation under service conditions at installed location.
- E. Enclosures:
  - 1. NEMA 250 Environment Type or Equivalent IEC 60529 Rating: Unless otherwise indicated, as specified for following installation locations:

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify field measurements are as indicated.
- B. Verify characteristics of system components are consistent with the indicated requirements.
- C. Verify mounting surfaces are ready to receive system components.
- D. Verify conditions are satisfactory for installation prior to starting work.

### 3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions and NECA 1.
- B. Do not exceed manufacturer's recommended maximum cable length between system components.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment; see Section 260529.
- E. Install control units plumb and level.
- F. Sensor/Sample Point Locations:
  - 1. Refrigerants Heavier than Air: Locate at 12 to 18 inches (300 to 450 mm) above floor unless otherwise indicated.
  - 2. Refrigerants Lighter than Air: Locate at 4 to 8 inches (100 to 200 mm) below ceiling unless otherwise indicated.
- G. Aspirated Air Sampling Refrigerant Detection Systems:
  - 1. Purge sample intake lines prior to connection to control unit.
  - 2. Install end-of-line filters on sample intake lines at sample points.
  - 3. Where applicable, terminate exhaust lines outdoors unless otherwise indicated.
- H. Provide grounding and bonding; see Section 260526.
- I. Provide identification; see Section 260553.
  - 1. Use identification nameplate or identification label to identify meaning of each alarm level at each refrigerant detection system control unit and remote annunciator/notification appliance.
  - 2. Machinery Room Hazard Signage:

- a. Room Interior: Use warning signs to require exit when associated refrigerant detection system alarm has been activated, except for trained personnel with appropriate respiratory and protective equipment.
- b. Room Entrances: Use warning signs to restrict access to authorized personnel and to prohibit entry when associated refrigerant detection system alarm has been activated, except for trained personnel with appropriate respiratory and protective equipment.
- c. Identify hazards of materials for emergency response in accordance with NFPA 704.

**3.03 PROTECTION**

- A. Protect installed system components from subsequent construction operations.

**END OF SECTION**



SECTION 310000  
EARTHWORK UTILITIES

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. All work specified in this Section shall conform to the Rhode Island Department of Transportation Standards Specifications for Road and Bridge Construction 2023 Edition with latest addenda applies to this Section.

1.2. SPECIAL CONDITIONS

- A. The Contractor shall notify "Dig-Safe" in Rhode Island at 1-888-344-7233, prior to any excavation. The "Dig-Safe" number shall be provided to the Engineer.

B. RELATED SECTIONS

311000	Site Preparation
312300	Soil and Aggregate Materials
321216	Asphalt Paving
329200	Loam & Seed
334000	Storm Drainage Utilities

1.3. DESCRIPTION OF WORK

- A. Work under this section includes, but is not necessarily limited to, the following:
  - 1. Preparing and grading subgrades for structural footings, drainage structures, sidewalks, pavements, and landscaping.
  - 2. Excavating all materials and backfilling structures, including open cut rock excavation and trench rock excavation for installation of site utilities.
  - 3. Filling, backfilling, and compacting fill to the satisfaction of a qualified soils testing laboratory engineer conforming to these specifications where applicable.
  - 4. Rough grading to required tolerances.
  - 5. Filling, as directed, excess cut under footings, foundations, and trenches.
  - 6. The placing of earth for forming, shaping and compaction of embankments.
  - 7. Maintaining bench marks, monuments, and other reference points, obtaining accurate replacement of final grade of any disturbed or destroyed, or that must be removed due to the nature of the work, furnishing certification by a professional surveyor that all disturbed items have been accurately relocated.

8. Written notice of readiness of footing excavations, fill materials, fill areas, compacted fills, and items requiring review and/or inspection.
9. Maintain excavations and trenches free of water.
10. Excavating, stock piling and placing material suitable for filling and backfilling.
11. Remove from site all debris, unsuitable material and excess excavated material as specified and/or as directed by the Engineer.
12. Excavation and grading of storm water detention and retention facilities and compensatory wetlands.
13. Restoration to original grades and condition, properties damaged by any activity related to the work, taking adequate precautions to avoid settlement or cave-in of properties higher than site, silting, erosion, or other damage to properties lower than site.

1.4. OTHER WORK

- A. All excavation for trenches required for direct burial cables, direct lines, handholes, manholes, transformer pads, pole bases, and the like shown on the site or electrical drawings or specified herein or in the electrical division of these specifications, shall be the responsibility of this Contractor.

PART 2 - PRODUCTS

2.1. MATERIALS

- A. Fill and backfill materials shall be in accordance with Section 31 2300 – Aggregate and Soil Materials unless specifically indicated otherwise.

PART 3 - EXECUTION

3.1. GENERAL EXCAVATION REQUIREMENTS

- A. Where used herein, "Finished Grade" refers to final grade at elevation indicated. Spot elevations govern contour elevations. Subgrade under lawn areas shall be maintained at 6" lower than "Finished Grade", unless indicated otherwise.
- B. The extent of excavation open at any one time shall be controlled by the conditions, but shall always be confined to the limits prescribed by the Engineer.
- C. No excavated material shall be placed on lawns, driveways or other private property without written consent of Owner. All disturbed areas shall be restored by the Contractor at no cost to Owner.
- D. The Contractor shall take all necessary measures to protect trees not to be removed from the site of the work against damage from machinery and from excavated material. Branches and roots shall not be cut unless permitted by the Engineer.
- E. Trees, cultivated plants, shrubs and hedges which might be damaged by the Contractor's

operations shall be protected or shall be transplanted, maintained, watered and replanted. Trees to be saved shall be protected by the installation of a snow fence installed at the drip line. If such trees, plants, shrubs or hedges are damaged to the degree that their growth or beauty is affected, they shall be replaced by the Contractor at his own expense. All surfaces which have been damaged by the Contractor's operations shall be restored to a condition at least equal to that in which they were found just prior to the start of construction. Damaged trees shall be replaced at a cost of six hundred dollars per caliper inch.

