

# **PROJECT MANUAL**

## **A New TRANSYLVANIA COUNTY EMS BASE**

### **TRANSYLVANIA COUNTY BOARD OF COMMISSIONERS**

**BREVARD, NORTH CAROLINA  
Sept. 21, 2022**



**RICHARD L. WORLEY, AIA ARCHITECT**  
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## **RICHARD L. WORLEY, AIA ARCHITECT**

4078 Haywood Road – Mills River, North Carolina 28759 Phone (828) 891-7389 ext. 126 fax (828) 891-5882

### **SECTION 000010 - INVITATION TO BID**

Transylvania County will be accepting sealed bids for the **New EMS Base Facility**, site located at 535 Morris Road (the corner of Morris Road and Ecusta Road), Brevard, North Carolina.

The project consist of a new building constructed of wood framing/concrete masonry units, prefab wood roof trusses, brick veneer, fiber cement siding, asphalt shingles, concrete slab on grade, mezzanine constructed of wood floor joist and sheathing, aluminum storefront window/entrances, aluminum gutters, painted gypsum board wall/ceiling finishes, acoustical layin ceiling system, painted concrete masonry wall in Truck Bay areas, vct tile, carpet tiles, ceramic tile, hollow metal doors/frames, wood doors, sectional garage doors, Plumbing/Mechanical/Electrical work including emergency transfer switch (Generator by Owner), Civil work including grading, soil remediation, disposal of unsuitable soil, fill from Owners local source, aggregate piers, parking and drives consisting of concrete and asphalt paving and an NFPA 13 D fire suppression system in a portion of the building.

The work will be let under one contract. **General Prime** bids only.

Plans and specifications will be on file and available for public inspection beginning **Wednesday, September 21, 2022,** at the following location.

Transylvania County Finance Office  
101 South Broad Street  
Brevard, NC 28712

Copies of RFP with detailed specifications, information and selection criteria may be obtained by qualified bidders beginning **September 21, 2022** by contacting Jennifer Galloway at the Transylvania County Finance Department, 101 South Broad Street, Brevard, NC 28712 or at [jennifer.galloway@transylvaniacounty.org](mailto:jennifer.galloway@transylvaniacounty.org), or at 828-884-3104.

**A MANDATORY** Pre-Bid Conference will be held on **Wednesday, October 5, 2022 at 10:00 AM EST** in the County Commissioners Chambers at 101 South Broad Street, Brevard, NC 28712. The Conference will include a discussion of the scope and nature of the work, review of the Contract Documents and discussion of questions submitted by the bidders. **Attendance is required by all contractors who plan to bid on this project.**

Questions regarding the project documents should be submitted in writing by **Wednesday, October 12, 2022 at 4:00 PM EST** to Jennifer Galloway at 101 South Broad Street, Brevard, NC 28712 or emailed to [jennifer.galloway@transylvaniacounty.org](mailto:jennifer.galloway@transylvaniacounty.org).

**Bid is to be submitted on Form of Proposal (Bid Form) provided in the Project Manual. Submit bids in sealed envelope that is clearly labeled with Project Name, Bidders Name and License Number on the outside of envelope.**

The Owner will receive sealed bids on **Wednesday, October 19, 2022 at 10:00 AM EST,** at the Transylvania County Administration Building located at 101 South Broad Street, Brevard, NC 28712. **Bids received after the specified date and time will not be accepted.** All prime bidders are invited to attend. Bids will be opened and read aloud.

**A Bid Security is required in the amount of 5% of the bid. Bid security must be in the form of an AIA A310 document, certified check or cashier check made payable to Transylvania County.**

**A Performance Bond and Payment Bond will be required of the successful bidder. Bonds must be executed by a surety company licensed to do business in North Carolina. Bond form shall be AIA Document A312. Refer to General and Supplementary Conditions indicated in the Project Manual.**

All bidders must have a NC General Contractors License in accordance with NC State Laws. The Owners reserve the right to waive irregularities and to reject bids.

RICHARD L. WORLEY, AIA ARCHITECT



## SECTION 000020 - FORM OF PROPOSAL

September 21, 2022

**TO: Transylvania County**  
**21 East Main Street**  
**Brevard, NC 28712**

I have received the documents entitled **Transylvania County EMS Base Facility**, located at 535 Morris Road, Brevard, North Carolina dated September 21, 2022. I have received **Addenda** \_\_\_\_\_ and have included their provisions in my Proposal. I have examined both the documents and the site and submit the following proposal. This proposal includes all work as indicated in the Drawings and Specifications.

This Form of Proposal must include the follow documents:

1. List of Subcontractors
2. Affidavit.
3. Contractors Qualification Form
4. Minority Business Participation Forms
5. Bid Security
6. E-Verify Affidavit

In submitting this proposal, I agree:

1. To hold my bid open for 45 days.
2. To enter into and execute a Contract, if awarded on the basis of this proposal.
3. To accomplish the work in accord with the Contract Documents.
4. To provide all required documentation regarding sales tax information associated with this project to the Owner in accordance with Government requirements in order for the Owners to receive reimbursement.
5. To maintain the terms of the E-Verify Affidavit.

**BASE BID: (excluding Alternates and Unit Prices below)**

**I will construct this project for the lump-sum price of:**

\_\_\_\_\_ Dollars (\$ \_\_\_\_\_).

**ALTERNATES:** (Refer to Bid Documents for description of Alternates). Alternates are **not** included in base bid.

**Alternate #1: I will provide this Alternate for the lump-sum price of: \$ \_\_\_\_\_**

I Propose and agree to complete the work within \_\_\_\_\_ calendar days from date the contract has been awarded.

**UNIT PRICES: (Refer to Bid Documents for description of Unit Prices).** Please indicate price for each Unit Price Below. Unit Prices are **not** included in base bid.

Unit Price #1: Railroad Ballast (\_\_\_\_\_) **per ton of placed railroad ballast.**

Unit Price #2: #57 Washed Stone (\_\_\_\_\_) **per ton of placed railroad rip rap.**

Unit Price #3: NCDOT Aggregate Base (\_\_\_\_\_) **per Cu Yd of compacted material.**

Unit Price #4: Woven Fabric ( ) per Sq Yd of placed material.

Unit Price #5: Non-Woven Fabric ( ) per Sq Yd of placed material.

Unit Price #6: Geogrid ( ) per Sq Yd of placed material.

Unit Price #7: Select Backfill ( ) per Cu Yd of placed material.

Unit Price #8: Unsuitable Soil ( ) per Cu Yd of removed material.

Unit Price #9: 4" PVC French Drain ( ) per Lin. Ft. of installed French Drain.

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

LICENSE #: \_\_\_\_\_

## SECTION 000030 - LIST OF SUBCONTRACTORS

PROJECT: \_\_\_\_\_

CONTRACTOR: \_\_\_\_\_

SUBCONTRACTORS:

(1)

Name: \_\_\_\_\_

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

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

Contact Person: \_\_\_\_\_

Type of Work: \_\_\_\_\_

Percentage of Total Contract: \_\_\_\_\_

(2)

Name: \_\_\_\_\_

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

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

Contact Person: \_\_\_\_\_

Type of Work: \_\_\_\_\_

Percentage of Total Contract: \_\_\_\_\_

(3)

Name: \_\_\_\_\_

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

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

Contact Person: \_\_\_\_\_

Type of Work: \_\_\_\_\_

Percentage of Total Contract: \_\_\_\_\_

(4)

Name: \_\_\_\_\_

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

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

Contact Person: \_\_\_\_\_

Type of Work: \_\_\_\_\_

Percentage of Total Contract: \_\_\_\_\_

(5)

Name: \_\_\_\_\_

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

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

Contact Person: \_\_\_\_\_

Type of Work: \_\_\_\_\_

Percentage of Total Contract: \_\_\_\_\_

(6)

Name: \_\_\_\_\_

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

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

Contact Person: \_\_\_\_\_

Type of Work: \_\_\_\_\_

Percentage of Total Contract: \_\_\_\_\_

*Make additional copies if needed.*

## AFFIDAVIT

This form must be completed, signed, notarized and returned with Bid. Failure to do so will be considered justification for the rejection of your Bid. A separate form must be submitted by each principal of a joint venture Bid.

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Project: Transylvania County  
Renovation of Old Detention Center for the Board of Elections  
Brevard, North Carolina

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

STATE OF: \_\_\_\_\_ COUNTY (CITY) OF: \_\_\_\_\_

This day personally appeared before the undersigned, a Notary Public in and for the City/County and State aforesaid, \_\_\_\_\_, who have been first duly sworn according to law, did depose and aver as follows:

1. That he is \_\_\_\_\_  
(Owner, partner, president, etc.)  
of \_\_\_\_\_  
(Insert name of Bidder)
2. That he is personally familiar with the Bid of  
\_\_\_\_\_ submitted in connection with  
(Name of Bidder)  
the above-captioned project.
3. That the Bid of said \_\_\_\_\_  
(Insert name of Bidder)  
Was formulated and submitted in good faith as the true  
Bid of said \_\_\_\_\_  
(Insert name of Bidder)

Richard L. Worley, AIA Architect

TC EMS Base

4. That in the preparation and submission of this Bid, said Bidder did not, either directly or indirectly, enter into any combination or arrangement with any person, firm or corporation or enter into any agreement, participate in any collusion, or otherwise take any action in the restraint of free, competitive bidding in violation of the Sherman Act (15 USC Section 1).

And further this deponent saith not.

\_\_\_\_\_  
Affiant

Subscribed and sworn to before me this \_\_\_\_\_ day of

\_\_\_\_\_ 20 \_\_\_\_\_.

My commission expires \_\_\_\_\_

\_\_\_\_\_  
Notary Public

***Note: This Affidavit must be submitted with the Bid. Failure to submit will be considered justification for rejection of the Bid.***

SECTION 000050 – CONTRACTOR’S QUALIFICATION FORM

PART 1 - GENERAL

Contractor is to submit with bid a Contractor’s Qualification Statement – AIA Document A305 – 1986. A draft copy has been provided for Contactor’s review. The submitted document in the bid package is to be an original document that has been fully executed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 000050





SECTION 000060 – MINORITY BUSINESS PARTICIPATION FORMS

PART 1 - GENERAL

1.1 SUMMARY

- A. The following are the Minority Business Participation Forms. Review documents and include appropriate form as required in Contractor's Bid Package.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 000100



**CERTIFICATION FOR TAXES**

Contract No: \_\_\_\_\_

Title: \_\_\_\_\_

I hereby certify that during the period \_\_\_\_\_ through \_\_\_\_\_, \_\_\_\_\_ paid North Carolina sales and use taxes aggregating \$\_\_\_\_\_ with respect to building materials, supplies, fixtures and equipment which have become a part of or annexed to a building or structure erected, altered or repaired by \_\_\_\_\_, and that the vendors from whom the property was purchased, the dates and numbers of the invoices covering the purchases, the total amount of the invoices of each vendor, the North Carolina sales and use taxes paid thereon, and the cost of property with-drawn from warehouse stock and North Carolina sales or use taxes paid thereon are as set forth in the attachments hereto.

\_\_\_\_\_  
Signature\_\_\_\_\_  
Title

N.C.State Tax (4.75%) \$ \_\_\_\_\_

Name of County	County Tax (2.0%, 2.25%)

Total County Taxes \$ \_\_\_\_\_

Total Taxes (State and County) \$ \_\_\_\_\_

.

State of North Carolina

AFFIDAVIT 000080

County of Transylvania

NOW COMES Affiant, first being sworn, deposes and says as follows

1. I have submitted a bid for contract or desire to enter into a contract with the County of Transylvania.
2. As part of my duties and responsibilities pursuant to said bid and/or contract, I attest that I am aware of and in compliance with the requirements of E-Verify, Article 2 of Chapter 64 of the North Carolina General Statutes, to include (mark which applies):

\_\_\_\_\_ After hiring an employee to work in the United States I verify the work authorization of said employee through E-Verify and retain the record of the verification fo work authorization while the employee is employee and for one year thereafter; or

\_\_\_\_\_ I employee less than twenty-five (25) employees in the State of North Carolina.

3. As part of my duties and responsibilities pursuant to said bid and/or contract, I attest that to the best of my knowledge any subcontractors employed as a part of this bid and/or contract are in compliance with the requirements of E-Verify, Article 2 Chapter 64 of the North Carolina General Statutes, to include (mark which applies):

\_\_\_\_\_ After hiring an employee to work in the United State the subcontractor verifies the work authorization of said employee through E-Verify and retains the record of the verification of work authorization while the employee is employed and for one year thereafter; or

\_\_\_\_\_ Employee less than twenty-five (25) employees in the State of North Carolina. Specify subcontractor:\_\_\_\_\_

This \_\_\_\_\_ day of \_\_\_\_\_, 2022.

\_\_\_\_\_  
Signature of Affiant

\_\_\_\_\_  
Print or Type Name

State of North Carolina County of Transylvania

Signed and sworn to (or affirmed) before me, this is the \_\_\_\_\_ day of \_\_\_\_\_, 2022.

\_\_\_\_\_, Notary Public

[OFFICIAL SEAL]

My Commission Expires: \_\_\_\_\_

SECTION 000100 – GENERAL CONDITIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. The General Conditions of the Contract for Construction is AIA Document A201 – 2007. Contractor is responsible for obtaining a copy of this document.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 000100





## **SECTION 000110 - SUPPLEMENTARY CONDITIONS**

The following supplements modify the "General Conditions of the Contract for Construction," AIA Document A201 - 2007 Edition. Where a portion of the General Conditions is modified or deleted by the Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

### **ARTICLE 1; GENERAL PROVISIONS**

#### **1.1 BASIC DEFINITIONS**

1.1.1 THE CONTRACT DOCUMENTS –No Modifications.

1.1.2 THE CONTRACT - No Modifications.

1.1.3 THE WORK - No Modifications

1.1.4. THE PROJECT - No Modifications.

1.1.5 THE DRAWINGS - No Modifications.

1.1.6 THE SPECIFICATIONS - No Modifications.

1.1.7 INSTRUMENTS OF SERVICE - No Modifications.

1.1.8 INITIAL DECISION MAKER – No Modifications.

#### **1.2 CORRELATION AND INTENT OF CONTRACT DOCUMENTS**

1.2.1 No Modifications.

Add Section 1.2.1.1 to Section 1.2.1:

1.2.1.1 In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities:

- .1 Modifications.
- .2 The Agreement.
- .3 Addenda, with those of later date having precedence over those of earlier date.
- .4 The Supplementary Conditions.
- .5 The General Conditions of the Contract for Construction.
- .6 Division 1 of the Specifications.
- .7 Drawings and Divisions 2–49 of the Specifications.
- .8 Other documents specifically enumerated in the Agreement as part of the Contract Documents.

1.2.2 No Modifications

1.2.3 No Modifications.

#### **1.3 CAPITALIZATION - No Modifications.**

#### **1.4 INTERPRETATION - No Modifications.**

#### **1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE**

1.5.1 No Modifications.

1.5.2 No Modifications.

#### **1.6 TRANSMISSION OF DATA IN DIGITAL FORM - No Modifications.**

### **ARTICLE 2; OWNER**

#### **2.1 GENERAL**

2.1.1 No Modifications.

2.1.2 No Modifications.

## **2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER**

2.2.1 No Modifications.

2.2.2 No Modifications.

2.2.3 No Modification.

2.2.4 No Modifications.

Delete Section 2.2.5 and substitute the following:

2.2.5 The Contractor will be furnished, free of charge, 5 copies of Drawings and Project Manuals. Additional sets will be furnished at the cost of reproduction, postage and handling as follows:

Drawings	\$ 4.00 per sheet
Specifications	\$ 6.00 per section
Specifications	\$55.00 per full set

Handling and postage charges to be as follows:

\$5.00 handling plus postage

## **2.3 OWNER'S RIGHT TO STOP THE WORK - No Modifications.**

## **2.4 OWNER'S RIGHT TO CARRY OUT THE WORK - No Modifications.**

# **ARTICLE 3; CONTRACTOR**

## **3.1 GENERAL**

3.1.1 No Modifications.

3.1.2 No Modifications.

3.1.3 No Modifications.

## **3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR**

3.2.1 No Modifications.

3.2.2 No Modifications.

3.2.3 No Modifications.

3.2.4 No Modifications.

Add the following Section 3.2.5 to Section 3.2:

3.2.5 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for evaluating and responding to the Contractor's requests for information that are not prepared in accordance with the Contract Documents or where the requested information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation.

## **3.3 SUPERVISION AND CONSTRUCTION PROCEDURES**

3.3.1 No Modifications.

3.3.2 No Modifications.

3.3.3 No Modifications.

## **3.4 LABOR AND MATERIALS**

3.4.1 No Modifications.

## 3.4.2 Add Section 3.4.2.1 to Section 3.4.2:

3.4.2.1 After the Contract has been executed, the Owner and Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in the General Requirements (Division 1 of the Specifications). By making requests for substitutions, the Contractor:

- .1 represents that the contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
- .2 represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;
- .3 certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently becomes apparent; and
- .4 will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

Add the following to the end of Section 3.4.2:

3.4.2.2 The Owner shall be entitled to reimbursement from the Contractor for amounts paid to the Architect for reviewing the Contractor's proposed substitutions and making agreed-upon changes in the Drawings and Specifications resulting from such substitutions.

## 3.4.3. No Modifications.

## 3.4.4 Add Subparagraph 3.4.4 as follows:

The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect to evaluate the Contractor's proposed substitutions and to make agreed upon changes in the Drawings and Specifications made necessary by the Owner's acceptance of such substitutions.

**3.5 WARRANTY - No modification.****3.6 TAXES**

3.6.1 The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

## 3.6.2 Add the following Paragraph:

3.6.2 The Owner is eligible for reimbursement of all sales tax. The Contractor is to submit the Transylvania County Sales/Use Tax Form included in the Project Manual with each Application. Should additional information be required for adequate documentation verifying that taxes have been paid and which State, County and City collected the taxes, in order for the Owner to apply for reimbursement, the Contractor will be responsible for providing such documentation.

**3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS**

3.7.1 No modification

3.7.2 No Modifications.

3.7.3 No Modifications.

3.7.4 No Modifications.

3.7.5 No Modifications.

**3.8 ALLOWANCES**

3.8.1 No modification

3.8.2.1 No modification

3.8.2.2 No Modifications.

3.8.2.3 No Modifications.

3.8.3 No modification

**3.9 SUPERINTENDENT**

3.9.1 No Modifications.

3.9.2 No Modifications.

3.9.3 No Modifications.

**3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES**

3.10.1 No modification.

3.10.2 No Modifications.

3.10.3 No Modifications.

**3.11 DOCUMENTS AND SAMPLES AT THE SITE - No modification.**

**3.12. SHOP DRAWINGS, PRODUCT DATA AND SAMPLES**

3.12.1 No Modifications.

3.12.2 No Modifications.

3.12.3 No Modifications.

3.12.4 No Modifications.

3.12.5 No Modification.

3.12.6 No Modifications.

3.12.7 No Modifications.

3.12.8 No Modifications.

3.12.9 No Modifications.

3.12.10 No Modifications.

Add Section 3.12.11 to Section 3.12:

3.12.11 The Architect's review of Contractor's submittals will be limited to examination of an initial submittal and one (1) resubmittals. The Owner is entitled to obtain reimbursement from the Contractor for amounts paid to the Architect for evaluation of additional resubmittals.