- F. The restoration of existing property shall be done as promptly as practicable and not left to the end of the construction work.
- G. All existing pipes, poles, wires, curbing, property line markers, fences, walls, or other structures which, in the opinion of the Engineer, must be preserved in place without relocation shall be carefully supported and protected by the Contractor. In the event of damage, they shall be restored to their original condition by the Contractor at his own expense.
- H. As excavation approaches existing utilities or other underground structures, digging with machinery shall cease and the excavation shall be done manually, as directed.
- I. Excavation and backfill operations adjacent to existing utilities, structures and construction shall be done in such a manner as will prevent the loss of ground or caving in of excavations, the undermining, damage or disturbing of existing pipelines, utilities and structures or any completed construction of the project. Backfill shall be placed, compacted, and done in such a manner as to prevent future settlement and damage to the existing pipelines, utilities, structures, or construction. Existing pipelines, utilities, structures, new construction, or property damaged due to excavation, backfilling and settlement of the backfill, shall be the responsibility of the Contractor and shall be corrected in a manner satisfactory to the Engineer at no additional expense to the Owner.
- J. Unsuitable excavated material shall systematically be separated and removed from suitable material to the satisfaction of Engineer.
- K. Unsuitable material shall be promptly removed and disposed of off-site at no expense to the Owner.
- L. Surplus suitable material shall be the property of the Owner and stored on site as directed, or at the Owner's request, this material shall be removed from the site by the Contractor at no additional cost to the Owner.
- M. Boulders over 10" in length, if encountered, shall be removed from subgrade of cut areas. Remove obstructions to depth of 12" below subgrade.
- N. If excavation goes beyond lines shown in details, Contractor shall replace material with gravel borrow.
- O. Excavations shall be carried to design depths.
- P. If excavation is carried beyond line or below grade, except as directed, or subgrade is made unsatisfactory by act or neglect of Contractor, he shall remove such unsatisfactory material. No extra payment will be made for replacement with satisfactory fill, additional concrete, or other suitable materials as directed.

- Q. Contractor shall provide adequate dust control during earthwork operations. Public ways and haul routes shall be cleaned and swept daily if required by intensity of the work, traffic and weather. Contractor to wet down areas as required and requested by the Engineer or Owner. Provide off-site water as necessary.
- R. Contractor shall provide and maintain temporary barricades and traffic controls as required.

### 3.2. PREPARATION

- A. Protect existing structures, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and facilities.

### 3.3. PROJECT CONDITIONS

- A. “Dig-Safe” Damage Prevention System: All Contractors performing drilling, boring, auguring, jetting, sheeting or pile installation, demolition, excavation or like work shall, prior to commencement of these activities, contact utility companies having responsibility for underground transmission systems for information relative to locations of existing underground utilities and/or appropriate dig-safe damage prevention and notification agency. Provide Dig-Safe number to Owner in writing prior to start of excavation.
- B. Adequate protection measures shall be provided to protect workmen and pedestrians passing by the site. Streets adjacent property shall be fully protected throughout the operations.
- C. Shoring, sheeting, and bracing and/or prefabricated trenching boxes shall be provided to prevent caving, erosion, or gulying sides of excavation.
- D. Provide for surface drainage and erosion control during the period of construction in a manner to avoid creating a nuisance to adjacent areas. Keep all excavations free of water during the entire progress of the work, regardless of the cause, source, or nature of the water.

### 3.4. CUTTING PAVEMENT

- A. Excavations made on pavement shall be made in a careful manner so as to cause the least amount of damage to the pavement. Roadway pavement in state highways, local roads, sidewalks, and easements having bituminous concrete pavement shall be cut prior to trench excavation. Pavement and/or cement concrete will be cut 6 inches either side of the maximum allowable trench width. Any damage to the cut line due to the excavations, backfilling or removal of temporary pavement shall be re-cut to neat lines at no additional cost to the Owner, prior to replacement of the specified finished pavement. The width of pavement removed shall be kept as narrow as practicable. Existing pavement and base course disturbed or damaged beyond the payment lines indicated shall be replaced by the Contractor to match existing pavement and base course, at no additional cost to the Owner.

- B. Contractor shall remove and dispose of existing bituminous concrete pavement off-site as is necessary to perform work of this contract as indicated. Removal of pavement shall be done in a neat manner by saw cutting a neat edge.
- C. Contractor shall saw cut, remove and provide off-site disposal of concrete and bituminous walk pavement as is necessary to perform the work of this contract. Removal of concrete and bituminous walks shall be performed in a neat manner at the nearest joint of the remaining walk pavement.
- D. Excavated pavement shall not be mixed with other excavated material which is to be used as backfill, and shall be removed immediately from the site of the work.

### 3.5 EXCAVATION, GENERAL

- A. Explosives and blasting are not permitted for this project. Rock and/or ledge, if encountered, shall be removed by mechanical means only.
- B. All excavations shall be classified as “earth excavation” or “rock excavation”.
- C. Definition of “earth excavation” shall include the removal of all suitable and unsuitable soils not otherwise classified herein, and the removal of boulders and rock fragments less and one (1) cubic yard in volume, from the following areas:
  - 1. Within the design excavation sections.
  - 2. Beyond the design excavation sections where unsuitable materials are encountered.
- D. Definition of “rock excavation” shall include the following:
  - 1. Rock excavation shall consist of removal of intact bedrock and boulders or detached bedrock fragments which have a volume of one (1) cubic yard or more. Boulders and detached rock fragments which have a volume of less than one (1) cubic yard are considered “earth excavation”.
  - 2. Materials that cannot be removed effectively with soil excavating equipment, such as rock material or aggregate conglomerate deposits so firmly cemented as to possess the physical characteristics of solid rock.
  - 3. Concrete or masonry structures larger than one (1) cubic yard in volume, and not less than 13-inches in the least dimension.
  - 4. Reinforced concrete larger than one (1) cubic yard in volume, reinforcement area more than ½ percent of cross-sectional area perpendicular to reinforcement in either direction, and not less than 8-inches in the least dimension.
  - 5. Soft or disintegrated rock or hardpan which can be removed with a hand pick or power operated excavating machine, or loose or previously blasted rock, will not be considered “rock excavation”.
- E. Definition of “unsuitable soils” shall include those soils due to their consolidation properties, degree of saturation, gradation or other deleterious characteristics will not provide a stable subgrade or side slopes; cannot be used as, or support embankment, or cannot be placed and compacted as backfill, or do not otherwise conform to the requirements of these Specifications.
- F. When, during excavation, material is encountered that the Contractor may classify as rock excavation, such material shall be uncovered and the Engineer notified by the Contractor. The Contractor shall not proceed with excavation of this material until the Engineer has classified material as earth excavation or rock excavation. Failure on the part of the

Contractor to uncover such material and notify the Engineer will cause forfeiture of the Contractor's right of claim for payment of rock excavation.