**3.13 USE OF SITE - No modification.**

**3.14 CUTTING AND PATCHING**

3.14.1 No Modification

3.14.2 No Modifications.

**3.15 CLEANING UP**

3.15.1 No Modifications.

3.15.2 No Modifications.

**3.16 ACCESS TO WORK - No modification.**

**3.17 ROYALTIES, PATENTS AND COPYRIGHTS - No modification.**

### **3.18 INDEMNIFICATION**

3.18.1 No modification

3.18.2 No Modifications.

## **ARTICLE 4; ARCHITECT**

### **4.1 GENERAL**

4.1.1 No Modifications.

4.1.2 No Modifications.

4.1.3 No Modifications.

### **4.2 ADMINISTRATION OF THE CONTRACT**

4.2.1 Add Clause 4.2.2.1 to Subparagraph 4.2.1:

4.2.2.1 The Contractor shall reimburse the Owner for compensation paid to the Architect for additional site visits made necessary by the fault, neglect or request of the Contractor.

4.2.2 No Modifications.

4.2.3 No Modifications.

4.2.4 No Modifications.

4.2.5 No Modifications.

4.2.6 No Modifications.

4.2.7 No Modifications.

Add Section 4.2.7.1 to Section 4.2.7 as follows:

4.2.7.1 In no case will the Architect's review period on any submittal be less than three (3) days after receipt of the submittal from the Contractor.

4.2.8 No Modifications.

4.2.9 No Modifications.

4.2.10 No Modifications.

4.2.11 No Modifications.

4.2.12 No Modifications.

4.2.13 No Modifications.

4.2.14 No Modifications.

Add Section 4.2.14.1 to Section 4.2.7 as follows:

4.2.14.1 Contractor's requests for information shall be prepared and submitted in accordance with Division 1 "General Requirements" included in the Contract Documents. The Architect will return without action requests for information that do not conform to requirements of the Contract Documents.

## **ARTICLE 5; SUBCONTRACTORS**

### **5.1 DEFINITIONS**

5.1.1 No Modifications.

5.1.2 No Modifications.

### **5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK**

5.2.1 Delete "as soon as practicable" and replace with "not later than 21 days"

5.2.2 No Modifications.

5.2.3 No Modifications.

5.2.4 No Modifications.

Add Section 5.2.5 as follows:

5.2.5 Not later than seven (7) days after the date of commencement of the Work, the Contractor shall furnish in writing to the Owner through the Architect the names of persons or entities proposed as manufacturers or fabricators for certain products, equipment and systems identified in the General Requirements (Division 1 of the Specifications) and, where applicable, the name of the installing Subcontractor.

**5.3 SUBCONTRACTURAL RELATIONS - No Modifications.**

**5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS**

5.4.1.1 No Modifications.

5.4.1.2 No Modifications.

5.4.2 No Modifications.

5.4.3 No Modifications.

**ARTICLE 6; CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS**

**6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS**

6.1.1 No Modifications.

6.1.2 No Modifications.

6.1.3 No Modifications.

6.1.4 No Modifications.

**6.2 MUTUAL RESPONSIBILITY**

6.2.1 No Modifications.

6.2.2 No Modifications.

6.2.3 No Modifications.

6.2.4 No Modifications.

6.2.5 No Modifications.

**6.3 OWNER'S RIGHT TO CLEAN UP \_ No Modifications.**

**ARTICLE 7; CHANGES IN THE WORK**

**7.1 GENERAL**

7.1.1 No Modifications.

7.1.2 No Modifications.

7.1.3 No Modifications.

Add paragraph 7.1.4 as following:

7.1.4 The combined overhead and profit included in the total cost to the Owner of a change in the Work shall be based on the following schedule:

- .1 For the Contractor, for Work performed by the Contractor's own forces, 15 percent of cost.

- .2 For the Contractor, for Work performed by the Contractor's Subcontractor, 5 percent of the amount due the Subcontractor.
- .3 For each Subcontractor involved, for Work performed by that Subcontractor's own forces, 15 percent of the cost.
- .4 For each Subcontractor, for Work performed by the Subcontractor's Sub-subcontractors, 5 percent of the amount due the Sub-subcontractor.
- .5 Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 7.3.7.
- .6 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials, and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized also. In no case will a change involving over \$200.00 be approved without such itemization.

## **7.2 CHANGE ORDERS**

7.2.1 No Modifications.

7.2.1.1 No Modifications.

7.2.1.2 No Modifications.

7.2.1.3 No Modifications.

## **7.3 CONSTRUCTION CHANGE DIRECTIVES**

7.3.1 No Modifications.

7.3.2 No Modifications.

7.3.3 No Modifications.

7.3.4 No Modifications.

7.3.5 No Modifications.

7.3.6 No Modifications.

7.3.7 No Modifications.

7.3.8 No Modifications.

7.3.9 No Modifications.

7.3.10 No Modifications.

## **7.4 MINOR CHANGES IN THE WORK – No Modification**

# **ARTICLE 8; TIME**

## **8.1 DEFINITIONS**

8.1.1 No Modifications.

8.1.2 No Modifications.

8.1.3 No Modifications.

8.1.4 No Modifications.

## **8.2 PROGRESS AND COMPLETION**

8.2.1 No Modifications.

8.2.2 No Modifications.

8.2.3 No Modifications.

### **8.3 DELAYS AND EXTENSIONS OF TIME**

8.3.1 No Modifications.

8.3.2 No Modifications.

8.3.3 No Modifications.

## **ARTICLE 9; PAYMENTS AND COMPLETION**

### **9.1 CONTRACT SUM – No Modifications.**

### **9.2 SCHEDULE OF VALUES – No Modifications.**

### **9.3 APPLICATIONS FOR PAYMENT**

9.3.1 Add the following sentence to Subparagraph 9.3.1:

The form of Application for Payment, duly notarized, shall be a current authorized edition of AIA Document G702, Application and Certification for Payment, supported by AIA Document G703, Continuation Sheet.

.1 No Modifications.

.2 No Modifications.

Add the following Subparagraph 9.3.1.3:

.3 Until the Work is 50% complete, the Owner shall pay 95% of the amount due the Contractor on account of progress payments. At the time the work is 50% complete, with written consent of the surety, the Owner shall not retain any further retainage from monthly payments due the Contractor if the Contractor continues to perform satisfactorily and any nonconforming work identified has been corrected. It is the intent of this paragraph to comply with applicable North Carolina State Law.

9.3.2 No Modifications.

9.3.3 No Modifications.

### **9.4 CERTIFICATES FOR PAYMENT**

9.4.1 No Modifications.

9.4.2 No Modifications.

### **9.5 DECISIONS TO WITHHOLD CERTIFICATION**

9.5.1 No Modifications.

9.5.2 No Modifications.

9.5.3 No Modifications.

### **9.6 PROGRESS PAYMENTS**

9.6.1 No Modifications.

9.6.2 No Modifications.

9.6.3 No Modifications.

9.6.4 No Modifications.

9.6.5 No Modifications.

9.6.6 No Modifications.



9.6.7 No Modifications.

**9.7 FAILURE OF PAYMENT – No Modifications.**

**9.8 SUBSTANTIAL COMPLETION**

9.8.1 No Modifications.

9.8.2 No Modifications.

9.8.3 No Modifications.

Add Section 9.8.3.1 to Section 9.8.3 as follows:

9.8.3.1 The Architect will perform no more than two (2) inspections to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for any additional inspections.

9.8.4 No Modifications.

9.8.5 Delete the second sentence and substitute the following:

Upon such acceptance and consent of surety, if any, the Owner shall make payment sufficient to increase the total payments to no less than 97.5% of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work and unsettled claims. It is the intent of this paragraph to comply with applicable North Carolina State Law.

**9.9 PARTIAL OCCUPANCY OR USE**

9.9.1 No Modifications.

9.9.2 No Modifications.

9.9.3 No Modifications.

**9.10 FINAL COMPLETION AND FINAL PAYMENT**

9.10.1 No Modifications.

9.10.2 No Modifications.

9.10.3 No Modifications.

9.10.4 No Modifications.

9.10.5 No Modifications.

**ARTICLE 10; PROTECTION OF PERSONS AND PROPERTY**

**10.1 SAFETY PRECAUTIONS AND PROGRAMS – No Modifications**

**10.2 SAFETY OF PERSONS AND PROPERTY**

10.2.1 No Modifications.

10.2.2 No Modifications.

10.2.3 No Modifications.

10.2.4 Add the following paragraph:

10.2.4.1 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary, the Contractor shall give the Owner reasonable advance notice.

10.2.5 No Modifications.

10.2.6 No Modifications.

10.2.7 No Modifications.

**10.3 HAZARDOUS MATERIALS**

10.3.1 No Modifications.

10.3.2 No Modifications.

10.3.3 No Modifications.

10.3.4 No Modifications.

10.3.5 No Modifications.

10.3.6 No Modifications.

**10.4 EMERGENCIES - No Modifications.**

**ARTICLE 11; INSURANCE AND BONDS**

**11.1 CONTRACTOR'S LIABILITY INSURANCE**

11.1.1 No Modifications.

- .1 Delete the semicolon at the end of Clause 11.1.1.1 and add:  
    , including private entities performing Work at the site and exempt from the  
    coverage on account of number of employees or occupation, which entities  
    shall maintain voluntary compensation coverage at the same limits specified  
    for mandatory coverage for the duration of the Project:

- .2 Delete the semicolon at the end of Clause 11.1.1.2 and add:

    or persons or entities excluded by statute from the requirements of Clause  
    11.1.1.1 but required by the Contract Documents to provide the insurance  
    required by that clause:

.3 No modifications.

.4 No Modifications.

.5 No Modifications.

.6 No Modifications.

.7 No Modifications.

.8 No Modifications.

11.1.2 Add the following Clauses 11.1.2.1 to Subparagraph 11.1.2:

- 11.1.2.1 The limits for Worker's Compensation and Employers' Liability insurance  
shall meet statutory limits mandated by State and Federal Laws. If (1) limits in  
excess of those required by statute are to be provided or (2) the employer is  
not statutorily bound to obtain such insurance coverage or (3) additional  
coverages are required, additional coverage and limits for such insurance shall  
be as follows:

- .1 Workers Compensation:

(a) State:	Statutory, with a limit of at least \$500,000.00
(b) Applicable Federal (e.g., Longshoremen's):	Statutory, with a limit of at least \$500,000.00
(c) Employer's Liability:	\$100,000.00 per Accident
	\$500,000.00 Disease, Policy Limit
	\$100,000.00 Disease, Each Employee

.2 Comprehensive or Commercial General Liability (including Contractor's Liability, Contingent Liability, Contractors Liability, Premises-Operations; Independent Contractor's Protective; Products and Completed Operations; Broad Form Property Damage):

(a) Bodily Injury:

\$1,000,000.00	Each Person
\$1,000,000.00	Each Occurrence
\$3,000,000.00	Aggregate

(b) Property Damage:

\$1,000,000.00	Each Occurrence
\$3,000,000.00	Aggregate

(c) Products and Completed Operations to be Maintained for one year after final payment:

\$3,000,000.00	Aggregate
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(d) Property Damage Liability Insurance shall provide X, C, and U coverage.

(e) Broad Form Property Damage Coverage shall include Completed Operations.

.3 Contractual Liability:

(a) Bodily Injury:

\$1,000,000.00	Each Occurrence
\$1,000,000.00	Annual Aggregate

(b) Property Damage:

\$1,000,000.00	Each Occurrence
\$1,000,000.00	Aggregate

.4 Personal Injury, with Employment Exclusion deleted:

\$1,000,000.00	Each Person
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.5 Business Auto Liability (including owned, non-owned and hired vehicles):

(a) Bodily Injury:

\$1,000,000.00	Each Person
\$1,000,000.00	Each Occurrence

(b) Property Damage:

\$1,000,000.00	Each Occurrence
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.6 If the General Liability coverages are provided by a Commercial Liability policy, the:

- (a) General Aggregate shall be not less than \$500,000.00 and it shall apply, in total, to this Project only.
- (b) Fire Damage Limits shall be not less than \$100,000.00 on any one fire.
- (c) Medical Expense Limit shall be not less than \$ N/A on any one person.

.7 Umbrella Excess Liability:

\$1,000,000.00 over primary insurance
\$10,000.00 retention for self-insured hazards each Occurrence.

.8 Aircraft Liability (owned and non-owned) when Aircraft are used in performance of the Contract:

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.9 Watercraft Liability (owned and non-owned) when Watercraft are used in the performance of the Contract:

11.1.3 – Add the following sentence to Section 11.1.3:

If this insurance is written on a Commercial General Liability policy form, the certificates shall be ACORD form 25-S, completed and supplemented in accordance with AIA Document G715<sup>TM</sup>-1991, Instruction Sheet and Supplemental Attachment for ACORD Certificate of Insurance 25-S.

11.1.4 – No Modifications:

**11.2 OWNER'S LIABILITY INSURANCE – No Modifications.**

**11.3 PROPERTY INSURANCE**

11.3.1 No Modifications:

.1 No Modifications.

.2 No Modifications.

.3 No Modifications.

.4 Change paragraph to read as follows:

This property Insurance will not cover portions of the work stored off the site and portions of the Work in transit. Insurance covering such work is the Contractors responsibility.

.5 No Modifications.

11.3.2 No Modifications.

11.3.3 No Modifications.

11.3.4 No Modifications.

11.3.5 No Modifications.

11.3.6 No Modifications.

11.3.7 No Modifications.

11.3.8 No Modifications.

11.3.9 No Modifications.

11.3.10 No Modifications.

**11.4 PERFORMANCE BOND AND PAYMENT BOND**

11.4.1 Delete Section 11.4.1 and substitute the following:

11.4.1 The Contractor **is** required to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder.

11.4.2 No Modification.

**ARTICLE 12; UNCOVERING AND CORRECTION OF WORK.**

**12.1 UNCOVERING OF WORK**

12.1.1 No Modifications.

12.1.2 No Modifications.

**12.2 CORRECTION OF WORK**

12.2.1 No Modifications.

12.2.2 No modification.

.1 No Modifications.

.2 No Modifications.

.3 No Modifications.

Add the following Section 12.2.2.4 to Section 12.2.2:

12.2.2.4 Upon request by the Owner and prior to the expiration of one year from the date of Substantial Completion, the Architect will conduct and the Contractor shall attend a meeting with the Owner to review the facility operations and performance.

12.2.3 No Modifications.

12.2.4 No Modifications.

12.2.5 No Modifications.

**12.3 ACCEPTANCE OF NONCONFORMING WORK – No Modifications.**

**ARTICLE 13; MISCELLANEOUS PROVISIONS**

**13.1 GOVERNING LAW – No Modifications.**

**13.2 SUCCESSORS AND ASSIGNS**

13.2.1 No Modifications.

13.2.2 No Modifications.

**13.3 WRITTEN NOTICE – No Modifications.**

**13.4 RIGHTS AND REMEDIES**

13.4.1 No Modifications.

13.4.2 No Modifications.

**13.5 TESTS AND INSPECTIONS**

13.5.1 No modification.

13.5.2 No Modifications.

13.5.3 No Modifications.

13.5.4 No Modifications.

13.5.5 No Modifications.

13.5.6 No Modifications.

**13.6 INTEREST – No Modifications.**

**13.7 TIME LIMITS ON CLAIMS – No Modifications.**

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

**14.1 TERMINATION BY THE CONTRACTOR**

14.1.1 No Modifications.

.1 No Modifications.

.2 No Modifications.

.3 No Modifications.

.4 No Modifications.

14.1.2 No Modifications.

14.1.3 No Modifications.

14.1.4 No Modifications.

#### **14.2 TERMINATION BY THE OWNER FOR CAUSE**

14.2.1 No Modifications.

.1 No Modifications.

.2 No Modifications.

.3 No Modifications.

.4 No Modifications.

14.2.2 No Modifications.

.1 No Modifications.

.2 No Modifications.

.3 No Modifications.

14.2.3 No Modifications.

14.2.4 No Modifications.

#### **14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE**

14.3.1 No Modifications.

14.3.2 No Modifications.

.1 No Modifications.

.2 No Modifications.

#### **14.4 TERMINATION BY THE OWNER FOR CONVENIENCE**

14.4.1 No Modifications.

14.4.2 No Modifications.

.1 No Modifications.

.2 No Modifications.

.3 No Modifications.

14.4.3 No Modifications..

### **ARTICLE 15; CLAIMS AND DISPUTES**

#### **15.1 CLAIMS**

15.1.1 **DEFINITION** - No Modifications.

15.1.2 **NOTICE OF CLAIMS** – No Modifications.

15.1.3 **CONTINUING CONTRACT PERFORMANCE** – No Modifications.

15.1.4 **CLAIMS FOR ADDITIONAL COST** – No Modifications.

**15.1.5 CLAIMS FOR ADDITIONAL TIME – No Modifications.**

.1 No Modifications.

.2 No Modifications.

Add the following Section 15.1.5.3 and 15.1.5.4 to Section 15.1.5:

15.1.5.3 Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days' increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Owner may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.

15.1.5.4 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of the Contractor.

**15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES – No Modifications.**

.1 No Modifications.

.2 No Modifications.

**15.2 INITIAL DECISION**

15.2.1 No Modifications.

15.2.2 No Modifications.

15.2.3 No Modifications.

15.2.4 No Modifications.

15.2.5 No Modifications.

15.2.6 No Modifications.

.1 No Modifications.

15.2.7 No Modifications.

15.2.8 No Modifications.

**15.3 MEDIATION**

15.3.1 No Modifications.

15.3.2 No Modifications.

15.3.3 No Modifications.

**15.4 ARBITRATION**

15.4.1 No Modifications.

.1 No Modifications.

15.4.2 No Modifications.

15.4.3 No Modifications.

15.4.4 No Modifications.

.1 No Modifications.

.2 No Modifications.

.3 No Modifications.

**END SECTION 00110**



## SECTION 011000 - SUMMARY

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Work covered by the Contract Documents.
  - 2. Use of premises.
  - 3. Owner's occupancy requirements.
  - 4. Specification formats and conventions.
- B. See Division 01 Section "Multiple Contract Summary" for division of responsibilities for the Work.

#### 1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: **Transylvania County EMS Base Facility**
  - 1. Project Location: Located at 535 Morris Road, Brevard, NC 28712.
- B. Owner: Transylvania County, 101 South Broad Street, Brevard, NC 28712
  - 1. Owner's Representative: Mr. Larry Reece, County Engineer/Project Manager
- C. Architect: Richard L. Worley, AIA Architect, 4078 Haywood Road, Mills River, NC 28759
- D. The Work consists of the following:
  - 1. A new building constructed of wood framing/concrete masonry units, prefab wood roof trusses, brick veneer, fiber cement siding, asphalt shingles, concrete slab on grade, mezzanine constructed of wood floor joist and sheathing, aluminum storefront window/entrances, aluminum gutters, painted gypsum board wall/ceiling finishes, acoustical layin ceiling system, painted concrete masonry wall in Truck Bay areas, vet tile, carpet tiles, ceramic tile, hollow metal doors/frames, wood doors, sectional garage doors, Plumbing/Mechanical/Electrical work including emergency transfer switch (Generator by Owner), Civil work including grading, soil remediation, disposal of unsuitable soil, fill from Owners local source, aggregate piers, parking and drives consisting of concrete and asphalt paving and an NFPA 13 D fire suppression system in a portion of the building.
- E. Project will be constructed under a single prime contract.