- G. Before rock removal commences, the Contractor shall uncover all ledge to be removed. Elevations shall be taken by a registered land surveyor not employed by the Contractor. Surveyor will be paid by the Contractor. After completing rock removal, elevations shall be taken again by the surveyor. Amounts of ledge removed will be agreed to by Contractor and Owner.
- H. A RI Registered Land Surveyor, not an employee of the Contractor but paid for by the Contractor, shall develop cross sections to show and determine rock quantities for payment purposes. Cross sections shall be reviewed by the Engineer. Payment for rock removal shall be based on "Methods of Measurement" or "pay lines" as stated within the project specifications and drawings. The Contractor shall be paid only in accordance with calculated quantities and not for actual rock removed.
- I. Wherever rock is shattered below grade and is unfit for foundations, the shattered rock shall be removed and replaced as specified. No extra payment will be made for overbreak or backfill as required.
- J. When, during excavation, material is encountered that Contractor may classify as unsuitable, such material shall be uncovered and the Engineer notified by Contractor. Contractor shall not proceed with excavation of this material until the Engineer has classified material as unsuitable. Failure on part of Contractor to uncover such material and notify the Engineer will cause forfeiture of Contractor's right of claim for payment of unsuitable material.

### 3.6. TRENCH EXCAVATION

- A. Trenches shall be excavated in such a manner and to such widths as will give suitable space to allow pipes to be laid and joints to be formed and to allow for sheeting and shoring, dewatering and for removing and replacing unsuitable materials. Trenches shall be excavated to lines and grades shown on the drawings.
- B. Final decision as to suitability of excavated material for use as backfill or fill shall be made by the Engineer. If, in the judgment of the Engineer the excavated material is unsuitable, the Contractor shall import bank run gravel to make up the deficiency.
- C. Comply with all Federal, State and local codes, ordinances and requirements of authorities having jurisdiction to maintain stable excavations.

### 3.7. UNAUTHORIZED EXCAVATION

- A. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction from the Owner or the Engineer.
- B. Fill unauthorized excavations with materials approved by the Engineer at no additional cost to the Owner.
- C. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by the Engineer, at no cost to the Owner.

3.8. APPROVAL OF SUBGRADE

- A. Notify the Engineer when excavations have reached the required subgrade.
- B. When the Engineer determines that unforeseen unsatisfactory soil is present, continue excavation and replace with systematically placed and compacted backfill or fill material as directed. Unforeseen additional excavation and replacement material will be paid according to the Contract provisions for changes in Work.
- C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Engineer at no cost to the Owner.
- D. Compacted fill surfaces which become disturbed, contaminated or otherwise unacceptable to the Owner or the Engineer shall be removed and replaced with acceptable fill at no additional cost to the Owner.
- E. Cold Weather Subgrade Protection
  - 1. When the atmospheric temperature is less than 32 degrees Fahrenheit, the Contractor shall protect excavation subgrades and lean concrete from freezing. Cold weather subgrade protection may consist of an earth fill cover, hay cover, insulation cover, heating or other means of protecting the subgrade materials from freezing.
  - 2. Subgrades, which have been permitted to freeze by the Contractor, will be judged to be unsuitable for placement of concrete, pavement or fill by the Owner, Owner's Representative or Engineer. The Contractor, at his own expense, shall conduct additional excavation of frozen subgrade soil, and replacement with materials acceptable to the Owner, Owner's Representative or Engineer.

3.9. STORAGE OF SOIL MATERIALS

- A. Stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow material. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Provide erosion control measures around perimeter of stockpiles. Cover to prevent wind-blown dust.
  - 1. Stockpile soils materials away from edge of excavations. Do not store within drop line of remaining trees. Establish soil and material stockpiles on site only at locations acceptable to the Owner.

3.10 BACKFILL

- A. Backfill excavations promptly, but not before completing the following:
  - 1. Acceptance of construction below finish grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.
  - 2. Surveying locations of underground utilities for record documents.
  - 3. Testing, inspecting, and approval of underground utilities.
  - 4. Concrete formwork removal.

5. Removal of trash and debris from excavation.
  6. Removal of temporary shoring and bracing, and sheeting.
  7. Installing permanent or temporary horizontal bracing supported walls.
- B. No backfill shall be placed except in the presence of the Owner or Owner's Representative.

3.11 FILL

- A. Preparation: Remove vegetation, topsoil, debris, wet and unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placing fills.
1. Plow, scarify, strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing surface.
- B. When subgrade or existing ground surface to receive fill has a density less than that required for fill, break up ground surface to depth required, pulverize, moisture-condition or aerate soil, and re-compact to required density.
- C. Place fill material in layers according to Section 31 23 00 – Aggregate and Soil Materials to the required elevations in accordance with the drawings and as follows:
1. Under loam and seed areas, use common borrow material.
  2. Under concrete sidewalks and bituminous concrete pavement, use gravel borrow.
  3. Under drainage piping and drainage structures, use bedding material.

3.12. TRENCH BACKFILL

- A. Trenches and other excavations shall not be backfilled until all required inspections have been satisfactorily performed and until the work as installed conforms to other requirements specified in the several sections covering the installation of the work. Trenches and other excavations shall be backfilled as soon as practicable with the specified material.
- B. All pipes under this contract are to be laid in bedding material as indicated on the contract drawings. Prior to backfilling the trench, the space on the both sides of the pipe and beneath the pipe shall be backfilling with bedding material as indicated on the contract drawings. This layer shall be carefully tamped using tools acceptable to the Engineer to obtain maximum compaction around and under the pipe at the same time being extremely careful not to cause movement of the pipe in either a lateral or vertical direction.
- C. In each trench, gravel borrow, as directed by the Engineer, which does not contain any stones, rock, or clay lumps that are in excess of 3" in their greatest dimension shall be deposited in the trench uniformly on both sides of the pipe and to a minimum height of 2" over the pipe for the entire width of the trench above the "Sand Fill" to the pipe spring line. This layer shall be thoroughly compacted to the above described requirements.
- D. The balance of the backfill to subgrade or finish grade as indicated shall be made using trench excavated materials in loam and seed areas and gravel borrow under paved, parking lot areas, and under slabs on grade, unless the Contractor is otherwise directed by



the Engineer. This layer shall be thoroughly compacted in accordance with Section 31 23 00 – Aggregate Materials.

- E. Compaction by water-jetting, puddling or ramming is prohibited. Where it is necessary to obtain maximum compaction, power tampers shall be used. The method of compacting shall be reviewed by the Engineer.
- F. During filling and backfilling operation, pipelines will be reviewed by the Engineer to determine whether any displacement of the pipe has occurred. If the inspection of the pipelines shows poor alignment, displaced pipe or any other defects, the defects designated by the Owner shall be remedied in a satisfactory manner, by the Contractor, at no additional expense to the Owner.
- G. Metallic tape, of the type designated in Specification Section 33 05 26 – Utility Identification Tape, shall be placed as directed in the trench backfill.