### 1.3 WORK UNDER OTHER CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

### 1.4 USE OF PREMISES

- A. Use of Site: Do not disturb portions of Project site beyond areas in which the Work is indicated.
  - 1. Limits: Confine constructions operations to site as indicated on drawings.
  - 2. Owner Occupancy: The Contractor does **not** have to allow for Owner occupancy of Project site except for Owners separate contractors nor **use by the public**.
  - 3. Driveways and Entrances: Keep driveways **parking, loading areas**, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

### 1.5 OWNER'S OCCUPANCY REQUIREMENTS

- A. Owner Occupancy: The site will be available to the Contractor but portions of the site may also be used by the Owner and/or separate contractors that are designated by work being provided by the Owner's employees or sub-contractors. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage and access.
  - 1. Maintain access to existing walkways, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
- B. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
  - 1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
  - 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
  - 3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.
  - 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

## 1.6 WORK RESTRICTIONS

- A. Nonsmoking Site and Building: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor air intakes building being constructed.

## 1.7 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.
  - 1. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
  - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
    - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

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## SECTION 012200 - UNIT PRICES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Requirements:
  - 1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

#### 1.2 DEFINITIONS

- A. Unit price is **an amount incorporated in the Agreement, applicable during the duration of the Work** as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

#### 1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, scaffolding, insurance, **applicable taxes**, overhead, and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

### PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION

#### 3.1 SCHEDULE OF UNIT PRICES

**Unit Price No. 1 - Railroad Ballast:** This item shall cover clean, screened, uniform Railroad Ballast grade (size) crushed stone for miscellaneous uses such as surface stabilization, erosion control or other uses as called for in the plans or directed by the Engineer and includes the purchase, delivery, storage and placement of the Railroad Ballast. Payment will be made on the ton of placed Railroad Ballast.

**Unit Price No. 2 - #57 Washed Stone:** This item shall cover #57 Washed Stone for miscellaneous uses such as surface stabilization, erosion control or other uses as called for in the plans or directed by the Engineer and includes the purchase, delivery, storage and placement of the #57 Washed stone. Payment will be made on the ton of placed Rip Rap.

**Unit Price No. 3 - NCDOT Aggregate Base Course (ABC Stone):** This item shall cover ABC Stone for miscellaneous uses such as foundation material for roads, drives, parking areas, building foundations or other uses as called for in the plans or directed by the Engineer and includes the purchase, delivery, storage, placement and compaction of the ABC Stone. Payment will be made on the cubic yard of placed, compacted material.

**Unit Price No. 4 - Woven Fabric (Mirafi HP570 or equivalent):** This item shall cover woven geotextile fabric to be placed over prepared earth subsurfaces to reinforce the subsurface prior to placement of rock subbase materials as called for in plans or as directed by the Engineer and includes the purchase, delivery, storage and placement of the woven geosynthetic fabric. Payment will be made on the square yard of placed material.

**Unit Price No. 5 - Non-Woven Fabric (Mirafi 140N or equivalent):** This item shall cover non-woven geotextile fabric to be placed over prepared earth subsurfaces to reinforce the subsurface prior to placement of rock subbase materials as called for in plans or as directed by the Engineer and includes the purchase, delivery, storage and placement of the non-woven geosynthetic fabric. Payment will be made on the square yard of placed material.

**Unit Price No. 6 - Geogrid (Tensar BX-1200 or equivalent):** This item shall cover geogrid fabric to be placed over prepared earth subsurfaces to reinforce the subsurface prior to placement of rock subbase materials as called for in plans or as directed by the Engineer and includes the purchase, delivery, storage and placement of the geogrid fabric. Payment will be made on the square yard of placed material.

**Unit Price No. 7 - Select Backfill:** This item shall cover clean, non-plastic, compactible earthen fill material when approved by Owner's Engineer for uses such as fill or make-up material when useful on-site materials are not available. Placement will be as called for in the plans or directed by the Engineer and includes the purchase, delivery, storage, placement (and compaction as may be necessary) of the select fill. Payment will be made on the cubic yard of placed material.

**Unit Price No. 8 - Unsuitable Material Removal:** This item shall cover the excavation and removal of on-site earthen materials that possesses characteristics unsuitable for construction uses on or in the project. Unsuitable materials shall be removed and replaced with suitable materials as elsewhere described, as called for in the plans or directed by the Engineer and includes the excavation, storage and hauling off-site to an approved receiving area. Payment will be made on the cubic yard of removed material.

**Unit Price No. 9 – 4" PVC French Drain:** This item shall cover the installation of 4" PVC French Drain as depicted in detail drawing, to include trench excavation, #57 washed stone wrapped in landscape fabric, with perforated 4" PVC drainage pipe centered in the stone, and backfill. 4" PVC French Drain shall be placed as called for in the plans or directed by the Engineer and shall include purchase, delivery, storage and placement of all materials necessary for a complete 4" PVC French Drain. Payment will be made on the linear foot of installed French drain.

END OF SECTION 012200

## SECTION 012300 - ALTERNATES

### PART 1 - GENERAL

#### 1.1 SUMMARY

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

#### 1.2 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
  2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

#### 1.3 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other work of the Contract.
  - C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.



PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

**A. Alternate No. 1:**

1. Alternate: Provide New metal roof as indicated on Sheet A15 and specification section "Standing Seam Metal Roof Panels" Section #074113.16 and "Snow Guards" #077253 in lieu of Asphalt Shingle roof.

END OF SECTION 012300

## SECTION 012500 - SUBSTITUTION PROCEDURES

## PART 1 - GENERAL

## 1.1 SUMMARY

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

## 1.2 DEFINITIONS

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

## 1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use form **acceptable to Architect/Owner**.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
    - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - e. Samples, where applicable or requested.
    - f. Certificates and qualification data, where applicable or requested.

- g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
  - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
  - i. Research reports evidencing compliance with building code in effect for Project, from **ICC-ES and NC Building Code**.
  - j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - k. Cost information, including a proposal of change, if any, in the Contract Sum.
  - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
  - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within **fourteen** days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within **fourteen** days of receipt of request, or **seven** days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

#### 1.4 QUALITY ASSURANCE

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

#### 1.5 PROCEDURES

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

#### 1.6 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than **fourteen** days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
  - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
  - b. Substitution request is fully documented and properly submitted.
  - c. Requested substitution will not adversely affect Contractor's construction schedule.
  - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
  - e. Requested substitution is compatible with other portions of the Work.
  - f. Requested substitution has been coordinated with other portions of the Work.
  - g. Requested substitution provides specified warranty.
  - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500



## SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. See Division 01 Section "Allowances" for procedural requirements for handling and processing allowances.
- C. See Division 01 Section "Unit Prices" for administrative requirements for using unit prices.

## 1.2 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

## 1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
  - 2. Within **time specified in Proposal Request** after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include costs of labor and supervision directly attributable to the change.
    - d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

#### 1.4 ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
1. Include installation costs in purchase amount only where indicated as part of the allowance.
  2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
  3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
  4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than **21** days after such authorization.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
  2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

#### 1.5 CHANGE ORDER PROCEDURES

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

1.6 CONSTRUCTION CHANGE DIRECTIVE

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600



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## SECTION 012900 - PAYMENT PROCEDURES

## PART 1 - GENERAL

## 1.1 SUMMARY

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

## 1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
  - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including **Application for Payment forms with Continuation Sheets, Submittals Schedule and Contractor's Construction Schedule.**
  - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than **fourteen** days before the date scheduled for submittal of initial Applications for Payment.
  - 3. Sub schedules: Where the Work is separated into phases requiring separately phased payments, provide sub schedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
  - 1. Identification: Include the following Project identification on the Schedule of Values:
    - a. Project name and location.
    - b. Name of Architect.
    - c. Architect's project number.
    - d. Contractor's name and address.
    - e. Date of submittal.
  - 2. Submit draft of **AIA Document G703 Continuation Sheets.**
  - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. **Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training in the amount of 5 percent of the Contract Sum.**
  - 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
  - 5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
  - 6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit 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 Contractor's option.
9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

### 1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
  1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Progress payments shall be submitted to Architect by the twenty fifth of the month. The period covered by each Application for Payment is one month, ending on the **last day of the month**.
- D. Payment Application Forms: Use **AIA Document G702 and AIA Document G703 Continuation Sheets** as form for Applications for Payment.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
  1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
  2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- F. Transmittal: Submit **3** signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt **within 24 hours**. One copy shall include waivers of lien and similar attachments if required.
  1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  2. When an application shows completion of an item, submit final or full waivers.
  3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
  2. Schedule of Values.
  3. Contractor's Construction Schedule (preliminary if not final).
  4. Schedule of unit prices.
  5. Submittals Schedule (preliminary if not final).
  6. List of Contractor's staff assignments.
  7. List of Contractor's principal consultants.
  8. Copies of building permits.
  9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  10. Initial progress report.
  11. Report of preconstruction conference.
  12. Certificates of insurance and insurance policies.
  13. Minority Business Participation Forms
  14. Certification for Sales Tax
- I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
  2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
  2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  3. Updated final statement, accounting for final changes to the Contract Sum.
  4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
  5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
  6. AIA Document G707, "Consent of Surety to Final Payment."

7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

## SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. Coordination Drawings.
  - 2. Project meetings.
  - 3. Requests for Interpretation (RFIs).
- B. See Division 01 Section "Multiple Contract Summary" for a description of the division of Work among separate contracts and responsibility for coordination activities not in this Section.
- C. See Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

## 1.2 DEFINITIONS

- A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

## 1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
  - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
  2. Preparation of the Schedule of Values.
  3. Installation and removal of temporary facilities and controls.
  4. Delivery and processing of submittals.
  5. Progress meetings.
  6. Preinstallation conferences.
  7. Project closeout activities.
  8. Startup and adjustment of systems.
  9. Project closeout activities.

#### 1.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
    - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - b. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
  2. Sheet Size: At least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
  3. Number of Copies: Submit **four** opaque copies of each submittal. Architect will return **two copies**.
  4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

#### 1.5 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within **three** days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than **15** days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing and long-lead items.
    - d. Designation of key personnel and their duties.
    - e. Procedures for processing field decisions and Change Orders.
    - f. Procedures for RFIs.
    - g. Procedures for testing and inspecting.
    - h. Procedures for processing Applications for Payment.
    - i. Distribution of the Contract Documents.
    - j. Submittal procedures.
    - k. LEED requirements.
    - l. Preparation of Record Documents.
    - m. Use of the premises **and existing building**.
    - n. Work restrictions.
    - o. Owner's occupancy requirements.
    - p. Responsibility for temporary facilities and controls.
    - q. Construction waste management and recycling.
    - r. Parking availability.
    - s. Office, work, and storage areas.
    - t. Equipment deliveries and priorities.
    - u. First aid.
    - v. Security.
    - w. Progress cleaning.
    - x. Working hours.
  3. Minutes: **Record** and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.



2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. The Contract Documents.
    - b. Options.
    - c. Related RFIs.
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Review of mockups.
    - i. Possible conflicts.
    - j. Compatibility problems.
    - k. Time schedules.
    - l. Weather limitations.
    - m. Manufacturer's written recommendations.
    - n. Warranty requirements.
    - o. Compatibility of materials.
    - p. Acceptability of substrates.
    - q. Temporary facilities and controls.
    - r. Space and access limitations.
    - s. Regulations of authorities having jurisdiction.
    - t. Testing and inspecting requirements.
    - u. Installation procedures.
    - v. Coordination with other work.
    - w. Required performance results.
    - x. Protection of adjacent work.
    - y. Protection of construction and personnel.
  3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
  5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at **regular** intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule,

in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

- 1) Review schedule for next period.
- b. Review present and future needs of each entity present, including the following:
  - 1) Interface requirements.
  - 2) Sequence of operations.
  - 3) Status of submittals.
  - 4) Deliveries.
  - 5) Off-site fabrication.
  - 6) Access.
  - 7) Site utilization.
  - 8) Temporary facilities and controls.
  - 9) Work hours.
  - 10) Hazards and risks.
  - 11) Progress cleaning.
  - 12) Quality and work standards.
  - 13) Status of correction of deficient items.
  - 14) Field observations.
  - 15) RFIs.
  - 16) Status of proposal requests.
  - 17) Pending changes.
  - 18) Status of Change Orders.
  - 19) Pending claims and disputes.
  - 20) Documentation of information for payment requests.
3. Minutes: **Record** the meeting minutes.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
  - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

#### 1.6 REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
  1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
  2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Project name.
  2. Date.
  3. Name of Contractor.
  4. Name of Architect.
  5. RFI number, numbered sequentially.
  6. Specification Section number and title and related paragraphs, as appropriate.
  7. Drawing number and detail references, as appropriate.
  8. Field dimensions and conditions, as appropriate.
  9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  10. Contractor's signature.
  11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
- C. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow **seven** working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for coordination information already indicated in the Contract Documents.
    - d. Requests for adjustments in the Contract Time or the Contract Sum.
    - e. Requests for interpretation of Architect's actions on submittals.
    - f. Incomplete RFIs or RFIs with numerous errors.
  2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
  3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within **10** days of receipt of the RFI response.
- D. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within **seven** days if Contractor disagrees with response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log **weekly**.
1. Project name.
  2. Name and address of Contractor.
  3. Name and address of Architect.

4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

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## SECTION 013300 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. See Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule.
- C. See Division 01 Section "Quality Requirements" for submitting test and inspection reports.
- D. See Division 01 Section "Closeout Procedures" for submitting warranties.
- E. See Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
- F. See Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
- G. See Division 01 Section "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of Owner's personnel.

#### 1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

#### 1.3 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- B. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
  - 1. Initial Review: Allow **15** days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  - 3. Resubmittal Review: Allow **15** days for review of each resubmittal.
- D. Identification: Place a permanent label or title block on each submittal for identification.
  - 1. Indicate name of firm or entity that prepared each submittal on label or title block.
  - 2. Provide a space approximately **6 by 8 inches (150 by 200 mm)** on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
  - 3. Include the following information on label for processing and recording action taken:
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name and address of Contractor.
    - e. Name and address of subcontractor.
    - f. Name and address of supplier.
    - g. Name of manufacturer.
    - h. Submittal number or other unique identifier, including revision identifier.
      - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
- E. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
- F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

- G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will **discard submittals** received from sources other than Contractor.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
  - 1. Note date and content of previous submittal.
  - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  - 3. Resubmit submittals until they are marked "NO EXCEPTION TAKEN" or "MAKE CORRECTIONS NOTED".
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating "NO EXCEPTION TAKEN" or "MAKE CORRECTIONS NOTED" taken by Architect.

#### 1.4 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

- A. General: Architect's CAD files will not be provided to Contractor for Contractor's use in connection with Project.

### PART 2 - PRODUCTS

#### 2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
  - 2. Mark each copy of each submittal to show which products and options are applicable.
  - 3. Include the following information, as applicable:
    - a. Manufacturer's written recommendations.
    - b. Manufacturer's product specifications.
    - c. Manufacturer's installation instructions.
    - d. Manufacturer's catalog cuts.
    - e. Wiring diagrams showing factory-installed wiring.
    - f. Printed performance curves.
    - g. Operational range diagrams.
    - h. Compliance with specified referenced standards.
    - i. Testing by recognized testing agency.



4. Number of Copies: Submit **four** copies of Product Data, unless otherwise indicated. Architect will return **two** copies. Mark up and retain one returned copy as a Project Record Document.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Dimensions.
    - b. Identification of products.
    - c. Fabrication and installation drawings.
    - d. Roughing-in and setting diagrams.
    - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    - f. Shopwork manufacturing instructions.
    - g. Templates and patterns.
    - h. Schedules.
    - i. Notation of coordination requirements.
    - j. Notation of dimensions established by field measurement.
    - k. Relationship to adjoining construction clearly indicated.
    - l. Seal and signature of professional engineer if specified.
    - m. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
  2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least **8-1/2 by 11 inches (215 by 280 mm)** but no larger than **30 by 40 inches (750 by 1000 mm)**.
  3. Number of Copies: Submit two opaque (bond) copies of each submittal. Architect will return one copy.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of appropriate Specification Section.
  3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
  4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

- a. Number of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return one submittal with options selected.
  5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    - a. Number of Samples: Submit **three** sets of Samples. Architect will retain **two** Sample sets; remainder will be returned.
  - E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location.
    1. Number of Copies: Submit **three** copies of product schedule or list, unless otherwise indicated. Architect will return **two** copies.
  - F. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
  - G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."
  - H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
  - I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design.
    1. Number of Copies: Submit **three** copies of subcontractor list, unless otherwise indicated. Architect will return **two** copies.
- ## 2.2 INFORMATIONAL SUBMITTALS
- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
    1. Number of Copies: Submit **two** copies of each submittal, unless otherwise indicated. Architect will not return copies.
    2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

3. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."
- B. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- C. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- J. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.
- M. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- N. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed

before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

- O. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- P. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- Q. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- R. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer.
- S. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
  - 1. Statement on condition of substrates and their acceptability for installation of product.
  - 2. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  - 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
- T. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- U. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.
  - 1. Architect will not review submittals that include MSDSs and will return them for resubmittal.

## 2.3 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit **three** copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

### PART 3 - EXECUTION

#### 3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

#### 3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken:
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

## SECTION 014000 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
  - 2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. See Divisions 02 through 49 Sections for specific test and inspection requirements.

#### 1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. **Approved mockups establish the standard by which the Work will be judged.**
- D. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
  - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- J. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of **five** previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

### 1.3 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. 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.

### 1.4 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Reports: Prepare and submit certified written reports that include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, and telephone number of testing agency.
  - 4. Dates and locations of samples and tests or inspections.

5. Names of individuals making tests and inspections.
  6. Description of the Work and test and inspection method.
  7. Identification of product and Specification Section.
  8. Complete test or inspection data.
  9. Test and inspection results and an interpretation of test results.
  10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  12. Name and signature of laboratory inspector.
  13. Recommendations on retesting and reinspecting.
- C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

## 1.5 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according



to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
  2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
  2. Notify Architect **seven** days in advance of dates and times when mockups will be constructed.
  3. Demonstrate the proposed range of aesthetic effects and workmanship.
  4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
  5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  6. Demolish and remove mockups when directed, unless otherwise indicated.

## 1.6 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner may 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 inspecting they are engaged to perform.
  2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, **and the Contract Sum will be adjusted by Change Order.**
- B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least **24** hours in advance of time when Work that requires testing or inspecting will be performed.
  3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. **Manufacturer's Field Services:** Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- D. **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. **Testing Agency Responsibilities:** Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
  3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform any duties of Contractor.
- F. **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  4. Facilities for storage and field curing of test samples.
  5. Delivery of samples to testing agencies.
  6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  7. Security and protection for samples and for testing and inspecting equipment at Project site.

- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

## 1.7 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Conducted by a qualified **testing agency or special inspector** as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

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

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
  2. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

## SECTION 014200 - REFERENCES

## PART 1 - GENERAL

## 1.1 DEFINITIONS

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

## 1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

### 1.3 ABBREVIATIONS AND ACRONYMS

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

- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

PRIVATE tbl1

AA	Aluminum Association, Inc. (The)
AAADM	American Association of Automatic Door Manufacturers
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists (The)
ABAA	Air Barrier Association of America
ABMA	American Bearing Manufacturers Association
ACI	ACI International (American Concrete Institute)
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies, Inc. (The)
AF&PA	American Forest & Paper Association
AGA	American Gas Association
AGC	Associated General Contractors of America (The)
AHA	American Hardboard Association (Now part of CPA)

AHAM	Association of Home Appliance Manufacturers
AI	Asphalt Institute
AIA	American Institute of Architects (The)
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Landcare Network)
ALSC	American Lumber Standard Committee, Incorporated
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
AOSA	Association of Official Seed Analysts, Inc.
APA	Architectural Precast Association
APA	APA - The Engineered Wood Association
APA EWS	APA - The Engineered Wood Association; Engineered Wood Systems
API	American Petroleum Institute
ARI	Air-Conditioning & Refrigeration Institute
ARMA	Asphalt Roofing Manufacturers Association
ASCE	American Society of Civil Engineers
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	ASME International (The American Society of Mechanical Engineers International)
ASSE	American Society of Sanitary Engineering

ASTM	ASTM International (American Society for Testing and Materials International)
AWCI	AWCI International (Association of the Wall and Ceiling Industry International)
AWCMA	American Window Covering Manufacturers Association (Now WCSC)
AWI	Architectural Woodwork Institute
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association (The)
BICSI	BICSI
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International)
BISSC	Baking Industry Sanitation Standards Committee
CCC	Carpet Cushion Council
CDA	Copper Development Association
CEA	Canadian Electricity Association
CFFA	Chemical Fabrics & Film Association, Inc.
CGA	Compressed Gas Association
CIMA	Cellulose Insulation Manufacturers Association
CISCA	Ceilings & Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute

CLFMI	Chain Link Fence Manufacturers Institute
CRRC	Cool Roof Rating Council
CPA	Composite Panel Association
CPPA	Corrugated Polyethylene Pipe Association
CRI	Carpet & Rug Institute (The)
CRSI	Concrete Reinforcing Steel Institute
CSA	Canadian Standards Association
CSA	CSA International (Formerly: IAS - International Approval Services)
CSI	Cast Stone Institute
CSI	Construction Specifications Institute (The)
CSSB	Cedar Shake & Shingle Bureau
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute)
DHI	Door and Hardware Institute
EIA	Electronic Industries Alliance
EIMA	EIFS Industry Members Association
EJCDC	Engineers Joint Contract Documents Committee
EJMA	Expansion Joint Manufacturers Association, Inc.
ESD	ESD Association
FIBA	Federation Internationale de Basketball (The International Basketball Federation)
FIVB	Federation Internationale de Volleyball (The International Volleyball Federation)
FM Approvals	FM Approvals



FM Global	FM Global (Formerly: FMG - FM Global)
FMRC	Factory Mutual Research (Now FM Global)
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.
FSA	Fluid Sealing Association
FSC	Forest Stewardship Council
GA	Gypsum Association
GANA	Glass Association of North America
GRI	(Now GSI)
GS	Green Seal
GSI	Geosynthetic Institute
HI	Hydraulic Institute
HI	Hydronics Institute
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)
HPVA	Hardwood Plywood & Veneer Association
HPW	H. P. White Laboratory, Inc.
IAS	International Approval Services (Now CSA International)
IBF	International Badminton Federation
ICEA	Insulated Cable Engineers Association, Inc.
ICRI	International Concrete Repair Institute, Inc.
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)

IESNA	Illuminating Engineering Society of North America
IENT	Institute of Environmental Sciences and Technology
IGCC	Insulating Glass Certification Council
IGMA	Insulating Glass Manufacturers Alliance
ILI	Indiana Limestone Institute of America, Inc.
ISO	International Organization for Standardization
ISSFA	International Solid Surface Fabricators Association
ITS	Intertek Testing Service NA
ITU	International Telecommunication Union
KCMA	Kitchen Cabinet Manufacturers Association
LMA	Laminating Materials Association (Now part of CPA)
LPI	Lightning Protection Institute
MBMA	Metal Building Manufacturers Association
MFMA	Maple Flooring Manufacturers Association, Inc.
MFMA	Metal Framing Manufacturers Association, Inc.
MH	Material Handling (Now MHIA)
MHIA	Material Handling Industry of America
MIA	Marble Institute of America
MPI	Master Painters Institute
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
NAAMM	National Association of Architectural Metal Manufacturers

NACE	NACE International (National Association of Corrosion Engineers International)
NADCA	National Air Duct Cleaners Association
NAGWS	National Association for Girls and Women in Sport
NAIMA	North American Insulation Manufacturers Association
NBGQA	National Building Granite Quarries Association, Inc.
NCAA	National Collegiate Athletic Association (The)
NCMA	National Concrete Masonry Association
NCPI	National Clay Pipe Institute
NCTA	National Cable & Telecommunications Association
NEBB	National Environmental Balancing Bureau
NECA	National Electrical Contractors Association
NeLMA	Northeastern Lumber Manufacturers' Association
NEMA	National Electrical Manufacturers Association
NETA	InterNational Electrical Testing Association
NFHS	National Federation of State High School Associations
NFPA	NFPA (National Fire Protection Association)
NFRC	National Fenestration Rating Council
NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NLGA	National Lumber Grades Authority
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association)
NRCA	National Roofing Contractors Association

NRMCA	National Ready Mixed Concrete Association
NSF	NSF International (National Sanitation Foundation International)
NSSGA	National Stone, Sand & Gravel Association
NTMA	National Terrazzo & Mosaic Association, Inc. (The)
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)
NWWDA	National Wood Window and Door Association (Now WDMA)
OPL	Omega Point Laboratories, Inc. (Now ITS)
PCI	Precast/Prestressed Concrete Institute
PDCA	Painting & Decorating Contractors of America
PDI	Plumbing & Drainage Institute
PGI	PVC Geomembrane Institute
PLANET	Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America)
PTI	Post-Tensioning Institute
RCSC	Research Council on Structural Connections
RFCI	Resilient Floor Covering Institute
RIS	Redwood Inspection Service
SAE	SAE International
SDI	Steel Deck Institute
SDI	Steel Door Institute
SEFA	Scientific Equipment and Furniture Association

SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)
SGCC	Safety Glazing Certification Council
SIA	Security Industry Association
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)
SJI	Steel Joist Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SMPTE	Society of Motion Picture and Television Engineers
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division)
SPIB	Southern Pine Inspection Bureau (The)
SPRI	Single Ply Roofing Industry
SSINA	Specialty Steel Industry of North America
SSPC	SSPC: The Society for Protective Coatings
STI	Steel Tank Institute
SWI	Steel Window Institute
SWRI	Sealant, Waterproofing, & Restoration Institute
TCA	Tile Council of America, Inc.
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
TMS	The Masonry Society
TPI	Truss Plate Institute, Inc.
TPI	Turfgrass Producers International

TRI	Tile Roofing Institute
UL	Underwriters Laboratories Inc.
UNI	Uni-Bell PVC Pipe Association
USAV	USA Volleyball
USGBC	U.S. Green Building Council
USITT	United States Institute for Theatre Technology, Inc.
WASTEC	Waste Equipment Technology Association
WCLIB	West Coast Lumber Inspection Bureau
WCMA	Window Covering Manufacturers Association (Now WCSC)
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association)
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association)
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California)
WIC	Woodwork Institute of California (Now WI)
WMMPA	Wood Moulding & Millwork Producers Association
WSRCA	Western States Roofing Contractors Association
WWPA	Western Wood Products Association

- C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

BOCA BOCA International, Inc.  
(See ICC)

IAPMO International Association of Plumbing and Mechanical Officials

ICBO	International Conference of Building Officials (See ICC)
ICBO ES	ICBO Evaluation Service, Inc.  (See ICC-ES)
ICC	International Code Council
ICC-ES	ICC Evaluation Service, Inc.
SBCCI	Southern Building Code Congress International, Inc. (See ICC)
UBC	Uniform Building Code (See ICC)

- D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

CE	Army Corps of Engineers
CPSC	Consumer Product Safety Commission
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FDA	Food and Drug Administration
GSA	General Services Administration
HUD	Department of Housing and Urban Development
LBL	Lawrence Berkeley National Laboratory
NCHR	National Cooperative Highway Research Program

## P

(See TRB)

NIST	National Institute of Standards and Technology
OSHA	Occupational Safety & Health Administration
PBS	Public Building Service (See GSA)
PHS	Office of Public Health and Science
RUS	Rural Utilities Service (See USDA)
SD	State Department
TRB	Transportation Research Board
USDA	Department of Agriculture
USPS	Postal Service

- E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA)
CFR	Code of Federal Regulations
DOD	Department of Defense Military Specifications and Standards
DSCC	Defense Supply Center Columbus (See FS)
FED-STD	Federal Standard (See FS)
FS	Federal Specification
FTMS	Federal Test Method Standard (See FS)



MIL (See MILSPEC)

MIL-STD (See MILSPEC)

MILSPEC Military Specification and Standards

UFAS Uniform Federal Accessibility Standards

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

CBH State of California, Department of Consumer Affairs Bureau of Home Furnishings and  
F Thermal Insulation

CCR California Code of Regulations

CPU California Public Utilities Commission  
C

TFS Texas Forest Service  
Forest Resource Development

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

## SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. See Division 01 Section "Multiple Contract Summary" for division of responsibilities for temporary facilities and controls.
- C. See Division 01 Section "Execution" for progress cleaning requirements.
- D. See Divisions 02 through 49 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.
- E. See Division 31 Section "Dewatering" for disposal of ground water at Project site.

#### 1.2 DEFINITIONS

- A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

#### 1.3 SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

#### 1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

#### 1.5 PROJECT CONDITIONS

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

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide bases for supporting posts.
- B. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.76-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with **1-5/8-inch- (42-mm-) OD top rails.**
- C. Wood Enclosure Fence: Plywood, **8 feet (2.4 m)** high, framed with four 2-by-4-inch (50-by-100-mm) rails, with preservative-treated wood posts spaced not more than 8 feet (2.4 m) apart.
- D. Lumber and Plywood: Comply with requirements in Division 06 Section "**Miscellaneous Rough Carpentry.**"
- E. Gypsum Board: Minimum 1/2 inch (12.7 mm) thick by 48 inches (1219 mm) wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36/C 36M.
- F. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

### 2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

### 2.3 EQUIPMENT

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

3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

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

#### 3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
  1. Toilets: Use of Owner's existing toilet facilities will **NOT** be permitted.
- C. Heating : Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- D. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- E. Electric Power Service: Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.
- F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
  1. Connect temporary service to Owner's existing power source, as directed by Owner.
- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install **one** telephone line(s) for each field office.
  1. Provide additional telephone lines for the following:
    - a. Provide a dedicated telephone line for each facsimile machine and computer in each field office.
  2. At each telephone, post a list of important telephone numbers including **police and fire departments, Contractor's home office, Architect's office, Owner's office, Principal subcontractors' field and home offices.**
  3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
- I. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail in field office.

### 3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
  1. Provide incombustible construction for offices, shops, and sheds located within construction area or within **30 feet (9 m)** of building lines. Comply with NFPA 241.
  2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
  1. Protect existing site improvements to remain including curbs, pavement, and utilities.
  2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Parking: **Use designated areas of Owner's existing** parking areas for construction personnel.
- D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
  1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
  2. Remove snow and ice as required to minimize accumulations.
- E. Project Identification and Temporary Signs: Provide Project identification and other signs **in accordance with local ordinances**. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
  1. Provide temporary, directional signs for construction personnel and visitors.
  2. Maintain and touchup signs so they are legible at all times.

- F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.
- G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
  - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- H. Existing Elevator Use: Use of Owner's existing elevators will **NOT** be permitted.
- I. Existing Stair Usage: Use of Owner's *specified* existing stairs will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
  - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.

### 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.
- F. Site Enclosure Fence: **Before construction operations begin**, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
  - 1. Extent of Fence: **As required to enclose Project site or portion determined sufficient to accommodate construction operations as indicated on Drawings.**

2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. **Provide Owner with one set of keys.**
- G. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
  1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
- J. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by **Owner and tenants** from fumes and noise.
  1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
  2. Construct dustproof partitions with 2 layers of **3-mil (0.07-mm)** polyethylene sheet on each side. Cover floor with 2 layers of **3-mil (0.07-mm)** polyethylene sheet, extending sheets **18 inches (460 mm)** up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant plywood.
    - a. Construct vestibule and airlock at each entrance through temporary partition with not less than **48 inches (1219 mm)** between doors. Maintain water-dampened foot mats in vestibule.
  3. Insulate partitions to provide noise protection to occupied areas.
  4. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
  5. Protect air-handling equipment.
  6. Weather strip openings.
  7. Provide walk-off mats at each entrance through temporary partition.
- K. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
  1. Prohibit smoking in **construction** areas.
  2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
  3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
  4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

### 3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
  - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
  - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
  - 2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000





## SECTION 016000 - PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. See Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
- C. See Divisions 02 through 49 Sections for specific requirements for warranties on products and installations specified to be warranted.

#### 1.2 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
  - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

#### 1.3 SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified material or product cannot be provided.
    - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
    - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - e. Samples, where applicable or requested.
    - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
    - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
    - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
    - j. Cost information, including a proposal of change, if any, in the Contract Sum.
    - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
    - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
  2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within **7** days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within **15** days of receipt of request, or **7** days of receipt of additional information or documentation, whichever is later.
    - a. Form of Acceptance: Change Order.
    - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
- B. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable

product request within **15** days of receipt of request, or **7** days of receipt of additional information or documentation, whichever is later.

- a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
  - b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.
- C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

#### 1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

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

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

## 1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
  - 1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
  - 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
  - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
  - 3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
  - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
  - 4. Where products are accompanied by the term "as selected," Architect will make selection.
  - 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
  - 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
- B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
  - a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
  - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
  - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution if received within 21 days after **the Notice of Award**. Requests received after that time may be considered or rejected at discretion of Architect.
- B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
  - 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
  - 2. Requested substitution does not require extensive revisions to the Contract Documents.
  - 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
  - 4. Substitution request is fully documented and properly submitted.
  - 5. Requested substitution will not adversely affect Contractor's Construction Schedule.
  - 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
  - 7. Requested substitution is compatible with other portions of the Work.
  - 8. Requested substitution has been coordinated with other portions of the Work.
  - 9. Requested substitution provides specified warranty.

## 2.3 COMPARABLE PRODUCTS

- A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
  - 1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
  - 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
  - 3. Evidence that proposed product provides specified warranty.
  - 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
  - 5. Samples, if requested.

## PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

## SECTION 017300 - EXECUTION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. General installation of products.
  - 2. Progress cleaning.
  - 3. Starting and adjusting.
  - 4. Protection of installed construction.
  - 5. Correction of the Work.
- B. See Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

#### 1.2 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

### PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
  - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.



1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
  2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

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

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to existing conditions. If discrepancies are discovered, notify Architect promptly.

### 3.4 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.5 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
  3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
  2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.6 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

### 3.7 PROTECTION OF INSTALLED CONSTRUCTION

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

### 3.8 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
  - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

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## SECTION 017329 - CUTTING AND PATCHING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. See Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
- C. See Division 07 Section "Penetration Firestopping" for patching fire-rated construction.

#### 1.2 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least **10** days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
  - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
  - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
  - 3. Products: List products to be used and firms or entities that will perform the Work.
  - 4. Dates: Indicate when cutting and patching will be performed.
  - 5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
  - 6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
  - 7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

#### 1.3 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

1. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
- C. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

#### 1.4 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
  1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
  2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.

- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to **prevent** interruption to occupied areas.

### 3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. **Concrete and Masonry:** Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
  - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.



3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
  4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

## SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
  - 1. Disposing of nonhazardous **demolition and construction** waste.

#### 1.2 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

### PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION

#### 3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by **Owner**. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

### 3.2 DISPOSAL OF WASTE

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

END OF SECTION 017419

## SECTION 017700 - CLOSEOUT PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Inspection procedures.
  - 2. Warranties.
  - 3. Final cleaning.
- B. See Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
- C. See Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
- D. See Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
- E. See Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
- F. See Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

#### 1.2 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
  - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  - 2. Advise Owner of pending insurance changeover requirements.
  - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
  - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
  - 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.

8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

### 1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit **three** copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
  - 1. Organize list of spaces in sequential order.
  - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

#### 1.5 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
  - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive **8-1/2-by-11-inch (215-by-280-mm)** paper.
  - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark 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 Installer.
  - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

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

### PART 3 - EXECUTION

#### 3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Remove snow and ice to provide safe access to building.
    - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - h. Sweep concrete floors broom clean in unoccupied spaces.
    - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    - k. Remove labels that are not permanent.
    - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
      - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
    - m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    - n. Replace parts subject to unusual operating conditions.
    - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
    - r. Leave Project clean and ready for occupancy.

- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700



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## SECTION 017823 - OPERATION AND MAINTENANCE DATA

## PART 1 - GENERAL

## 1.1 SUMMARY

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

## 1.2 CLOSEOUT SUBMITTALS

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

### 1.3 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
  - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  - 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
  - 1. Binders: Heavy-duty, three-ring, vinyl-covered, **loose-leaf** binders, in thickness necessary to accommodate contents, sized to hold **8-1/2-by-11-inch (215-by-280-mm)** paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
  - 2. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
    - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

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

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  - 1. Title page.
  - 2. Table of contents.
  - 3. Manual contents.
- B. Title Page: Include the following information:
  - 1. Subject matter included in manual.
  - 2. Name and address of Project.
  - 3. Name and address of Owner.
  - 4. Date of submittal.
  - 5. Name and contact information for Contractor.
  - 6. Name and contact information for Construction Manager.
  - 7. Name and contact information for Architect.
  - 8. Name and contact information for Commissioning Authority.

9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

## 1.5 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
  2. Emergency instructions.
  3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
  2. Flood.
  3. Gas leak.
  4. Water leak.
  5. Power failure.
  6. Water outage.
  7. System, subsystem, or equipment failure.
  8. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- E. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
  2. Shutdown instructions for each type of emergency.

3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

#### 1.6 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
  1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  2. Performance and design criteria if Contractor has delegated design responsibility.
  3. Operating standards.
  4. Operating procedures.
  5. Operating logs.
  6. Wiring diagrams.
  7. Control diagrams.
  8. Piped system diagrams.
  9. Precautions against improper use.
  10. License requirements including inspection and renewal dates.
- C. Descriptions: Include the following:
  1. Product name and model number. Use designations for products indicated on Contract Documents.
  2. Manufacturer's name.
  3. Equipment identification with serial number of each component.
  4. Equipment function.
  5. Operating characteristics.
  6. Limiting conditions.
  7. Performance curves.
  8. Engineering data and tests.
  9. Complete nomenclature and number of replacement parts.
- D. Operating Procedures: Include the following, as applicable:
  1. Startup procedures.
  2. Equipment or system break-in procedures.
  3. Routine and normal operating instructions.
  4. Regulation and control procedures.
  5. Instructions on stopping.
  6. Normal shutdown instructions.
  7. Seasonal and weekend operating instructions.
  8. Required sequences for electric or electronic systems.
  9. Special operating instructions and procedures.

- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed and identify color coding where required for identification.

#### 1.7 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds, as described below.
- C. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
  - 1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
    - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  - 1. Test and inspection instructions.
  - 2. Troubleshooting guide.
  - 3. Precautions against improper maintenance.
  - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - 5. Aligning, adjusting, and checking instructions.
  - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.
- H. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

#### 1.8 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern, and texture.
  - 4. Material and chemical composition.
  - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - 1. Inspection procedures.
  - 2. Types of cleaning agents to be used and methods of cleaning.
  - 3. List of cleaning agents and methods of cleaning detrimental to product.
  - 4. Schedule for routine cleaning and maintenance.
  - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823





## SECTION 017839 - PROJECT RECORD DOCUMENTS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings.
  - 2. Record specifications.
  - 3. Record Product Data.
- B. Related Requirements:
  - 1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

## 1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit two set(s) of marked-up record prints.
  - 2. Number of Copies: Submit copies of Record Drawings as follows:
    - a. Initial Submittal:
      - 1) Submit PDF electronic files of scanned record prints and **one** set of file prints.
      - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
    - b. Final Submittal:
      - 1) Submit PDF electronic files of scanned Record Prints and **three** set(s) of file prints.
      - 2) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit **annotated PDF electronic files and two paper copies** of Project's Specifications, including addenda and Contract modifications.
- C. Record Product Data: Submit **annotated PDF electronic files and directories and two paper copies** of each submittal.
  - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

### 1.3 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an acceptable drawing technique.
    - c. Record data as soon as possible after obtaining it.
    - d. Record and check the markup before enclosing concealed installations.
    - e. Cross-reference record prints to corresponding photographic documentation.
  2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order and/or Change Directive.
    - k. Details not on the original Contract Drawings.
    - l. Field records for variable and concealed conditions.
    - m. Record information on the Work that is shown only schematically.
  3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  2. Format: Annotated PDF electronic file[ **with comment function enabled**].