### 3.13. MOISTURE CONTROL

- A. Uniformly moisten, moisten condition, or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air-dry satisfactory soil material that is too wet to compact to specified density.
  - 3. Fill materials shall not be frozen when placed, or be allowed to freeze prior to, or after compaction, or placement.
  - 4. Soil bearing surfaces below completed slabs and foundations shall be protected against freezing. Frost protection shall be provided in a manner acceptable to the Owner's Representative as soon as possible after foundations are constructed.
  - 5. Do not excavate to full indicated depth when freezing temperatures may be expected, unless the mats, footing, or slab is poured immediately after the excavation has been completed. Protect the excavation from frost if placing of concrete is delayed. Concrete for foundations or slabs shall not be placed on frozen soil. Where footings, slabs, or mud mats are exposed to freezing temperatures, they shall be protected to prevent damage to the concrete by freezing or frost penetration into the soil upon which they rest. Where foundations are exposed over the winter during construction, provide at least two and one-half (2.5) feet of earth cover above the bottom surface of concrete, plus hay or other protection if temperatures are severe, as directed by the Owner's Representative.
- B. Wet weather: If fill material placement, spreading, rolling, or compaction operations are interrupted by heavy rain or other unfavorable conditions, do not resume such operations until ascertaining that the moisture content and density of the previously-placed soil are as required by these specifications.

### 3.13 COMPACTION

- A. Compaction shall be in accordance with the requirements of Section 31 23 00 – Aggregate

and Soil Materials.

### 3.14 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  - 1. Provide a smooth transition between existing adjacent grades and new grades.
  - 2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
  - 1. Lawn or Unpaved Areas: Plus or minus 0.10 foot.
  - 2. Pavements: Plus or minus ½ inch.

### 3.15 COMPACTION EQUIPMENT

- A. Contractor shall use, for compaction of subgrade and fill in designated areas, equipment at number of coverages stipulated depending upon suitability of equipment for the work, as follows:
  - 1. Rubber-tired roller-compactor, having 4 wheel equipped with pneumatic tires of such size and ply as can be maintained at pressures between 80 and 100 psi with 25,000 lb. wheel load during rolling operation. Roller-wheels shall be located abreast, and so designed that each wheel will carry approximately equal load in traversing over even ground. Spacing of wheels shall be such that distance between nearest edges of adjacent tires will not be greater than one-half width of one tire at operating pressure for 25,000 lb. wheel load. Roller shall have body suitable for ballast loading such that load per wheel may be varied, if so directed, between 10,000 lb. and 25,000 lb. Roller shall be towed at speeds not exceeding 10 miles per hour.
  - 2. Acceptable drum type vibratory compactor operating at not less than 2,000 vibrations per minute.
  - 3. In any event, regardless of equipment used, compaction of soil shall meet the relative densities stated in this section.

### 3.16 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions. Scarify or remove and replace material to depth directed by the Engineer; reshape and re-compact at optimum moisture content to the required density.

- C. Settling: Where settling occurs within one (1) year after project completion, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.

3.17. FIELD QUALITY CONTROL

- A. Testing Agency Services: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
- B. Field in-place density tests may be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017.
- C. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, re-compact and retest until required density is obtained.

3.18. DISPOSAL OF SURPLUS AND WASTE MATERIAL

- A. All unsuitable material, and suitable material not required for the proper completion of the contract, shall become the property of the Contractor, and shall be removed and properly disposed of off-site at no additional cost to the Owner.
- B. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, debris, and pavement, and legally dispose of it off the Owner's property, at no additional cost to the Owner.
- C. Reuse: Transport surplus satisfactory soil to designated storage areas on the Owner's property. Stockpile or spread soil as directed by the Engineer.
  - 1. Remove waste material, including unsatisfactory soil, pavement, trash, and debris, and legally dispose of it off the Owner's property, at no cost to the Owner. Contractor to obtain and pay for all necessary permits or licenses for off-site disposal.

END OF SECTION

SECTION 31 1000

SITE PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction 2023 Edition with latest addenda applies to this Section.
- C. Related Sections
  - 1. 31 0000 Earthwork
  - 2. 31 2060 Erosion and Sedimentation Controls

1.2 DESCRIPTION OF WORK

- A. This work shall consist of clearing and grubbing, clean-up, cutting and removing isolated trees and stumps, stripping and stockpiling topsoil, removing and disposing of all vegetation, bollards, fence posts, cut off fence posts and associated concrete foundations, hazard markers, signs, sign posts and any other obstructions and undesirable materials within project site which are not designated or permitted to remain.
  - 1. Refer to Section 31 0000 Earthwork
  - 2. Refer to Section 31 2060 Erosion and Sedimentation Controls

1.3 PROTECTION

- A. Prior to commencing the work, all areas shown on the plans as existing tree save areas and new tree line shall be identified, clearly marked and protected until accepted. Storage of construction materials, vehicle parking of access shall be allowed only in areas designated by Engineer, and approved by Owner. Any damaged plant materials resulting from neglect by the general Contractor or his subcontractors shall result in a monetary and/or plant material exchange.
- B. All other non-treed areas indicated to remain in its natural state shall also be protected by the Contractor. Any resulting damage due to the Contractor's neglect shall be restored to the satisfaction of the Engineer. If restoration is not satisfactory, then sufficient monies to cover damage shall be withheld from the Contractor.

- 1.4 Contractor shall protect treed and environmentally sensitive areas by installing tree and shrub protective devices, or any such barriers necessary to protect these areas. Trees and shrubs to be saved within work area shall be protected by tree protective devices or snow fence. Refer to the Contract Drawings for locations and details.

1.5 RESTRICTIONS

- A. Prior to clearing operations, the Contractor shall clearly and plainly mark on the ground, by use of colored tape, limits of clearing and grubbing, as indicated on plans. No clearing or cutting

shall be done prior to such field determination. Contractor shall relate the tree lines from the horizontal control geometry and other control points as plan referenced.

- B. When limits of clearing have been physically and clearly marked together with building and roadway centerline stakes, Contractor shall then notify the Engineer for an on-site review of the clearing limits. Failure of the Contractor to notify the Engineer prior to commencing this work shall result in forfeiture of payment for this work.
- C. It is the declared and acknowledged intention that, other than those areas required for existing and new building and physical structures, roads, storm drainage facilities, walks, parking areas, athletic fields and site grading, the remainder of site shall remain in its natural state.