3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
  - a. Project name.
  - b. Date.
  - c. Designation "PROJECT RECORD DRAWINGS."
  - d. Name of Architect.
  - e. Name of Contractor.

#### 1.4 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
  3. Note related Change Orders, **Record Product Data**, and Record Drawings where applicable.
- B. Format: Submit record specifications as **annotated PDF electronic file of marked-up paper copy of Specifications**].

#### 1.5 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
- C. Format: Submit Record Product Data as **annotated PDF electronic file**.
  1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

#### 1.6 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for

construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's[ **and Construction Manager's**] reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017839

## SECTION 033000 - CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

#### 1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, and other pozzolans materials subject to compliance with requirements.
- B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

#### 1.3 PREINSTALLATION MEETINGS

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

#### 1.4 ACTION SUBMITTALS

##### A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Aggregates.
6. Admixtures:
  - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
7. Vapor retarders.
8. Liquid floor treatments.
9. Curing materials.
10. Joint fillers.

- B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
10. Intended placement method.
11. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
  - a. Location of construction joints is subject to approval of the Architect.

D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

## 1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Vapor retarders.
5. Joint-filler strips.

B. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Aggregates.
6. Admixtures:

- C. Research Reports: For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
- D. Preconstruction Test Reports: For each mix design.
- E. Field quality-control reports.
- F. Minutes of preinstallation conference.

## 1.6 QUALITY ASSURANCE

- A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
  - 1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

## 1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.
  - 1. Include the following information in each test report:
    - a. Admixture dosage rates.
    - b. Slump.
    - c. Air content.
    - d. Seven-day compressive strength.
    - e. 28-day compressive strength.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301 (ACI 301M).

## 1.9 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 306.1.
- B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M).



## PART 2 - PRODUCTS

## 2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 (ACI 301M) unless modified by requirements in the Contract Documents.

## 2.2 CONCRETE MATERIALS

## A. Cementitious Materials:

- 1. Portland Cement: ASTM C150/C150M, **Type I/II**.
- 2. Fly Ash: ASTM C618, Class C or F.
- 3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.

- B. Normal-Weight Aggregates: ASTM C33/C33M, coarse aggregate or better, graded. Provide aggregates from a single source.

- 1. Maximum Coarse-Aggregate Size: **3/4 inch** nominal.
- 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

- C. Air-Entraining Admixture: ASTM C260/C260M.

- D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride[ **in steel-reinforced concrete**].

- 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
- 2. Retarding Admixture: ASTM C494/C494M, Type B.
- 3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
- 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
- 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
- 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

- E. Water and Water Used to Make Ice: ASTM C94/C94M, potable **or complying with ASTM C1602/C1602M, including all limits listed in Table 2 and the requirements of paragraph 5.4**

## 2.3 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A, not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Fortifiber Building Systems Group.
  - b. ISI Building Products.

- c. W. R. Meadows, Inc.

## 2.4 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that **penetrates, hardens, and densifies concrete surfaces.**
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Euclid Chemical Company (The); an RPM company.
    - b. Kaufman Products, Inc.
    - c. W. R. Meadows, Inc.

## 2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
  - 1. Color:
    - a. Ambient Temperature Below 50 deg F (10 deg C): Black.
    - b. Ambient Temperature between 50 deg F (10 deg C) and 85 deg F (29 deg C): Any color.
    - c. Ambient Temperature Above 85 deg F (29 deg C): White.
- C. Water: Potable or complying with ASTM C1602/C1602M.
- D. Clear, Waterborne, Membrane-Forming, Nondissipating Curing Compound: ASTM C309, Type 1, Class B, **certified by curing compound manufacturer to not interfere with bonding of floor sealer and/or any floor coverings.**
  - 1. Manufacturers: Subject to compliance with requirements:
    - a. Euclid Chemical Company (The); an RPM company.
    - b. Kaufman Products, Inc.
    - c. W. R. Meadows, Inc.

## 2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: **ASTM D1751, asphalt-saturated cellulosic fiber.**

## 2.7 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301 (ACI 301M).

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
  1. Fly Ash or Other Pozzolans: 25 percent by mass.
  2. Slag Cement: 50 percent by mass.
  3. Total of Fly Ash or Other Pozzolans, Slag Cement: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass.
  4. Total of Fly Ash or Other Pozzolans: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass.
- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
  1. Use **water-reducing high-range water-reducing or plasticizing** admixture in concrete, as required, for placement and workability.
  2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  3. Use water-reducing admixture in **pumped concrete**, [**concrete for heavy-use industrial slabs and concrete with a w/cm below 0.50**].

## 2.8 CONCRETE MIXTURES

- A. Class **A** : Normal-weight concrete used for footings, grade beams, and tie beams.
  1. Minimum Compressive Strength: See structural for strength at 28 days.
  2. Slump Limit: **5 inches (125 mm), plus or minus 1 inch (25 mm)**.
  3. Air Content:
    - a. Exposure Class F1: **5.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch (19-mm) nominal maximum aggregate size**.
  4. Limit water-soluble, chloride-ion content in hardened concrete to **0.30** percent by weight of cement.
- B. Class **C** : Normal-weight concrete used for interior slabs-on-ground.
  1. Exposure Class: ACI 318 (ACI 318M) **W1**.
  2. Minimum Compressive Strength: **4000 psi (27.6 MPa)** at 28 days.
  3. Maximum w/cm: **0.50**.
  4. Minimum Cementitious Materials Content: **520 lb/cu. yd. (309 kg/cu. m)**.
  5. Slump Limit: **5 inches (125 mm), plus or minus 1 inch (25 mm)**.
  6. Air Content:
    - a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
  7. Limit water-soluble, chloride-ion content in hardened concrete to **0.30** percent by weight of cement.

## 2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and furnish batch ticket information.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
  - 1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
  - 2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
  - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
  - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
  - 3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

### 3.2 INSTALLATION OF VAPOR RETARDER

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
  - 1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
  - 2. Face laps away from exposed direction of concrete pour.
  - 3. Lap vapor retarder over footings and grade beams not less than 6 inches (150 mm), sealing vapor retarder to concrete.
  - 4. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
  - 5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
  - 6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
  - 7. Protect vapor retarder during placement of reinforcement and concrete.

- a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches (150 mm) on all sides, and sealing to vapor retarder.

### 3.3 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
  1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
  2. Place joints perpendicular to main reinforcement.
    - a. Continue reinforcement across construction joints unless otherwise indicated.
    - b. Do not continue reinforcement through sides of strip placements of floors and slabs.
  3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
  4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
  5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least **one-fourth** of concrete thickness as follows:
  1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
  2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
  1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
  2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
  3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints:
  1. Install dowel bars and support assemblies at joints where indicated on Drawings.

2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

F. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

### 3.4 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
  1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
  2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
  1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M), but not to exceed the amount indicated on the concrete delivery ticket.
  1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
  1. If a section cannot be placed continuously, provide construction joints as indicated.
  2. Deposit concrete to avoid segregation.
  3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
  4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301 (ACI 301M).
    - a. Do not use vibrators to transport concrete inside forms.
    - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer.
    - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
    - d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Do not place concrete floors and slabs in a checkerboard sequence.
  2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  3. Maintain reinforcement in position on chairs during concrete placement.
  4. Screed slab surfaces with a straightedge and strike off to correct elevations.
  5. Level concrete, cut high areas, and fill low areas.
  6. Slope surfaces uniformly to drains where required.
  7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
  8. Do not further disturb slab surfaces before starting finishing operations.

### 3.5 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 (ACI 301M) Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
  - a. Patch voids larger than 3/4 inch (19 mm) wide or 1/2 inch (13 mm) deep.
  - b. Remove projections larger than 1/4 inch (6 mm).
  - c. Patch tie holes.
  - d. Surface Tolerance: ACI 117 (ACI 117M) Class B.
  - e. Locations: Apply to concrete surfaces **exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.**

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

### 3.6 FINISHING FLOORS AND SLABS

- A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: Sample to be provided to Owner for approval before proceeding with any scratch finish.
1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.

2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch (6 mm) in one direction.
3. Apply scratch finish to surfaces **to receive mortar setting beds for bonded cementitious floor finishes in showers.**

C. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 (ACI A117M) tolerances for conventional concrete.

D. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces **exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.**
7. Finish and measure surface, so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed **1/8 inch (3 mm) and also no more than 1/16 inch (1.6 mm) in 2 feet (610 mm).**

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces **where ceramic or quarry tile is to be installed by either thickset or thinset method.** While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Coordinate required final finish with Architect before application.
2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

### 3.7 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:



1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
  2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
  3. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
  2. Construct concrete bases **4 inches (100 mm)** high unless otherwise indicated on Drawings, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
  3. Minimum Compressive Strength: **4000 psi (27.6 MPa)** at 28 days.
  4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
  5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
  6. Prior to pouring concrete, place and secure anchorage devices.
    - a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    - b. Cast anchor-bolt insert into bases.
    - c. Install anchor bolts to elevations required for proper attachment to supported equipment.

### 3.8 CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
1. Comply with ACI 301 (ACI 301M) and ACI 306.1 for cold weather protection during curing.
  2. Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M) for hot-weather protection during curing.
  3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h (1 kg/sq. m x h), calculated in accordance with ACI 305.1, before and during finishing operations.
- B. Curing Formed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:
1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
  2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
  3. If forms remain during curing period, moist cure after loosening forms.
  4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

- a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
  - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
  - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
  - d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
  - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
    - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
    - 2) Maintain continuity of coating and repair damage during curing period.
- C. Curing Unformed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:
- 1. Begin curing immediately after finishing concrete.
  - 2. Interior Concrete Floors:
    - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
      - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
        - a) Lap edges and ends of absorptive cover not less than 12 inches (300 mm).
        - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
      - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive.
        - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
        - b) Cure for not less than seven days.
      - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
        - a) Water.
        - b) Continuous water-fog spray.
    - b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:

- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
    - a) Lap edges and ends of absorptive cover not less than 12 inches (300 mm).
    - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
  - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive.
    - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
    - b) Cure for not less than seven days.
  - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
    - a) Water.
    - b) Continuous water-fog spray.
- c. Floors to Receive Curing Compound:
- 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
  - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
  - 3) Maintain continuity of coating, and repair damage during curing period.
  - 4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer **unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.**
- d. Floors to Receive Curing and Sealing Compound: All Truck Bays and adjacent room that scheduled to have exposed concrete w/ sealer.
- 1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
  - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
  - 3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

### 3.9 TOLERANCES

- A. Conform to ACI 117 (ACI 117M).

### 3.10 APPLICATION OF LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.
  - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
  - 2. Do not apply to concrete that is less than **seven** days' old.
  - 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
  - 4. Rinse with water; remove excess material until surface is dry.
  - 5. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller in accordance with manufacturer's written instructions.

### 3.11 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: **Engage** a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
  - 1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
  - 2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
  - 3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
    - a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
      - 1) Project name.
      - 2) Name of testing agency.
      - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
      - 4) Name of concrete manufacturer.
      - 5) Date and time of inspection, sampling, and field testing.
      - 6) Date and time of concrete placement.
      - 7) Location in Work of concrete represented by samples.
      - 8) Date and time sample was obtained.
      - 9) Truck and batch ticket numbers.
      - 10) Design compressive strength at 28 days.
      - 11) Concrete mixture designation, proportions, and materials.
      - 12) Field test results.

- 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
  - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
1. Verification of use of required design mixture.
  2. Curing procedures and maintenance of curing temperature.
  3. Verification of concrete strength before removal of shores and forms from beams and slabs.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
    - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  2. Slump: ASTM C143/C143M:
    - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
    - b. Perform additional tests when concrete consistency appears to change.
  3. Slump Flow: ASTM C1611/C1611M:
    - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
    - b. Perform additional tests when concrete consistency appears to change.
  4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete.
    - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  5. Concrete Temperature: ASTM C1064/C1064M:
    - a. One test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
  6. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.

- a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C31/C31M:
  - a. Cast and laboratory cure two sets of **three** 6-inch (150 mm) by 12-inch (300 mm) or 4-inch (100 mm) by 8-inch (200 mm) cylinder specimens for each composite sample.
  - b. Cast, initial cure, and field cure **two** sets of **three** standard cylinder specimens for each composite sample.
8. Compressive-Strength Tests: ASTM C39/C39M.
  - a. Test one set of **three** laboratory-cured specimens at seven days and one set of two specimens at 28 days.
  - b. Test one set of **three** field-cured specimens at seven days and one set of two specimens at 28 days.
  - c. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa) if specified compressive strength is 5000 psi (34.5 MPa), or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi (34.5 MPa).
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests:
  - a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
  - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
    - 1) Acceptance criteria for concrete strength to be in accordance with ACI 301 (ACI 301M), Section 1.6.6.3.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

- F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 (ASTM E1155M) within **24** hours of completion of floor finishing and promptly report test results to Architect.

### 3.12 PROTECTION

- A. Protect concrete surfaces as follows:
  - 1. Protect from petroleum stains.
  - 2. Diaper hydraulic equipment used over concrete surfaces.
  - 3. Prohibit vehicles from interior concrete slabs.
  - 4. Prohibit use of pipe-cutting machinery over concrete surfaces.
  - 5. Prohibit placement of steel items on concrete surfaces.
  - 6. Prohibit use of acids or acidic detergents over concrete surfaces.
  - 7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

## SECTION 042000 - UNIT MASONRY

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Concrete masonry units.
  - 2. Brick Veneer – **To be provided by the Owner.**

#### 1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

#### 1.3 ACTION SUBMITTALS

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

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of product. For masonry units, include **material test reports substantiating compliance with requirements.**
- B. Mix Designs: For each type of mortar **and grout**. Include description of type and proportions of ingredients.
  - 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
  - 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

#### 1.5 QUALITY ASSURANCE

#### 1.6 FIELD CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.



- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

## PART 2 - PRODUCTS

### 2.1 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work **and will be within 20 feet (6 m) vertically and horizontally of a walking surface.**
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
  - 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

### 2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
  - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- B. CMUs: ASTM C90, with ultimate compressive strength of 1500 psi, grade N..
- C. Brick Veneer: **2-1/4"x3-1/2"x7-5/8" face brick to Be provided by the Owner.**

### 2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color to match and replicate existing.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C 91/C 91M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Cemex S.A.B. de C.V.
  - b. Essroc.
  - c. Holcim (US) Inc.
  - d. Lafarge North America Inc.
  - e. Lehigh Cement Company.
- E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in masonry mortar.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Davis Colors.
    - b. Lanxess Corporation.
    - c. Solomon Colors, Inc.
- F. Colored Cement Products: Packaged blend made from **portland cement and hydrated lime or masonry cement** and mortar pigments, all complying with specified requirements, and containing no other ingredients.
  1. Colored Portland Cement-Lime Mix:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Essroc.
      - 2) Holcim (US) Inc.
      - 3) Lafarge North America Inc.
      - 4) Lehigh Cement Company.
  2. Colored Masonry Cement:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Cemex S.A.B. de C.V.
      - 2) Essroc.
      - 3) Holcim (US) Inc.
      - 4) Lafarge North America Inc.
      - 5) Lehigh Cement Company.
- G. Aggregate for Mortar: ASTM C 144.
  1. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
  2. White-Mortar Aggregates: Natural white sand or crushed white stone.

3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- H. Aggregate for Grout: ASTM C 404.
- I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. BASF Construction Chemicals - Building Systems.
    - b. Euclid Chemical Company (The); an RPM company.
    - c. Grace Construction Products; W.R. Grace & Co. -- Conn.
- J. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ACM Chemistries.
    - b. BASF Aktiengesellschaft.
    - c. Euclid Chemical Company (The); an RPM company.
    - d. Grace Construction Products; W.R. Grace & Co. -- Conn.
- K. Water: Potable.

## 2.4 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M to used at CMU walls with brick veneer only.
1. Exterior Walls: **Hot-dip galvanized carbon steel.**
  2. Wire Size for Side Rods: **0.148-inch (3.77-mm) diameter.**
  3. Wire Size for Cross Rods: **0.148-inch (3.77-mm)] diameter.**
  4. Wire Size for Veneer Ties: **0.148-inch (3.77-mm) diameter.**
  5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
  6. Provide in lengths of not less than 10 feet (3 m), **with prefabricated corner and tee units.**
- C. Masonry-Joint Reinforcement for Multiwythe Masonry:
1. Ladder type with one side rod at each face shell of hollow masonry units more than 4 inches (100 mm) wide, plus **one side rod** at each wythe of masonry 4 inches (100 mm) wide or less.

## 2.5 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch (16-mm) cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
  - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
  - 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
  - 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches (100 mm) wide.
  - 1. Wire: Fabricate from [~~3/16-inch- (4.76-mm-)~~] [~~1/4-inch- (6.35-mm-)~~] diameter, hot-dip galvanized-steel wire.
- D. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated.
  - 1. Corrosion Protection: **Hot-dip galvanized to comply with ASTM A 153/A 153M.**

## 2.6 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from **neoprene urethane or PVC**.
- B. Preformed Control-Joint Gaskets: Made from **styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406** and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

## 2.7 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Diedrich Technologies, Inc.; a division of Sandell Construction Solutions.
    - b. EaCo Chem, Inc.
    - c. PROSOCO, Inc.

## 2.8 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
  - 2. Use **portland cement-lime or masonry cement** mortar unless otherwise indicated.
  - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, **Proportion** Specification. Provide the following types of mortar for applications stated unless another type is indicated **or needed to provide required compressive strength of masonry**.
  - 1. For masonry below grade or in contact with earth, use Type M.
  - 2. For reinforced masonry, use **Type S**.
  - 3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
  - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
  - 2. Provide grout with a slump of **10 to 11 inches (250 to 280 mm)** as measured according to ASTM C 143/C 143M.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

### 3.2 TOLERANCES

#### A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

#### B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.

#### C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

### 3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

- E. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

### 3.4 MORTAR BEDDING AND JOINTING

A. Lay **CMUs** as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Lay structural clay tile as follows:

1. Lay vertical-cell units with full head joints unless otherwise indicated. Provide bed joints with full mortar coverage on face shells and webs.
2. Lay horizontal-cell units with full bed joints unless otherwise indicated. Keep drainage channels, if any, free of mortar. Form head joints with sufficient mortar so excess will be squeezed out as units are placed in position. Butter both sides of units to be placed, or butter one side of unit already in place and one side of unit to be placed.
3. Maintain joint thicknesses indicated except for minor variations required to maintain bond alignment. If not indicated, lay walls with 1/4- to 3/8-inch- (6- to 10-mm-) thick joints.

- D. Rake out mortar joints at to a uniform depth of 1/4 inch (6 mm) and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.

- E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

- F. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

### 3.5 COMPOSITE MASONRY

A. Bond wythes of composite masonry together **as follows**:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for **1.77 sq. ft. (0.16 sq. m)** of wall area spaced not to exceed [**24 inches (610 mm)**] o.c. horizontally and 16 inches (406 mm) o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches (305 mm) of openings and space not more than 36 inches (914 mm) apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches (610 mm) o.c. vertically.
2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.

- a. Where bed joints of both wythes align, use **ladder-type reinforcement extending across both wythes.**
  - b. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement **with continuous horizontal wire in facing wythe attached to ties.**
- B. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.
- C. Collar Joints in Clay Tile Masonry: After each course is laid, fill the vertical, longitudinal joint between wythes solidly with mortar at **exterior walls, except cavity walls , and interior walls and partitions.**
- D. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.
- E. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
  1. Provide individual metal ties not more than **[8 inches (203 mm)] [16 inches (406 mm)]** o.c.
  2. Provide continuity with masonry-joint reinforcement by using prefabricated T-shaped units.
  3. Provide rigid metal anchors not more than **24 inches (610 mm)** o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

### 3.6 MASONRY-JOINT REINFORCEMENT

- A. General: Refer to Structural Drawings for Masonry Note E.9 on Sheet S0.1, and Detail 6/SO.2 & 7/S0.2 for specified bond beams in lieu of joint reinforcing. Joint reinforcing only specified on multi-wythe wall construction.
  1. Space reinforcement not more than 16 inches (406 mm) o.c.
  2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
  3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings **in addition to continuous reinforcement.**
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

### 3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:



1. Provide an open space not less than **1 inch (25 mm)** wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

### 3.8 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
  1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
  1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
  2. Limit height of vertical grout pours to not more than **60 inches (1520 mm)**.

### 3.9 REPAIRING, POINTING, AND CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
  3. Protect adjacent surfaces from contact with cleaner.
  4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
  6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.10 MASONRY WASTE DISPOSAL

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
  - 1. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.
- B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

## SECTION 055213 - PIPE AND TUBE RAILINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Steel railings.

#### 1.2 ACTION SUBMITTALS

A. Product Data:

1. Manufacturer's product lines of mechanically connected railings.
2. Handrail brackets.
3. Metal finishes.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish.

D. Delegated Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For **delegated design professional engineer**.

B. Welding certificates.

C. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.

#### 1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Handrails and Top Rails of Guards:
    - a. Uniform load of **50 lbf/ ft. (0.73 kN/m)** applied in any direction.
    - b. Concentrated load of **200 lbf (0.89 kN)** applied in any direction.
    - c. Uniform and concentrated loads need not be assumed to act concurrently.
  - 2. Infill of Guards:
    - a. Concentrated load of **50 lbf (0.22 kN)** applied horizontally on an area of **1 sq. ft. (0.093 sq. m)**.
    - b. Infill load and other loads need not be assumed to act concurrently.

### 2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
  - 1. Provide type of bracket with **predrilled hole for exposed bolt anchorage]**and that provides **1-1/2-inch (38-mm)** clearance from inside face of handrail to finished wall surface.

### 2.3 STEEL RAILINGS

- A. Tubing: **ASTM A500/A500M (cold formed)**.
  - 1. Provide galvanized finish for installations.
- B. Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Cast Iron Fittings: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

## 2.4 FASTENERS

- A. Fastener Materials:
  - 1. Hot-Dip Galvanized Railing Components: hot-dip zinc-coated steel fasteners complying ASTM F2329/F2329M for zinc coating.
- B. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 **or ICC-ES AC308**.

## 2.5 MISCELLANEOUS MATERIALS

- A. Handrail Brackets: **Cast iron** center of handrail.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint, complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

## 2.6 FABRICATION

- A. Cut, drill, and punch metals cleanly and accurately.
  - 1. Remove burrs and ease edges to a radius of approximately **1/32 inch (1 mm)** unless otherwise indicated.
  - 2. Remove sharp or rough areas on exposed surfaces.
- B. Form work true to line and level with accurate angles and surfaces.
- C. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove flux immediately.
  - 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for **Finish #2 welds; good appearance, completely sanded joint, some undercutting and pinholes okay**.
- D. Form changes in direction as follows:
  - 1. **By bending or by inserting prefabricated elbow fittings.**
- E. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- F. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
- G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is **1/4 inch (6 mm)** or less.

- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
  - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- I. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.
  - 1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
  - 2. Coordinate anchorage devices with supporting structure.
- J. For removable railing posts, fabricate slip-fit sockets from stainless steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height.
  - 1. Provide socket covers designed and fabricated to resist being dislodged.
  - 2. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

## 2.7 STEEL AND IRON FINISHES

- A. Galvanized Railings:
  - 1. Hot-dip galvanize [exterior] [indicated] steel railings, including hardware, after fabrication.
  - 2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
  - 3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

## 2.8 ALUMINUM FINISHES

## 2.9 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings.
  - 1. Fit exposed connections together to form tight, hairline joints.
  - 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
  - 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
  - 4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
  - 5. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).

6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed **1/4 inch in 12 feet (6 mm in 3.5 m)**.

- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

## 2.10 ANCHORING POSTS

- A. Anchor posts to wood structure with steel plates as required by conditions, that are welded to posts and to wood supporting members.
- B. Install removable railing sections, where indicated on Drawings, in slip-fit stainless steel sockets cast in concrete.

## 2.11 ATTACHING RAILINGS

- A. Attach handrails to walls with wall brackets. Provide brackets with **1-1/2-inch (38-mm)** <Insert clearance from inside face of handrail and finished wall surface.
- B. Secure wall brackets to building construction as follows:
  1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
  2. For hollow masonry anchorage, use toggle bolts.
  3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
- C. Install railing gates level, plumb, and secure for full opening without interference.

## 2.12 CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055213

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## SECTION 061000 - ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Wood blocking and nailers.
4. Wood furring **and grounds**.
5. Wood sleepers.
6. Plywood backing panels.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data:

1. For each type of process and factory-fabricated product.
2. For preservative-treated wood products.

#### 1.3 INFORMATIONAL SUBMITTALS

##### A. Material Certificates:

1. For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained.

##### B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Engineered wood products.
3. Shear panels.
4. Power-driven fasteners.
5. Post-installed anchors.
6. Metal framing anchors.

## PART 2 - PRODUCTS

## 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber 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. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content:
  - 1. Boards: **15** percent.
  - 2. Dimension Lumber: **19 percent thickness or less; 19 percent for more than 2-inch nominal (38-mm actual) thickness** unless otherwise indicated.
  - 3. Timber. **19 percent.**
- C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
  - 1. Allowable design stresses, as published by manufacturer, are to meet or exceed those indicated. Manufacturer's published values are to be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

## 2.2 PRESERVATIVE TREATMENT

- A. Preservative Treatment by Pressure Process: AWP A 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 or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that 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 **items indicated on Drawings, and the following**:
  - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  - 2. Wood sills, sleepers, blocking, **furring, stripping**, and similar concealed members in contact with masonry or concrete.

3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than **18 inches (460 mm)** above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

## 2.3 DIMENSION LUMBER FRAMING

### A. Non-Load-Bearing Interior Partitions by Grade: **Construction or No. 2** grade.

1. Species:
  - a. Southern pine or mixed southern pine; SPIB.
  - b. Northern species; NLGA.
  - c. Eastern softwoods; NeLMA.
  - d. Western woods; WCLIB or WWP.

### B. Framing Other Than Non-Load-Bearing Partitions by Grade: **No. 2** grade.

1. Species: SYP See structural.

## 2.4 ENGINEERED WOOD PRODUCTS

### A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D5456 and manufactured with an exterior-type adhesive complying with ASTM D2559.

1. Extreme Fiber Stress in Bending, Edgewise: See Structural Notes.
2. Modulus of Elasticity, Edgewise: See Structural Notes.

## 2.5 MISCELLANEOUS LUMBER

### A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Cants.
4. Furring.
5. Grounds.

### B. Dimension Lumber Items: **Construction or No. 2** grade lumber of any species.

### C. Concealed Boards: **19** percent maximum moisture content and **any of** the following species and grades:

1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
2. Eastern softwoods; No. 2 Common grade; NeLMA.
3. Northern species; No. 2 Common grade; NLGA.
4. Western woods; **Construction or No. 2 Common** grade; WCLIB or WWP.

## 2.6 PLYWOOD BACKING PANELS

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

## 2.7 FASTENERS

- A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.
  - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners[ **with hot-dip zinc coating complying with ASTM A153/A153M**] [of Type **304 stainless steel**].
- B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

## 2.8 METAL FRAMING ANCHORS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 1. Simpson Strong-Tie Co., Inc.
- B. Allowable design loads, as published by manufacturer, are to meet or exceed those **indicated** on Structural as **basis-of-design products**. Manufacturer's published values are to be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors are to be punched for fasteners adequate to withstand same loads as framing anchors.
- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, **G60 (Z180)** coating designation.
  - 1. Use for interior locations unless otherwise indicated.
- D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); **G185 (Z550)** coating designation; and not less than **0.036 inch (0.9 mm)** thick.
  - 1. Use for wood-preservative-treated lumber and where indicated.

## 2.9 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets:

1. Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch (25-mm) nominal thickness, compressible to 1/32 inch (0.8 mm); selected from manufacturer's standard widths to suit width of sill members indicated.
  2. Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.
  3. Self-adhering sheet consisting of 64mils (1.6 mm) of rubberized asphalt laminated on one side to a 4-mil- (0.10-mm-) thick, polyethylene-film reinforcement, and with release liner on adhesive side.
- B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, **butyl rubber or rubberized-asphalt** compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than **0.025 inch (0.6 mm)**.
- C. Adhesives for Gluing [**Furring**] [**and**] [**Sleepers**] to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- C. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate [**furring**,]nailers, blocking, [**grounds**, ]and similar supports to comply with requirements for attaching other construction.
- D. Install shear wall panels to comply with manufacturer's written instructions.
- E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- F. Do not splice structural members between supports unless otherwise indicated.
- G. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).

2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

### 3.2 PROTECTION

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

END OF SECTION 061000

## SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Wood roof trusses.
2. Wood girder trusses.

#### 1.2 ALLOWANCES

- A. Provide wood truss bracing under the Metal-Plate-Connected Truss Bracing Allowance as specified in Section 012100 "Allowances."

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.

- B. Shop Drawings: Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Scissor trusses to have only one end pinned and one end to provide for horizontal deflection.
3. Indicate sizes, stress grades, and species of lumber.
4. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
5. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
6. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
7. Show splice details and bearing details.

- C. Delegated-Design Submittals: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss-fabricating firm.

- B. Evaluation Reports: For the following, from ICC-ES:

1. Metal-plate connectors.
2. Metal truss accessories.

## 1.5 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
  1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
  2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store trusses to comply with recommendations in SBCA BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal-plate-connected wood trusses.
- B. Structural Performance: Metal-plate-connected wood trusses are to be capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1.
- C. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.
- D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

## 2.2 DIMENSION LUMBER

- A. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (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. Provide dry lumber with **15** percent maximum moisture content at time of dressing.
- B. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in **Section 061000 "Rough Carpentry."**



## 2.3 METAL CONNECTOR PLATES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Alpine, a division of ITW Inc.
  - 2. Cherokee Metal Products, Inc.; Masengill Machinery Company.
  - 3. Eagle Metal Products.
  - 4. MiTek Industries, Inc.
- B. Fabricate connector plates to comply with TPI 1.
- C. Hot-Dip Galvanized-Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 (Z180) coating designation; and not less than 0.036 inch (0.9 mm) thick.

## 2.4 FASTENERS

- A. Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  - 1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
  - 2. Where trusses are exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
- B. Nails, Brads, and Staples: ASTM F1667.

## 2.5 METAL FRAMING ANCHORS AND ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 1. Simpson Strong-Tie Co., Inc.
- B. Allowable design loads, as published by manufacturer, are to comply with or exceed those **indicated**. Manufacturer's published values are to be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors are to be punched for fasteners adequate to withstand same loads as framing anchors.
- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 (Z180) coating designation.

## 2.6 FABRICATION

- A. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly, with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- B. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Anchor trusses securely at bearing points; use metal truss tie-downs as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.
- F. Securely connect each truss ply required for forming built-up girder trusses.
- G. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
  1. Install bracing to comply with **Section 061000 "Rough Carpentry."**
  2. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.
- H. Install wood trusses within installation tolerances in TPI 1.
- I. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.
- J. Replace wood trusses that are damaged or do not comply with requirements.

END OF SECTION 061753

## SECTION 064116 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product, **including, panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, and cabinet hardware and accessories.**
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
- C. Samples:
1. Plastic laminates, for each color, pattern, and surface finish.

#### 1.3 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

### PART 2 - PRODUCTS

#### 2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
- B. Grade: **Custom.**
- C. Type of Construction: **Frameless.**
- D. Cabinet, Door, and Drawer Front Interface Style: **Reveal overlay.**

- E. Reveal Dimension: **1/2 inch (13 mm)**.
- F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Formica Corporation.
    - b. Lamin-Art, Inc.
    - c. Wilsonart International Holdings, Inc.
- G. Laminate Cladding for Exposed Surfaces:
  - 1. Horizontal Surfaces: **Grade HGL.**
  - 2. Postformed Surfaces: **Grade HGP.**
  - 3. Vertical Surfaces: **Grade VGS.**
  - 4. Pattern Direction: **Vertically for drawer fronts, doors, and fixed panels.**
- H. Materials for Semiexposed Surfaces:
  - 1. Surfaces Other Than Drawer Bodies: **High-pressure decorative laminate, NEMA LD 3, Grade VGS.**
  - 2. Drawer Sides and Backs: **Solid-hardwood lumber Thermoset decorative panels with PVC edge banding.**
  - 3. Drawer Bottoms: **Hardwood plywood.**
- I. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless located directly under tops.
- J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
  - 1. As indicated by laminate manufacturer's designations.
  - 2. Match Architect's sample.
  - 3. As selected by Architect from laminate manufacturer's full range in the following categories:
    - a. Solid colors, **matte** finish.
    - b. Wood grains, **matte** finish.
    - c. Patterns, **matte** finish.

## 2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
  - 1. Wood Moisture Content: **5 to 10** percent.

- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
  - 1. Medium-Density Fiberboard: ANSI A208.2, **Grade 130, made with binder containing no urea formaldehyde.**
  - 2. Softwood Plywood: DOC PS 1, **medium-density overlay.**
  - 3. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, **made with adhesive containing no urea formaldehyde.**

## 2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, **135** degrees of opening.
- C. Wire Pulls: Back mounted, solid [**metal 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.**
- D. Shelf Rests: BHMA A156.9, B04013; **metal**].
- E. Drawer Slides: BHMA A156.9.
  - 1. Grade 1 and Grade 2: Side mounted **and extending under bottom edge of drawer; full-extension** type; **zinc-plated steel** with polymer rollers.
  - 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; **full-extension** type; zinc-plated-steel ball-bearing slides.
  - 3. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide **Grade 1.**
  - 4. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide **Grade 1HD-100.**
  - 5. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide **Grade 1HD-200.**
  - 6. For computer keyboard shelves, provide **Grade 1HD-100.**
  - 7. For trash bins not more than 20 inches (500 mm) high and 16 inches (400 mm) wide, provide **Grade 1HD-200.**
- F. Door Locks: BHMA A156.11, E07121.
- G. Drawer Locks: BHMA A156.11, E07041.
- H. Door and Drawer Silencers: BHMA A156.16, L03011.
- I. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
  - 1. Satin Stainless Steel: BHMA 630.

## 2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: **Softwood or hardwood lumber**, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.
- D. Adhesive for Bonding Plastic Laminate: **Contact cement**.
  - 1. Adhesive for Bonding Edges: **adhesive specified above for faces**.

## 2.5 FABRICATION

- A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- C. Install glass to comply with applicable requirements in Section 088000 "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

# PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

## 3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- C. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

- D. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails **or finishing screws** for exposed fastening, countersunk and filled flush with woodwork.
- E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
  - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 12 inches o.c. with **No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips.**

END OF SECTION 064116

.



## SECTION 072100 - THERMAL INSULATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board insulation.
2. Glass-fiber blanket insulation.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Extruded polystyrene foam-plastic board insulation.
2. Glass-fiber blanket insulation.

#### 1.3 INFORMATIONAL SUBMITTALS

A. Installer's Certification: Listing type, manufacturer, and R-value of insulation installed in each element of the building thermal envelope.

1. Sign, date, and post the certification in a conspicuous location on Project site.

B. Product test reports.

C. Research reports.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes **less than 25 and 450** when tested in accordance with ASTM E84.

B. Fire-Resistance Ratings: Comply with ASTM E119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from listings of another qualified testing agency.

C. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

- D. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches (305 mm) and wider in width.
- E. Thermal-Resistance Value (R-Value): **R-value as indicated on Drawings and below** in accordance with ASTM C518.

## 2.2 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

- A. Extruded Polystyrene Board Insulation, Type X: ASTM C578, Type X, **15-psi (104-kPa)** minimum compressive strength; unfaced.

## 2.3 GLASS-FIBER BLANKET INSULATION

- A. Glass-Fiber Blanket Insulation, Unfaced: ASTM C665, Type I; passing ASTM E136 for combustion characteristics.
  - 1. Exterior Walls (special stud spacing conditions): Unfaced insulation 5-1/2" R-20 to be used on walls with unusual stud spaces created by double studs, 12" stud spacing, etc. w/ polyethylene V/B. in lieu of Scrim-Kraft face V.B. See Structural for stud spacing.
- B. Glass-Fiber Blanket Insulation, Polypropylene-Scrim-Kraft Faced: ASTM C665, Type II (nonreflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).
  - 1. Main Ceiling Insulation: 12" R-38.
  - 2. Main Exterior Walls: 5-1/2" R-20 as designated on Floor Plan Sheet A1.
- C. Glass-Fiber CertaPRO AcoustaTherm Batts, Unfaced: ASTM C665, Type 1; passing ASTM E136 and ASTM E84 fire resistance characteristics.
  - 1. All interior stud partitions as designated on Floor Plan Sheet A1 3-1/2" thick friction fit batts.

## 2.4 ACCESSORIES

- A. Insulation Anchors, Spindles, and Standoffs: As recommended by manufacturer.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
- C. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

### 3.2 INSTALLATION OF SLAB INSULATION

- A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
  - 1. If not otherwise indicated, extend insulation a minimum of **24 inches (610 mm)** below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
  - 1. If not otherwise indicated, extend insulation a minimum of **24 inches (610 mm)** in from exterior walls.

### 3.3 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors.
- C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

### 3.4 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately **24 inches (610 mm)** o.c. both ways on inside face and as recommended by manufacturer.

1. Fit courses of insulation between **wall ties and other** obstructions, with edges butted tightly in both directions, and with faces flush.
2. Press units firmly against inside substrates.
3. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 "Unit Masonry."

### 3.5 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
4. For wood-framed construction, install blankets according to ASTM C1320 and as follows:
  - a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings and seal each continuous area of insulation to ensure airtight installation.
  - a. Exterior Walls: Set units with facing placed toward **interior of construction as indicated on Drawings**.
  - b. Interior Walls: Set units with facing placed **toward areas of high humidity**.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately **2.5 lb/cu. ft. (40 kg/cu. m)**.
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

END OF SECTION 072100

## SECTION 074113.16 - STANDING-SEAM METAL ROOF PANELS (ALTERNATE #1)

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Standing-seam metal roof panels.
2. Also see Section #077253 Snow Guards also included in Alt. #1.