#### 1.6 SAFETY

- A. All operation required under this section shall be conducted in a safe manner employing whatever means are necessary to provide safety to all persons on the project site.

### PART 2 - PRODUCTS

#### 2.1 TREE PROTECTIVE DEVICES

- A. Wood framing shall consist of nominal lumber 6 feet in length, and width and thickness varying from 2-inch by 2-inch to 2-inch by 6-inch, depending on trunk diameter. Binding material shall consist of wire single strand 9 gauge wire or ½-inch strapping.

#### 2.2 SHRUB PROTECTION DEVICES

- A. Standard snow fence, 4 feet in height, installed around the shrub or grouping of shrubs to be protected. The snow fence will be supported by nominal 2" hard wood posts, embedded as required into the ground surface. Additional support to be provided by wire or rope guys attached to nominal 2" hard wood stakes driven into the ground surface.

### PART 3 - EXECUTION

#### 3.1 CLEARING

- A. Clearing shall consist of felling and cutting up or trimming of trees, and satisfactory disposal of trees together with downed timber, snags, brush, shrubs, fences, logs, rubbish, rock walls or other debris occurring within areas indicated on the plans as new construction.
- B. Trunks of trees may not be cut off more than 6" above original ground surface, in areas to be cleared where grubbing is not required.
- C. Trunks of trees at the top of slopes, where rounding of slopes occur to meet existing ground and tree line, shall be cut off flush with or below the final slope line.

#### 3.2 GRUBBING

- A. Grubbing shall consist of removal and satisfactory disposal of stumps and buried roots larger than 1-1/2" diameter, to a depth of 18" below surface of original ground, except stumps within proposed structural foundation areas shall be entirely removed.

- B. Areas to be grubbed shall be as follows:
  - 1. New road and paved areas where depth of fill is less than 3', measured from subgrade to the original ground surface.
  - 2. Areas occupied by building to a horizontal distance of 6' outside the building walls or to the toe of slopes for buildings on fill.
  - 3. In cut areas for the entire width or cut.
  - 4. In non-paved areas required to be filled, if depth of fill is less than 2'.
  - 5. Except for building and structural foundation areas, no grubbing shall be required in areas where the height between the subgrade and original ground surface exceeds 3'. The remaining stumps may be left provided they do not extend more than 6" above the ground surface.

### 3.3 ISOLATED TREES

- A. Isolated trees and stumps designed to be removed shall be cut and their stumps as well as any other designated stump shall be removed by excavation, grinding or other mechanical means.
- B. Brush, shrubs or other vegetation designated to be removed shall be cut at ground level and disposed as indicated elsewhere in this specification.

### 3.4 DISPOSAL OF CLEARED AND GRUBBED MATERIALS, ISOLATED TREES, STUMPS AND OTHER VEGETATION

- A. The Contractor shall dispose of the trees, brush, shrubs and other perishable material by any of the following methods:
  - 1. The Contractor may sell or salvage all merchantable timber from clearing and grubbing operations.
  - 2. The Contractor may chip trees on the site, for use as directed by Engineer; all surplus chips shall become the property of the Contractor.
  - 3. All trees and brush to be cleared shall become the property of the Contractor. The satisfactory disposal of this material off the site will be the Contractor's responsibility. Disposal must be in accordance to applicable federal, state and local community requirements.
- B. No burning of trees, brush, shrubs or perishable material will be allowed on project site. The Contractor will not be allowed to haul trees, brush, shrubs or perishable material from the project for the purpose of burning.
- C. Stumps, roots and perishable materials shall be removed from the project site prior to earthwork operations.

### 3.5 DISPOSAL OF OTHER MATERIALS

- A. The disposal of other materials designed or needed to be removed in order to complete the designated construction will be the responsibility of the Contractor in accordance with all local, state and federal requirements.
- B. Voids from the removal of sign posts, foundations, fence posts, bollards, or other objects designated to be removed will be filled with material and compaction meeting the requirements of Division-2 Section "Earthwork".

3.6 STRIPPING

- A. The Contractor shall remove to the extent ordered and satisfactorily, transport and store all suitable topsoil for use as loam.
- B. Storage area shall be on site. If no storage areas are indicated on plans or available on-site, then Contractor shall make provisions to store topsoil elsewhere for use of the project. Engineer's approval of storage areas required.
- C. All stripped topsoil shall remain the property of the Owner (unless otherwise stipulated in writing) and no material shall be hauled off-site until Engineer is notified. Failure of the Contractor to notify the Engineer prior to hauling any topsoil off-site shall result in forfeiture of payment for this work.
- D. Stripped topsoil shall be obtained from open fields or grassed areas containing organic material suitable for loaming operations. The depth of stripping shall vary based on subsurface information provided elsewhere in these specifications and actual site conditions. In any event, soils shall be removed to the minimum depth of topsoil. Mixing of subsoils shall be accepted. The depth of soil removal shall be verified in the field. All stripped topsoil shall be screened and tested for suitability for use under lawns and adjusted as required.
- E. Any stripped topsoil not required for this project shall remain the property of the Owner unless Contractor is directed to remove surplus topsoil from site, which he shall do at no additional expense to the Owner.

3.7 UNSUITABLE MATERIAL

- A. Excavated unsuitable material shall be separated and classified as unsuitable material, unsuitable non-hazardous material (sludge) and unsuitable hazardous material.

3.8 TREE AND SHRUB PROTECTION DEVICES

A. TREE PROTECTION DEVICES

- 1. This work shall consist of applying wood framing around the trunk or trunks of the tree from the ground level to a height of 6 feet.
- 2. The wood framing shall be placed around the trunk in sufficient quantity to protect the trunk from mechanical damage. The binding material shall be tight enough to prevent the wood from being moved. None of the binding materials shall come in contact with the trunk or any portion of the tree. In no instance shall nails or any other type of fastener enter the tree. The wood framing shall be removed when all mechanical work within the surrounding area has been completed.

B. SHRUB PROTECTION DEVICES

- 1. This work shall consist of the furnishing and installation of standard snow fence around the shrub or grouping of shrubs designated to be protected as indicated on the plan details or as directed by the Engineer.
- 2. All installations will include reflective tape on the guy wires or ropes as warning devices for vehicular or pedestrian traffic. Each guy wire or rope is to be marked with a minimum of two 12" long by 1" wide strips of reflective tape.
- 3. Upon completion of construction, with the approval of the Engineer protective devices are to be dismantled and removed from the site.

END OF SECTION

SECTION 31 2060

EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction 2023 Edition with latest addenda.
- C. Soil Erosion and Sediment Control Plan, Bryant University: Student Housing, 1150 Douglas Pike, Smithfield, RI 02917, AP 49, Lot 125, dated January 2024.
- D. Related Sections:
  - 1. 31 1000 Site Preparation
  - 2. 31 0000 Earthwork

1.2 DESCRIPTION OF WORK

- A. Furnish and install temporary control measures as shown on the plan or as needed during the progress of the work or as ordered by the Engineer during the life of the contract to control water pollution through use of mulches, grasses, netting, fiber mats, silt fences, brush and baled hay checks, and sand bags and filter fabrics and other erosion control devices and methods.
- B. The Contractor shall attend a pre-construction meeting to discuss in detail his intended construction sequence and accompanying soil erosion and sediment control program.
- C. The Contractor is responsible for compliance with the rules and regulations governing the enforcement of the Rhode Island Freshwater Wetlands Act.
- D. The Contractor is responsible for full compliance with the Soil Erosion and Sediment Control Plan, including all necessary inspections and any remedial actions determined to be necessary by the Owner or Engineer.
- E. The temporary pollution control provisions contained herein shall be coordinated with the permanent erosion control by the Contractor who shall submit plans showing the methods of control to be utilized prior to commencing of work depicting the various areas to assure economical, effective and continuous erosion control throughout the construction and post construction period.
- F. Plans include specific requirements on erosion and sediment control including requirements of regulatory agencies and limits on area of soil which can be disturbed during any one time period for this project.



PART 2 - PRODUCTS

2.1 MATERIALS

- A. Mulches
  - 1. Mulches may be hay, straw, fiber mats, netting, wood cellulose, corn or tobacco stalks, bark, corn cobs, wood chips, or other suitable material and shall be reasonably clean and free of noxious weeds and deleterious materials.
- B. Silt Fence
  - 1. Silt fence shall be Enviro Fence by Mirafi, Propex Silt Stop manufactured by Amoco Fabrics Company, or approved equal.
- C. Baled Hay Erosion Check
  - 1. Baled hay shall be approximately 36"x18"x24".
- D. Grass
  - 1. Grass shall be a quick growing species suitable to the area providing a temporary cover, which will not later compete with the grasses sown later for permanent cover. Seed mixture is indicated on project plans.
- E. Fertilizer and Soil Conditioners
  - 1. Standard commercial grade as reviewed by the Engineer.
- F. Stone
  - 1. Stone shall be approximately 12" to 18" diameter in size.
- G. Excelsior Blanket
  - 1. The excelsior blanket shall consist of a machine produced mat of curled wood excelsior of 80% six inch or longer fiber length, with consistent thickness and the fiber evenly distributed over the entire area of the blanket. The top side of each blanket shall be covered with a photodegradable extruded plastic mesh. The blanket shall be made smolder resistant without the use of chemical additives. Excelsior blanket shall be furnished in rolls of 48 inches by 180 feet, with a weight of 78 lbs. plus or minus 10%, covering and areas of 80 sq. yd. per roll. Staples shall be made of wire, 0.091 inches in diameter or greater, "U" shaped with legs 6 inches in length and a 1 inch crown. Longer staples may be required for loose soils.
- H. Hay and Straw
  - 1. Hay and straw for mulch shall be mowings of acceptable herbaceous growth reasonably dry. No salt hay shall be used. This mulch shall be used to stabilize slopes and assist in maintaining soil temperature during seed germination. Straw or hay mulch must be anchored immediately after spreading to prevent windblowing. The following methods of anchoring straw or hay may be used:
    - a. Mulch Anchoring Tool: A tractor-drawn implement designed to punch mulch into the soil surface, limited to use on slopes no steeper than 3' horizontally to 1' vertically. Machinery shall be operated on the contour.
    - b. Mulch Netting: Install in accordance with manufacturer's recommendations.
    - c. Liquid Mulch Binders: Application of liquid mulch binders and tackifiers should be heaviest at edges of areas and at crests of ridges and banks to prevent windblowing. The remainder of the area should have binder applied uniformly. Binders may be applied after mulch is spread or may be sprayed into the mulch as it is being blown onto the soil. Applying straw and binder together is the most effective method,

- d. Chemical binders such as petroset, terratack, hydro mulch and aerospray may be used as recommended by the manufacturer to anchor mulch.
- i. Hay Bales
  - 1. Hay bales shall be mowings of acceptable herbaceous growth reasonably free from noxious weeds or woody stems and shall be reasonably dry. Hay bales shall be approximately 36" long x 18" wide x 24" high. Bales shall be anchored with 2"x2"x3' long wooden stakes.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

- A. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, the surface area of erodible earth material exposed by excavation, borrow and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams or other water courses, lakes, ponds or other areas of water impoundment. Such work may involve the use of temporary mulches, mats, seeding, check dams or other control devices or methods as necessary to control erosion. Cut slopes shall be seeded and mulched as the excavation proceeds, to the extent considered desirable and practicable.
- B. The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time. Temporary pollution control measures will be used to correct conditions that develop during construction, that were not foreseen during the design stage, that are needed prior to installation of permanent pollution control features, or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project, at no additional cost to the Owner.
- C. Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise temporary erosion control measures may be required between successive construction stages. Under no conditions shall the surface area of erodible earth material exposed at one time, by stripping of topsoil, exceed five (5) acres without review by the Engineer.
- D. Contractor shall have on-site all necessary hay bales, silt fence, rip-rap, and storm drainage piping etc., prior to undertaking any work that may cause erosion.
- E. The Engineer will limit the area of excavation, borrow and embankment operations in progress commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent pollution control measures current. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible, justified and indicated on plans at no additional costs to Owner.
- F. If overland water flow becomes a problem in the construction progress then the Contractor shall take it upon himself to construct any and all ditches, temporary roads, fills and pipe culverts as necessary to alleviate a water problem which may affect progress of work. This work shall be performed at no additional expense to the Owner.