#### 1.2 PREINSTALLATION MEETINGS

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

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
- C. Samples: For each type of metal panel indicated.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Warranties: Sample of special warranties.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

## 1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: **20 years** no repair limit weathertight limited warranty from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Finish Warranty Period: **20 years** from date of Substantial Completion.
- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
  - 1. Warranty Period: **20 years** from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
  - 1. Wind Loads: As indicated on Drawings.
  - 2. Other Design Loads: **As indicated on Drawings.**
  - 3. Deflection Limits: For wind loads, no greater than **1/240** of the span.
- B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E1680 **or ASTM E283** at the following test-pressure difference:
  - 1. Test-Pressure Difference: **1.57 lbf/sq. ft. (75 Pa).**
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E1646 **or ASTM E331** at the following test-pressure difference:
  - 1. Test-Pressure Difference: **2.86 lbf/sq. ft. (137 Pa).**
- D. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E2140.
- E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
  - 1. Uplift Rating: **UL 90.**

- F. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
1. Fire/Windstorm Classification: Class 1A-90.
  2. Hail Resistance: **MH**.
- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): **120 deg F (67 deg C), ambient**.

## 2.2 STANDING-SEAM METAL ROOF PANELS

- A. Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.
- B. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together. Basis of Design to be **Medallion-Lok snap together architectural panel with rigid 1.75" standing seam**.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Fabral; a brand of OmniMax International.
    - b. McElroy Metal, Inc.
    - c. PAC-CLAD; Petersen Aluminum Corporation; a Carlisle company.
  2. Metallic-Coated Steel Sheet: Aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, **Class AZ50 (Class AZM150)** coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
    - a. Nominal Thickness: **0.022 inch (0.56 mm)**.
    - b. Exterior Finish: **Three-coat fluoropolymer**.
    - c. Color: **As selected by Owner from manufacturer's full range**.
  3. Clips: **One-piece fixed** to accommodate thermal movement.
  4. Material:

- a. **0.028-inch- (0.71-mm-)** nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
- 5. Panel Coverage: **16 inches (406 mm)**.
- 6. Panel Height: **1.75 inches (44 mm)**.

## 2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of **30 mils (0.76 mm)** thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer. See roof plan for locations.
  - 1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D1970.
  - 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D1970.
  - 3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Carlisle WIP Products; a brand of Carlisle Construction Materials.
    - b. Henry Company.
    - c. Owens Corning.
- B. Felt Underlayment: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felts.
- C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

## 2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645; cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 (Z275) hot-dip galvanized coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
  - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
  - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum **1-inch- (25-mm-)** thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.



- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Gutters and Downspouts: Formed from same material as roof panels according to SMACNA's "Architectural Sheet Metal Manual." Finish to match **metal roof panels**.
- E. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- F. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
  - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
  - 2. Joint Sealant: ASTM C920; as recommended in writing by metal panel manufacturer.
  - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

## 2.5 FABRICATION

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

## 2.6 FINISHES

- A. Panels and Accessories:
  - 1.
  - 2. Three-Coat Fluoropolymer: **AAMA 621** Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat.
  - 3. Concealed Finish: White or light-colored acrylic or polyester backer finish.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

### 3.2 INSTALLATION OF UNDERLAYMENT

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated **on Drawings**, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.
  - 1. Apply over the roof area indicated below:
    - a. Roof perimeter for a distance up from eaves of **36 inches (914 mm)** beyond interior wall line.
    - b. Valleys, from lowest point to highest point, for a distance on each side of **18 inches (460 mm)**. Overlap ends of sheets not less than 6 inches (152 mm).
    - c. Rake edges for a distance of **18 inches (460 mm)**.
    - d. Hips and ridges for a distance on each side of **12 inches (305 mm)**.
    - e. Roof-to-wall intersections for a distance from wall of **18 inches (460 mm)**.
    - f. Around dormers, chimneys, skylights, and other penetrating elements for a distance from element of **18 inches (460 mm)**.
- B. Felt Underlayment: Apply at locations indicated **on Drawings**, in shingle fashion to shed water, and with lapped joints of not less than **2 inches (50 mm)**.
  - 1. Apply over the entire roof surface.
  - 2. Apply on roof not covered by self-adhering sheet underlayment. Lap over edges of self-adhering sheet underlayment not less than **3 inches (75 mm)**, in shingle fashion to shed water.
- C. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.
- D. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

### 3.3 INSTALLATION OF STANDING-SEAM METAL ROOF PANELS

- A. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
  - 1. Install clips to supports with self-tapping fasteners.

2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
  3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
  4. Watertight Installation:
    - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
    - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
    - c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.
- B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
- C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

### 3.4 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074113.16



## SECTION 076200 - SHEET METAL FLASHING AND TRIM

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Manufactured reglets **with counterflashing**.
2. Formed roof-drainage sheet metal fabrications.
3. Formed steep-slope roof sheet metal fabrications.
4. Formed wall sheet metal fabrications.

## 1.2 PREINSTALLATION MEETINGS

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

## 1.3 ACTION SUBMITTALS

## A. Product Data: For each of the following

1. Underlayment materials.
2. Elastomeric sealant.
3. Butyl sealant.

## B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
10. Include details of special conditions.
11. Include details of connections to adjoining work.

## C. Samples: For each exposed product and for each color and texture specified, 12 inches (300 mm) long by actual width.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of coping and roof edge flashing that is **ANSI/SPRI/FM 4435/ES-1 tested**.
- B. Evaluation Reports: For copings and roof edge flashing, from **an agency acceptable to authority having jurisdiction ICC-ES** showing compliance with ANSI/SPRI/FM 4435/ES-1.
- C. Sample warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.
- B. Special warranty.

#### 1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: 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.
  - 1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested, shop is to be listed as able to fabricate required details as tested and approved.

#### 1.7 WARRANTY

- A. Special Warranty on Finishes: 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 Delta E units when tested in accordance with ASTM D2244.
    - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
    - 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 PERFORMANCE REQUIREMENTS

- A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, are to 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 are not to rattle, leak, or loosen, and are to remain watertight.

- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's **"The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing"** and SMACNA's **"Architectural Sheet Metal Manual"** requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install **copings roof edge flashings** tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:
- D. FM Approvals Listing: Manufacture and install **copings roof edge flashings** that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, **Class 1-90**. Identify materials with name of fabricator and design approved by FM Approvals.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change: **120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.**

## 2.2 SHEET METALS

- A. Aluminum Sheet: ASTM B209 (ASTM B209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with **smooth, flat** surface.
  - 1. As-Milled Finish: **Mill.**
  - 2. Alclad Finish: Metallurgically bonded surfacing alloy on both sides, forming aluminum sheet with reflective luster.
  - 3. Factory Prime Coating: Where painting after installation is required, pretreat metal with white or light-colored, factory-applied, baked-on epoxy primer coat; minimum dry film thickness of 0.2 mil (0.005 mm).
  - 4. Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
  - 5. Color Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
    - a. Color: **As selected by Owner from full range of industry colors and color densities.**
    - b. Color Range: 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.
  - 6. Exposed Coil-Coated Finish:
    - a. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color

coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

7. Color: **As selected by Owner from manufacturer's full range]** <Insert color>.
  8. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).
- B. Metallic-Coated Steel Sheet: Provide **zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 (Z275) coating designation or aluminum-zinc alloy-coated steel sheet in accordance with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation, Grade 40 (Grade 275);** prepainted by coil-coating process to comply with ASTM A755/A755M.
1. Surface: **Smooth, flat and with manufacturer's standard clear acrylic coating on both sides.**
  2. Exposed Coil-Coated Finish:
    - a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions[ **for seacoast and severe environments**].
  3. Color: **As selected by Owner from manufacturer's full range.**
  4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).
- C. Lead Sheet: ASTM B749 lead sheet.

## 2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.
- B. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils (0.76 mm) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Carlisle WIP Products; a brand of Carlisle Construction Materials.
    - b. Henry Company.
    - c. Owens Corning.
    - d. Polyglass U.S.A., Inc.
    - e. Protecto Wrap Company.
  2. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F (29 deg C) or lower.



- C. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

## 2.4 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners[, **solder**], protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as 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. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    - b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
    - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
  - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
  - 3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
  - 4. Fasteners for **Zinc-Coated (Galvanized)** Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, 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 C920, elastomeric polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.
- G. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.
- H. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated **with interlocking counterflashing on exterior face, of same metal as reglet**.

## 2.5 FABRICATION, GENERAL

- A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
  - 1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
  - 2. 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.
  - 3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
  - 4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
  - 5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances:
  - 1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
  - 2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
  - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
  - 2. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.
- 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 cited sheet metal standard **and by FM Global Property Loss Prevention Data Sheet 1-49** for application, but not less than thickness of metal being secured.
- G. Seams:
  - 1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
  - 2. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. **Rivet joints where necessary for strength.**
  - 3. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. **Rivet joints where necessary for strength.**

## 2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

### A. Hanging Gutters:

1. Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required.
2. Fabricate in minimum 96-inch- (2400-mm-) long sections.
3. Furnish flat-stock gutter brackets and **[flat-stock] [twisted]** gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard, but with thickness not less than **twice the gutter thickness**.
4. Fabricate expansion joints, expansion-joint covers, **gutter bead reinforcing bars**, and gutter accessories from same metal as gutters. **Shop fabricate interior and exterior corners.**
5. Accessories: **Continuous, removable leaf screen with sheet metal frame and hardware cloth screen and Valley baffles.**
6. Gutters with Girth up to 15 Inches (380 mm): Fabricate from the following materials:
  - a. Aluminum: **0.032 inch (0.81 mm)** thick.
  - b. Galvanized Steel: **0.022 inch (0.56 mm)** thick.
  - c. Aluminum-Zinc Alloy-Coated Steel: **0.022 inch (0.56 mm)** thick.
7. Gutters with Girth 16 to 20 Inches (410 to 510 mm): Fabricate from the following materials:
  - a. Aluminum: **0.040 inch (1.02 mm)** thick.
  - b. Galvanized Steel: **0.028 inch (0.71 mm)** thick.
  - c. Aluminum-Zinc Alloy-Coated Steel: **0.028 inch (0.71 mm)** thick.
8. Gutters with Girth 21 to 25 Inches (530 to 640 mm): Fabricate from the following materials:
  - a. Aluminum: **0.050 inch (1.27 mm)** thick.
  - b. Galvanized Steel: **0.034 inch (0.86 mm)** thick.
  - c. Aluminum-Zinc Alloy-Coated Steel: **0.034 inch (0.86 mm)** thick.
9. Gutters with Girth 26 to 30 Inches (660 to 760 mm): Fabricate from the following

### B. Downspouts: Fabricate **rectangular** downspouts to dimensions indicated on Drawings, complete with mitered elbows. Furnish with metal hangers from **same material as downspouts and anchors. Shop fabricate elbows.**

1. Hanger Style: Concealed.
2. Fabricate from the following materials:
  - a. Aluminum: **0.024 inch (0.61 mm)** thick.
  - b. Galvanized Steel: **0.022 inch (0.56 mm)** thick.
  - c. Aluminum-Zinc Alloy-Coated Steel: **0.022 inch (0.56 mm)** thick.

## 2.7 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

### A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:

1. Aluminum: **0.032 inch (0.81 mm)** thick.
2. Galvanized Steel: **0.022 inch (0.56 mm)** thick.
3. Aluminum-Zinc Alloy-Coated Steel: **0.022 inch (0.56 mm)** thick.

- B. Valley Flashing: Fabricate from the following materials:
  - 1. Stainless Steel: **0.0188 inch (0.477 mm)** thick.
  - 2. Galvanized Steel: **0.028 inch (0.71 mm)** thick.
  - 3. Aluminum-Zinc Alloy-Coated Steel: **0.028 inch (0.71 mm)** thick.
- C. Drip Edges: Fabricate from the following materials:
  - 1. Aluminum: **0.032 inch (0.81 mm)** thick.
  - 2. Galvanized Steel: **0.022 inch (0.56 mm)** thick.
  - 3. Aluminum-Zinc Alloy-Coated Steel: **0.022 inch (0.56 mm)** thick.
- D. Eave, Rake[, **Ridge, and Hip**] Flashing: Fabricate from the following materials:
  - 1. Aluminum: **0.032 inch (0.81 mm)** thick.
  - 2. Galvanized Steel: **0.022 inch (0.56 mm)** thick.
  - 3. Aluminum-Zinc Alloy-Coated Steel: **0.022 inch (0.56 mm)** thick.

## 2.8 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, [ **jamb,** ] and similar flashings to extend [ **4 inches (100 mm)** ] <Insert dimension> beyond wall openings. Form head and sill flashing with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
  - 1. Aluminum: **0.032 inch (0.81 mm)** thick.
  - 2. Galvanized Steel: **0.022 inch (0.56 mm)** thick.
  - 3. Aluminum-Zinc Alloy-Coated Steel: **0.022 inch (0.56 mm)** thick.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF UNDERLAYMENT

- A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim.
  - 1. Install in shingle fashion to shed water.
  - 2. Lap joints not less than 2 inches (50 mm).
- B. Self-Adhering, High-Temperature Sheet Underlayment:
  - 1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
  - 2. Prime substrate if recommended by underlayment manufacturer.
  - 3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
  - 4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses.
  - 5. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller.
  - 6. Roll laps and edges with roller.
  - 7. Cover underlayment within 14 days.

### 3.2 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
1. Install fasteners, **solder**, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of **sealant**.
  3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
  4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
  5. Install continuous cleats with fasteners spaced not more than 12 inches (300 mm) o.c.
  6. Space individual cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
  7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
  8. Do not field cut sheet metal flashing and trim by torch.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of **uncoated-aluminum** sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
  2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
1. Space movement joints at maximum of **10 feet (3 m)** with no joints within 24 inches (600 mm) of corner or intersection.
  2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
  3. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate **wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws and substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance**.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated.
  - a. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant.
  - b. Form joints to completely conceal sealant.
  - c. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way.
  - d. Adjust setting proportionately for installation at higher ambient temperatures.
    - 1) Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Rivets: Rivet joints in **uncoated aluminum and zinc** where necessary for strength.

### 3.3 INSTALLATION OF ROOF-DRAINAGE SYSTEM

- A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters:
  1. Join sections with [**riveted and soldered joints**] [**or**] [**joints sealed with sealant**].
  2. Provide for thermal expansion.
  3. Attach gutters at eave or fascia to firmly anchor them in position.
  4. Provide end closures and seal watertight with sealant.
  5. Slope to downspouts.
  6. Install gutter with expansion joints at locations indicated on Drawings, but not exceeding, **50 feet (15.2 m)** apart. Install expansion-joint caps.
  7. Install continuous gutter screens on gutters with noncorrosive fasteners, **removable hinged to swing open** for cleaning gutters.
- C. Downspouts:
  1. Join sections with 1-1/2-inch (38-mm) telescoping joints.
  2. Provide hangers with fasteners designed to hold downspouts securely to walls.
  3. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.
  4. Provide elbows at base of downspout to direct water away from building.
  5. Connect downspouts to underground drainage system.
- D. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated on Drawings. Lap joints minimum of 4 inches (100 mm) in direction of water flow.

### 3.4 INSTALLATION OF ROOF FLASHINGS

- A. Install sheet metal flashing and trim to comply with performance requirements, **sheet metal manufacturer's written installation instructions**, and cited sheet metal standard.
  1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.

2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at **staggered 3-inch (75-mm)** centers.
3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

C. Copings:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated.
  - a. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at **24-inch (600-mm)** centers.
  - b. Anchor interior leg of coping with washers and screw fasteners through slotted holes at **24-inch (600-mm)** centers.
3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.

1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
2. Extend counterflashing 4 inches (100 mm) over base flashing.
3. Lap counterflashing joints minimum of 4 inches (100 mm).

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with [**elastomeric**] [**butyl**] sealant and clamp flashing to pipes that penetrate roof.

### 3.5 INSTALLATION OF WALL FLASHINGS

- A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise 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, **jamb**, and similar flashings to extend **4 inches (100 mm)** beyond wall openings.

### 3.6 INSTALLATION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

### 3.7 CLEANING

- 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.

### 3.8 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. 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, as determined by Architect.

END OF SECTION 076200



## SECTION 077253 - SNOW GUARDS (Alternate #1)

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Rail-type, seam-mounted snow guards.

## 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include roof plans showing layouts and attachment details of snow guards. **Snow guards are not be located over a roof mounting clip that would inhibit movement in the standing seam.**
  - 1. Include details of rail-type snow guards.
- C. Samples:
  - 1. Rail-Type Snow Guards: Bracket, ~~12-inch-~~ (300-mm-) long rail, and installation hardware.
    - a. For units with factory-applied finishes, submit **manufacturer's color selections to match roof.**
- D. Delegated Design Submittals: For snow guards, include analysis reports signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Include calculation of number and location of snow guards.

## 1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that the engineer is licensed in the **state** in which the Project is located.
- B. Product Test Reports: For each type of snow guard, for tests performed by a qualified testing agency, indicating load at failure of attachment to roof system identical to roof system used on this Project.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
  - 1. Temperature Change: **120 deg F (67 deg C), ambient; material surfaces temperature change.**
- B. Structural Performance: Snow guards shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
  - 1. Snow Loads: **As indicated on Structural Drawings.**

### 2.2 RAIL-TYPE SNOW GUARDS

- A. Rail-Type, Seam-Mounted Snow Guards:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. S-5! Metal Roof Innovations, Ltd.
  - 2. Description: Snow guard rails fabricated from extrusions, anchored to brackets and equipped with **one rail with integral track to accept color-matching inserts of material and finish used for metal roof.**
  - 3. Seam Clamps: ASTM B85/B85M aluminum casting with stainless steel set screws incorporating round nonpenetrating point; designed for use with applicable roofing system to which clamp is attached.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install snow guards according to manufacturer's written instructions.
  - 1. Space rows as indicated on **Shop Drawings.**
- B. Attachment for Standing-Seam Metal Roofing:
  - 1. Do not use fasteners that will penetrate metal roofing or fastening methods that void metal roofing finish warranty.
  - 2. Rail-Type, Seam-Mounted Snow Guards:

- a. Install brackets to vertical ribs in straight rows.
- b. Secure with stainless steel set screws, incorporating round nonpenetrating point, on same side of standing seam.
- c. Torque set screw according to manufacturer's instructions.
- d. Install cross members to brackets.

END OF SECTION 077253

.

## SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

### 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. Standard hollow metal **doors and frames**.

- B. Related Sections:

- 1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
  - 2. Division 08 Section "**Door Hardware (Scheduled by Describing Products)**" for door hardware for hollow metal doors.
  - 3. Division 09 Sections "**Exterior Painting**" and "**Interior Painting**" for field painting hollow metal doors and frames.

#### 1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.
- C. Custom Hollow Metal Work: Hollow metal work fabricated according to ANSI/NAAMM-HMMA 861.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, **fire-resistance rating** and finishes.
- B. Shop Drawings: Include the following:
  - 1. Elevations of each door design.
  - 2. 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.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Other Action Submittals:
1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.
- E. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

## 1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at according to **NFPA 252 and requirements of Section 715 “Opening Protectives” of NC Building Code**.
- C. Smoke-Control Door Assemblies: Comply with **NFPA 105 or UL 1784**.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to finish of factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions. Spreader bars are for handling and transit only.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum **4-inch- (102-mm-)** high wood blocking. Do not store in a manner that traps excess humidity.
1. Provide minimum **1/4-inch (6-mm)** space between each stacked door to permit air circulation.