- G. Under no circumstances shall the amount of surface area of erodable earth material exposed at one time by excavation, borrow or fill within the right of-way exceed five (5) acres without prior review by the Engineer.
- H. The Engineer may increase or decrease the amount of surface area of erodable earth material to be exposed at one time by clearing and grubbing, excavation, borrow and fill operations as determined by his analysis of project conditions.
- I. In the event of conflict between these requirements and pollution control laws, rules and regulations of the federal, state or local agencies, the more restrictive laws, rules, or regulations shall apply.
- J. Excelsior Blanket:
  - 1. Contractor shall furnish, place, secure and maintain excelsior blanket over seeded areas as indicated on the plans or directed by the Engineer if so specified on the project plans. The area to be covered shall be properly prepared, fertilized and seeded before the blanket is applied. When the blanket is unrolled, the netting shall be on top and the fibers shall be in contact with the soil over the entire area. In ditches, the blankets shall be applied in the direction of the flow of water, butted snugly at ends and sides, and then stapled. On slopes, the blankets shall be applied either horizontally or vertically to the slope. Ends and sides shall be butted snugly and stapled.
  - 2. The blanket shall be held in place by means of staples driven vertically into the soil. Staples shall be spaced approximately two lineal yards apart, on each side, and one row in the center alternately spaced between each side (60 staples for each blanket). Use a common row of staples on adjoining blankets. In areas of high water velocity, as determined by the Engineer, staples shall be installed on two foot centers.
  - 3. The Contractor shall maintain the excelsior blanketed areas until all work on the entire contract has been completed and accepted. Maintenance shall consist of the repair of areas damaged by erosion, wind, fire or other causes. Such areas shall be repaired to reestablish the condition and grade of the soil prior to application of the matting and shall be refertilized and reseeded as specified.
- K. Silt Fence
  - 1. Unless directed otherwise, silt fences shall be placed as indicated on project plans or as directed by the Engineer.
  - 2. Installation shall be per plan details.
- L. Installation Location of Baled Hay and Silt Fences
  - 1. Hay Bales
    - a. Contractor shall furnish, place, secure (with stakes) and maintain hay bales at locations indicated on the plans or directed by the Engineer.
    - b. Hay bales shall remain and be maintained by the Contractor until directed to be removed by the Engineer.
  - 2. Silt Fence
    - a. Unless directed otherwise, silt fences shall be placed at the locations indicated on the plans.

### 3.2 CONSTRUCTION ENTRANCES

- A. Stabilized construction entrances shall be installed at all points of access to reduce or eliminate tracking or flowing of sediment onto the town road in accordance with the following criteria:
  - 1. Provide 1 to 2-1/2 inch crushed stone, min. 8" thick.
  - 2. Construction entrance shall be as wide as or wider than all points of ingress and egress.

3.3 SPECIAL INSTRUCTIONS

- A. Silt fence shall be inspected during storm events, after each rainfall of one-inch magnitude or greater, prior to weekends, and prior to any forecasted storm events. The Contractor shall submit weekly inspection reports to the Engineer.
- B. In the event that temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled, and are ordered by the Engineer, such work shall be performed by the Contractor at his own expense.
- C. It is also the Contractor's responsibility to maintain the placement of hay bales, silt fences and other erosion control devices, remove silt from ditches and culverts and to repair any erosion of ditches and slopes.
- D. In case of repeated failures on the part of the Contractor to control erosion, pollution, and/or siltation, the Engineer reserves the right to employ outside assistance or to use his own forces to provide the necessary corrective measures. Such incurred direct cost plus project engineering costs will be charges to the Contractor and appropriate deductions made from the Contractor's monthly progress payment.
- E. Any erosion, siltation or general damage resulting from neglect by the Contractor to undertake temporary and permanent erosion control measures as required or directed shall result in the responsibility of the Contractor to correct the areas as determined by the Engineer.
- F. Contractor shall also be required to install and maintain temporary erosion control measures within a time frame agreeable to the Engineer.
- G. Temporary pollution control may include construction work outside the project limits where such work is necessary as a result of utility installations and equipment storage sites.
- H. The erosion control features installed by the Contractor shall be acceptable maintained by the Contractor.
- I. When a reasonable ground cover has been established, with the approval of the Engineer, the Contractor will remove all temporary erosion control measures, and the Contractor shall regrade and seed the area from which these measures were removed. Grading and seeding will be by hand if access for mechanical equipment is not possible.

END OF SECTION

SECTION 312300

SOIL AND AGGREGATE MATERIALS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
  - 1. Requirements for furnishing and placing materials which include Crushed Stone, Bank Gravel, Gravel Borrow Base Course, Common Borrow, and Sand.
  - 2. Location of specified materials as detailed on the Drawings or as directed by the Engineer for excavation below normal depth, utility support, replacement of unsuitable material or elsewhere, as ordered.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- C. Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction 2023 Edition with latest addenda applies to this Section.
- D. Related Sections
  - 1. 31 2000 Earthwork
  - 2. 32 1313 Concrete Paving
  - 3. 32 1216 Asphalt Paving
  - 4. 32 1413 Precast Concrete Curbing

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO).
  - 1. T11-85, Amount of Material Finer than 0.075 mm Sieve in Aggregate.
  - 2. T27-84, Sieve Analysis of Fine and Coarse Aggregates.
- B. American Society for Testing and Materials (ASTM).
  - 1. D 1557-91, Test Method for Moisture Density Relations of Soils and Soil Aggregate Mixtures Using 10-lb (4.54-kg) Rammer and 18-in. (475-mm) Drop.
- C. Standard Specification for Road and Bridge Construction of the Rhode Island Department of Transportation, dated 2023, together with all erratic, addenda, additional revisions and supplemental specifications, all of which are hereinafter referred to as the Rhode Island Standard Specifications.

1.3 SUBMITTALS

- A. Shop Drawings
  - 1. Provide sieve analysis when gradation requirements are given in the Specification.
- B. Sample
  - 1. Furnish representative sample including location of source with Shop Drawing transmittal sheet.

1.4 QUALITY ASSURANCE

A. Field Samples

1. All materials furnished by the Contractor to be incorporated into the work shall be subject to the inspection of the Engineer. The Engineer shall be the sole judge as to the acceptability of proposed materials and said judgment shall be final, conclusive, and binding.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Storage and protection of aggregate materials shall be in accordance with Section 00 7000.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Bank Gravel

1. Granular material well graded from fine to coarse with a maximum size of 6 inches, obtained from approved natural deposits and unprocessed except for the removal of unacceptable material and stones larger than the maximum size permitted.
2. Gravel shall not contain vegetation, masses of roots, or individual roots.
3. Gravel shall be substantially free from loam, organic matter, clay and other deleterious materials.
4. Gradation requirements for gravel shall be determined by AASHTO-T11 and T27 and conform to the following:

Sieve	Percent Passing
1/2 inch	60-95
No. 4	50-85
No. 50	8-28
No. 200	0-8

B. Crushed Stone

1. Well graded in size from 3/8 inches to 3/4 inches or such other sizes as may be approved.
2. Clean, hard, and durable particles or fragments, free from dirt, vegetation, or other objectionable matter, and free from an excess of soft, thin elongated, laminated or disintegrated pieces.
3. Screened stone of suitable size and grading may be used instead of crushed stone.
4. The specifications shall apply whichever material is used. See Section M.01 of the Rhode Island Standard Specifications.

C. Gravel Borrow Base Course

1. Materials and methods of placing gravel borrow base course shall conform to the requirements of Section 301 of the Rhode Island Standard Specifications.
2. All material used for bedding water pipes, sidewalks, driveways, and for gravel roadway subbase shall conform to Section M.01 of the Rhode Island Standard Specifications.
3. All materials used for the bedding of electrical conduit shall conform to the requirements of Section M.01, of the Rhode Island Standard Specifications.

D. Common Borrow

1. Materials and methods of placing common borrow shall conform to the requirements of Section 202 of the Rhode Island Standard Specifications.

- E. Sand Borrow
  - 1. Materials for sand borrow shall conform to the requirements of ASTM C-33 Fine Aggregate Concrete Sand.

## 2.2 SOURCE QUALITY CONTROL

- A. Test, Inspection
  - 1. The Engineer may elect to sample material supplied at the source.
  - 2. Assist the Engineer and/or personnel from the designated testing laboratory in obtaining samples.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Bank Gravel
  - 1. Spread in layers of uniform thickness not exceeding 8 inches before compaction and moistened or allowed to dry as directed.
  - 2. Compact thoroughly by means of suitable power-driven tampers or other power-driven equipment.
  - 3. Compaction shall conform to 95 percent of minimum dry density per ASTM D 1557.
  - 4. The percolation rate for the compacted bank-run gravel shall not exceed 5 minutes per inch.
- B. Crushed Stone
  - 1. Spread in layers of uniform thickness not greater than 6 inches.
  - 2. Compact thoroughly by means of a suitable vibrator or mechanical tamper.

### 3.2 FIELD QUALITY CONTROL

- A. Site Tests shall be completed in accordance with Section 01 4000 Quality Control.

### 3.3 GRAVEL BORROW BASE COURSE PLACEMENT

- A. Prior to placing pavement, all backfill shall have been properly compacted as specified under Section 31 00 00 to eliminate settling of backfill. No pavement shall be placed over poorly compacted backfill. Backfill and base course shall be compacted, brought to the proper elevation, and dressed so that new pavement construction shall be at the required grade. The Contractor shall maintain the surfaces of all excavated and disturbed areas until the pavement is placed. If there is a time lapse of more than 24 hours between the completion of preparation of subgrade or placing of gravel borrow base course and placing of paving, or if subgrade of gravel borrow base course has been eroded or disturbed by traffic, the subgrade or base course shall be restored before placing paving.
- B. The Contractor shall remove and stockpile of all surplus material and remove and acceptably dispose of all unsuitable material.
- C. Before permanent paving is installed, the base shall be brought up to grade, and temporary pavement and excess gravel shall be removed.

### 3.4 TOLERANCES

- A. See Rhode Island Standard Specifications.

END OF SECTION



SECTION 321216

ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction 2023 Edition with latest addenda applies to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Class 9.5 Hot Mix Asphalt (HMA)
  - 2. Class 12.5 HMA
  - 3. Tack coat.
- B. Related Sections:
  - 1. Section 01 4000 Quality Control
  - 2. Section 31 0000 Earthwork
  - 3. Section 31 2300 Aggregate Materials

1.3 SUBMITTALS

- A. Shop Drawings: Include plans, elevations, sections, details, RIDOT approved mix designs and attachments to other work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Class 9.5 and Class 12.5 HMA shall be RIDOT approved and shall conform to the requirements of Section 401 of the Rhode Island Standard Specifications. The HMA pavement shall consist of the layers and thicknesses as shown on the Plans. RAP, RAS or other reclaimed material shall not be used.
- B. Tack coat shall conform to the requirements of Section 403 of the Rhode Island Standard Specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Methods of placing Class 9.5 and Class 12.5 HMA shall conform to the requirements of Section 401 of the Rhode Island Standard Specifications.

- B. Methods of placing tack coat shall conform to the requirements of Section 403 of the Rhode Island Standard Specifications. All vertical joints and saw cut vertical faces that are adjacent to new HMA shall receive tack coat.
  - 1. The application rate for old pavement shall be 0.1 gallons per square yard, plus-or-minus 0.02 gallons per square yard.
- C. Where existing paved surfaces are to be retained and are required to join the pavement constructed hereunder, the existing jointed edges shall be saw cut vertically to the full depth, not less than 1 foot back from their present locations or at the location as directed by the Engineer and/or shown on the Drawings, and painted with tack coat.

**3.2 HAULING EQUIPMENT**

- A. Cleaning of truck beds shall be done off site and will not be allowed in any area that will be paved.

**3.3 TOLERANCES**

- A. See Rhode Island Standard Specifications.

END OF SECTION

SECTION 32 1313

CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction 2023 Edition with latest addenda applies to this Section.

1.2 SUMMARY

- A. Section includes cement concrete sidewalks, driveways and wheelchair ramps.
- B. Related Sections:
  - 1. Section 01 4000 Quality Control
  - 2. Section 31 0000 Earthwork
  - 3. Section 31 2300 Aggregate Materials

1.3 SUBMITTALS

- A. Shop Drawings: Include plans, elevations, sections, details, RIDOT approved mix designs and attachments to other work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials for cement concrete sidewalks, driveways and wheelchair ramps shall conform to the requirements of Section 905 of the Rhode Island Standard Specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation of cement concrete sidewalks, driveways and wheelchair ramps shall conform to the requirements of Section 905 of the Rhode Island Standard Specifications.
- B. Wheelchair ramps shall be installed in accordance with the 2023 Rhode Island Standard Details and all revisions.
- C. The Contractor shall establish grade elevations at all wheelchair ramp locations, and shall set transition lengths according to the appropriate table from the wheelchair ramp details in the Rhode Island Standard Details.

D. All wheelchair ramp joints and transition sections, which define grade changes shall be formed, staked and checked prior to placing cement concrete. All grade changes are to be made at joints.

E. All concrete sidewalk joints shall be reinforced with two (2) 12-inch #4 rebar dowels.

3.2 TOLERANCES

A. See Rhode Island Standard Specifications.

END OF SECTION