## 1.7 PROJECT CONDITIONS

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

## 1.8 COORDINATION

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

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
  - 1. Ceco Door Products; an Assa Abloy Group company.
  - 2. Curries Company; an Assa Abloy Group company.
  - 3. KARPEN STEEL/HMMA Member

### 2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum **A60 (ZF180)** metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), **40Z (12G)** coating designation; mill phosphatized.
  - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of **4 inches (102 mm)**, as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with **6- to 12-lb/cu. ft. (96- to 192-kg/cu. m)** density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Division 08 Section "Glazing."

- J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for **15-mil (0.4-mm)** dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
1. Design: **As indicated.**
  2. Core Construction: Manufacturer's standard kraft-paper honeycomb or polystyrene core.
    - a. Fire Door Core: As required to provide fire-protection **and temperature-rise** ratings indicated.
    - b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than **6.0 deg F x h x sq. ft./Btu (1.057 K x sq. m/W)** when tested according to ASTM C 1363.
  - 1) Locations: **Exterior doors.**
  3. Vertical Edges for Single-Acting Doors: **Manufacturer's standard.**
  4. Top and Bottom Edges: Closed with flush **0.042-inch- (1.0-mm-)** thick, end closures or channels of same material as face sheets.
  5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Level 2 and Physical Performance Level A (Heavy Duty), **Model 1 (Full Flush).**
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Level 2 and Physical Performance Level A (Heavy Duty), **Model 1 (Full Flush).**
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

## 2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet (Galvanized: A60 Galvaneal).
1. Fabricate frames with mitered corners.



2. Fabricate frames as **full profile welded**.
  3. Frames for Level 3 Steel Doors: **0.053-inch- (1.3-mm-)** thick steel sheet.
- C. Interior Frames: Fabricated from cold-rolled steel sheet.
1. Fabricate frames with mitered or coped corners.
  2. Fabricate frames as **full profile welded** unless otherwise indicated.
  3. Frames for Level 3 Steel Doors: **0.053-inch- (1.3-mm-)** thick steel sheet.
  4. Frames for Borrowed Lights: **Same as adjacent door frame**.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

## 2.5 FRAME ANCHORS

- A. Jamb Anchors:
1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than **0.042 inch (1.0 mm)** thick, with corrugated or perforated straps not less than **2 inches (50 mm)** wide by **10 inches (250 mm)** long; or wire anchors not less than **0.177 inch (4.5 mm)** thick.
  2. Existing Anchoring: Existing wall anchoring, as required by wall type and as determined by site conditions.
- B. Floor Anchors: Formed from same material as frames, not less than **0.042 inch (1.0 mm)** thick, and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

## 2.6 LOUVERS

- A. Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of **0.020-inch- ((0.5-mm-))** thick, cold-rolled steel sheet set into **0.032-inch- (0.8-mm-)** thick steel frame.
1. Sightproof Louver: Stationary louvers constructed with inverted Y-shaped blades.
  2. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same testing and inspecting agency that established fire-resistance rating of door assembly.

## 2.7 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Ceiling Struts: Minimum **1/4-inch-thick by 1-inch- (6.4-mm-thick by 25.4-mm-)** wide steel.
- C. Grout Guards: Formed from same material as frames, not less than **0.016 inch (0.4 mm)** thick.

## 2.8 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in **SDI 117**.
- C. Hollow Metal Doors:
  - 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
  - 2. Glazed Lites: Factory cut openings in doors.
  - 3. 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 (19 mm)** beyond edge of door on which astragal is mounted.
- D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
  - 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
  - 2. **Sidelight** Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
  - 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  - 4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
  - 5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
  - 6. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Masonry Type: Locate anchors not more than **18 inches (457 mm)** from top and bottom of frame. Space anchors not more than **32 inches (813 mm)** o.c. and as follows:
      - 1) Two anchors per jamb up to **60 inches (1524 mm)** high.
      - 2) Three anchors per jamb from **60 to 90 inches (1524 to 2286 mm)** high.
      - 3) Four anchors per jamb from **90 to 120 inches (2286 to 3048 mm)** high.
      - 4) Four anchors per jamb plus 1 additional anchor per jamb for each **24 inches (610 mm)** or fraction thereof above **120 inches (3048 mm)** high.
  - 7. Door Silencers: Except on weather-stripped doors, 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.

- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
  - 1. Locate hardware as indicated, or if not indicated, according to **ANSI/SDI A250.8**.
  - 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
  - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
  - 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.
- G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
  - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
  - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
  - 4. Provide loose stops and moldings on inside of hollow metal work.
  - 5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

## 2.9 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. **Remove welded-in shipping spreaders installed at factory.** Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
  - 1. Squareness: Plus or minus **1/16 inch (1.6 mm)**, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - 2. Alignment: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs on a horizontal line parallel to plane of wall.
  - 3. Twist: Plus or minus **1/16 inch (1.6 mm)**, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - 4. Plumbness: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive templated, mortised, and surface-mounted hinges, locks, exit devices and aux. flush bolts.

### 3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with **ANSI/SDI A250.11**.
  - 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-protection-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 glazing 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 plumbness, squareness, 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 are 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 powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
  - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
  - 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
  - 5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
  - 6. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
  - 7. 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 (1.6 mm)**, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus **1/16 inch (1.6 mm)**, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus **1/16 inch (1.6 mm)**, 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 Standard Steel Doors:
    - a. Jambs and Head: **1/8 inch (3 mm)** plus or minus **1/16 inch (1.6 mm)**.
    - b. Between Edges of Pairs of Doors: **1/8 inch (3 mm)** plus or minus **1/16 inch (1.6 mm)**.
    - c. Between Bottom of Door and Top of Threshold: Maximum **3/8 inch (9.5 mm)**.
    - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum **3/4 inch (19 mm)**.
  - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
  - 3. Smoke-Control Doors: Install doors according to **NFPA 105**.
- 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 (230 mm)** o.c. and not more than **2 inches (50 mm)** o.c. from each corner.

#### 3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

## SECTION 081416 - FLUSH WOOD DOORS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Solid-core doors with **wood-veneer** faces.
2. Factory fitting flush wood doors to frames and factory machining for hardware.

#### 1.2 SUBMITTALS

##### A. Product Data: For each type of door indicated.

##### B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire-protection ratings for fire-rated doors.

#### 1.3 QUALITY ASSURANCE

##### A. Quality Standard: In addition to requirements specified, comply with **AWI's "Architectural Woodwork Quality Standards Illustrated."**

##### B. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing according to **NFPA 252, UL 10B and UL 10C in accordance with NC Building Code requirements in Section 715 and related sections.**

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

##### A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**

1. Algoma Hardwoods, Inc.
2. Eggers Industries.
3. Graham; an Assa Abloy Group company.

4. Mohawk Flush Doors, Inc.; a Masonite company.
5. VT Industries Inc.

## 2.2 DOOR CONSTRUCTION, GENERAL

- A. WDMA I.S.1-A Performance Grade:
  1. Extra Heavy Duty: in all areas.
- B. Structural-Composite-Lumber-Core Doors:
  1. Structural Composite Lumber: WDMA I.S.10.
    - a. Screw Withdrawal, Face: 700 lbf (3100 N).
    - b. Screw Withdrawal, Edge: 400 lbf (1780 N).
- C. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
  1. Edge Construction: Comply with specified or mineral core as required to provide fire-protection rating indicated.
  2. Pairs: Provide formed-steel edges and astragals.
- D. Mineral-Core Doors:
  1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
  2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
  3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

## 2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors - Refer to Door Schedule and Details:
  1. Grade: **Custom (Grade A faces).**
  2. Species: **Natural birch.**
  3. Cut: **Rotary.**
  4. Core: **Structural composite lumber.**
  5. Construction: **Five plies.** Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.



## 2.4 LOUVERS AND LIGHT FRAMES

- A. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- (1.2-mm-) thick, cold-rolled steel sheet; **factory primed for paint finish**; and approved for use in doors of fire-protection rating indicated.

## 2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
  - 1. Comply with requirements in NFPA 80 for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied.
- C. Openings: Cut and trim openings through doors in factory.
  - 1. Light Openings: Trim openings with moldings of material and profile indicated.
  - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."
  - 3. Louvers: Factory install louvers in prepared openings.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Hardware: For installation, see Division 08 Section "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
  - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
  - 1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.
    - a. Comply with NFPA 80 for fire-rated doors.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining as required at Project site.

END OF SECTION 081416

## SECTION 083613 - SECTIONAL DOORS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Sectional-door assemblies.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type and size of sectional door and accessory.
- B. Shop Drawings: For each installation and for components not dimensioned or detailed in manufacturer's product data.
- C. Samples: For each exposed product and for each color and texture specified.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranties.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
- B. Regulatory Requirements: Comply with provisions in the **ICC A117.1** applicable to sectional doors.

#### 1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: **Five** years from date of Substantial Completion.

- B. Finish Warranty: Manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Warranty Period: **10** years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Provide sectional doors that comply with performance requirements specified without failure from defective manufacture, fabrication, installation, or other defects in construction[ **and without requiring temporary installation of reinforcing components**].
- B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
  - 1. Design Wind Load: **Uniform pressure (velocity pressure) of 20 lbf/sq. ft. (960 Pa), acting inward and outward.**
  - 2. Testing: In accordance with ASTM E330/E330M **or DASMA 108 for garage doors and complying with DASMA 108 acceptance criteria.**
- C. Windborne-Debris Impact Resistance: Provide sectional doors complying with the following requirements:
  - 1. Glazed Openings: Pass ASTM E1886 Large Missile Test and cyclic-pressure tests in accordance with ASTM E1996 for protection and Wind Zone **applicable to design wind speed in accordance with code requirements in Brevard, NC per NC Building Code.**
- D. Seismic Performance: Provide sectional doors that withstand the effects of earthquake motions determined in accordance with **ASCE/SEI 7.**
  - 1. Component Importance Factor: **1.5.**

### 2.2 SECTIONAL-DOOR ASSEMBLY

- A. **Aluminum** Sectional Door: Provide sectional door formed with hinged sections and fabricated so that finished door assembly is rigid and aligned with tight hairline joints; free of warp, twist, and deformation; and complies with requirements in DASMA 102.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Clopay Building Products.
    - b. Overhead Door Corporation.
    - c. Rite-Hite Holding Corporation.
- B. Operation Cycles: Door components and operators capable of operating for not less than **50,000** operation cycles. One operation cycle is complete when door is opened from closed position to the open position and returned to closed position.

- C. Air Infiltration: Maximum rate of **0.4 cfm/sq. ft. (2.03 L/s per sq. m)** when tested in accordance with ASTM E283 or DASMA 105.
- D. U-Value: **0.052 Btu/sq. ft. x h x deg F (0.295 W/sq. m x K).**
- E. Aluminum Sections: ASTM B221 (ASTM B221M) extruded-aluminum stile and rail members of alloy and temper standard with manufacturer for type of use and finish indicated; **in minimum thickness required to comply with requirements**; with rail and stile dimensions and profiles indicated on Drawings; and with overlapped or interlocked weather- and pinch-resistant seal at meeting rails.
  - 1. Door-Section Thickness: **1-3/4 inches (44 mm) or 2 inches (51 mm).**
  - 2. Section Reinforcing: Continuous horizontal and diagonal reinforcement as required to stiffen door and for wind loading. Ensure that reinforcement does not obstruct vision lites.
    - a. Hardware Locations: Provide reinforcement for hardware attachment.
  - 3. Insulated Stiles and Rails: Fill stiles and rails **manufacturer's standard polyurethane expanding foam.**
  - 4. Glazed Panels: Manufacturer's standard, aluminum-framed section with glazing sealed with glazing tape and **aluminum** glazing bead. Glazing as follows:
    - a. Insulating Glass Units: Manufacturers' standard unit with **tempered glass lites complying with ASTM C1048, Kind FT fully tempered, SolarBan 70XL argon filled.**
- F. Track: Manufacturer's standard, galvanized-steel, **high-lift** track system with **contour to follow sloping ceiling at scissor truss system.** Provide complete system including brackets, bracing, and reinforcement to ensure rigid support of ball-bearing roller guides.
  - 1. Material: Galvanized steel, ASTM A653/A653M, minimum G60 (Z180) zinc coating.
  - 2. Size: **3 inches (76 mm) wide.**
  - 3. Track Reinforcement and Supports: Provide galvanized-steel members to support track without sag, sway, and vibration during opening and closing of doors. Slot vertical sections of track spaced **2 inches (51 mm)** apart for door-drop safety device.
    - a. Vertical Track: Incline vertical track to ensure weathertight closure at jambs. Provide **continuous angle** attached to track and wall.
    - b. Horizontal Track: Provide continuous reinforcing angle from curve in track to end of track, attached to track and supported at points by laterally braced attachments to overhead structural members.
- G. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom **top and jambs** of door. **Provide combination bottom weatherseal and sensor edge for bottom seal.**
- H. Hardware: Heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless steel, or other corrosion-resistant fasteners, to suit door type.

1. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch (2.01-mm) nominal coated thickness at each end stile and at each intermediate stile, in accordance with manufacturer's written recommendations for door size.
    - a. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is impossible.
  2. Rollers: Heavy-duty rollers with steel ball bearings in case-hardened steel races, mounted to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Match roller-tire diameter to track width.
    - a. Roller-Tire Material: **Manufacturer's standard.**
  3. Push/Pull Handles: Equip each door with galvanized-steel lifting handles on each side of door, finished to match door.
- I. Counterbalance Mechanism:
1. Torsion Spring: Adjustable-tension torsion springs complying with requirements of DASMA 102 for number of operation cycles indicated, mounted on torsion shaft.
  2. Cable Drums and Shaft for Doors: Cast-aluminum cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised.
    - a. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft.
  3. Cables: Galvanized-steel, multistrand, lifting cables.
  4. Cable Safety Device: Include a spring-loaded steel or bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if lifting cable breaks.
  5. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.
  6. Bumper: Provide spring bumper at each horizontal track to cushion door at end of opening operation.
- J. Manual Door Operator:
1. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum **25 lbf (111 N)** force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.
- K. Electric Door Operator: Electric door operator assembly of size and capacity recommended by door manufacturer for door and operation cycles specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
1. Comply with NFPA 70.
  2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24 V ac or dc.

3. Safety: Listed in accordance with UL 325 by a qualified testing agency for commercial or industrial use; **moving parts of operator enclosed or guarded if exposed and mounted at 8 ft. (2.4 m) or lower.**
4. Usage Classification: **Heavy duty, 25 or more cycles per hour and more than 90 cycles per day.**
5. Operator Type: **Jackshaft, side mounted.**
6. Motor: Reversible-type **with controller (disconnect switch)** for **exterior, dusty, wet, or humid** motor exposure. Use adjustable motor-mounting bases for belt-driven operators.
  - a. Motor Size: **As required to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor 1/2 hp (373 W).**
  - b. Electrical Characteristics:
    - 1) Phase: **Polyphase.**
    - 2) Volts: **208V.**
7. Limit Switches: Equip motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
8. Obstruction Detection: Automatic external entrapment protection consisting of automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.
  - a. Entrapment Protection: **Pneumatic sensor edge, black, located within weatherseal mounted to bottom bar and Retro-reflective photo sensor.** Coordinate exact location of photo sensors with Owners.
9. Control Station: **Surface mounted, three-position (open, close, and stop).**
  - a. Operation: **Push button.**
  - b. Interior-Mounted Unit: Full-guarded, surface-mounted, **heavy-duty type, with general-purpose NEMA ICS 6, Type 1** enclosure.
  - c. Features: Provide the following:
    - 1) Vehicle detection operation.
    - 2) Radio-control operation.
    - 3) Photocell operation.
    - 4) Explosion- and dust-ignition-proof control wiring.
10. Emergency Manual Operation: **Chain** type designed so required force for door operation does not exceed **25 lbf (111 N).**
11. Emergency Operation Disconnect Device: Hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
12. Motor Removal: Design operator so motor can be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
13. Anodized Aluminum Finish:

- a. Clear Anodic Finish: AAMA 611, **AA-M12C22A41, Class I, 0.018 mm** or thicker.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; in accordance with manufacturer's written instructions.
- B. Tracks:
  - 1. Fasten vertical track assembly to opening jambs and framing with fasteners spaced not more than 24 inches (610 mm) apart.
  - 2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.
- C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
- D. Power-Operated Doors: Install **automatic garage doors openers** in accordance with UL 325.

#### 3.2 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION 083613



## SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Aluminum-framed storefront systems.
  - 2. Aluminum-framed entrance door systems.

#### 1.2 PREINSTALLATION MEETINGS

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

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
  - 1. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
  - 2. Include point-to-point wiring diagrams.
- C. Samples: For each type of exposed finish required.
- D. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.
- E. Delegated Design Submittal: For aluminum-framed entrances and storefronts, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Energy Performance Certificates: NFRC-certified energy performance values from manufacturer.
- B. Product test reports.
- C. Field quality-control reports.
- D. Sample warranties.

## 1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

## 1.6 QUALITY ASSURANCE

- A. Qualifications:

1. Installers: An entity that employs installers and supervisors who are trained and approved by manufacturer and that employs a qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors.
2. Delegated Design Engineer: A professional engineer who is legally qualified to practice in North Carolina where Project is located and who is experienced in providing engineering services of the type required to comply with Building Codes.

- B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

## 1.7 WARRANTY

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

1. Warranty Period: **Five** years from date of Substantial Completion.

- B. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked-enamel, powder-coat, or organic finishes within specified warranty period.

1. Warranty Period: **Five** years from date of Substantial Completion.

- C. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Warranty Period: **10** years from date of Substantial Completion.

## PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
  - 1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  - 2. Failure also includes the following:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage.
    - c. Noise or vibration created by wind and thermal and structural movements.
    - d. Loosening or weakening of fasteners, attachments, and other components.
    - e. Failure of operating units.
- C. Structural Loads:
  - 1. Wind Loads: As indicated on Drawings.
- D. Deflection of Framing Members Supporting Glass: At design wind load, as follows:
  - 1. Deflection Normal to Wall Plane: Limited to **1/175 of clear span for spans of up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m).**
- E. Structural: Test in accordance with ASTM E330/E330M as follows:
  - 1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
  - 2. When tested at **150** percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding **0.2** percent of span.
  - 3. Test Durations: As required by design wind velocity, but not less than **10** seconds.
- F. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:
  - 1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than **10 lbf/sq. ft. (480 Pa).**

G. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:

1. Thermal Transmittance (U-factor):
  - a. Fixed Glazing and Framing Areas: U-factor for the system of not more than **0.45 Btu/sq. ft. x h x deg F (2.55 W/sq. m x K)** as determined in accordance with NFRC 100.
  - b. Entrance Doors: U-factor of not more than **0.77 Btu/sq. ft. x h x deg F (4.37 W/sq. m x K)** as determined in accordance with NFRC 100.
2. Solar Heat-Gain Coefficient (SHGC):
  - a. Fixed Glazing and Framing Areas: SHGC for the system of not more than [**0.26**] **0.35** as determined in accordance with NFRC 200.
  - b. Entrance Doors: SHGC of not more than **0.25** as determined in accordance with NFRC 200.
3. Air Leakage:
  - a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than **0.06 cfm/sq. ft. (0.30 L/s per sq. m)** at a static-air-pressure differential of **1.57 lbf/sq. ft. (75 Pa)** when tested in accordance with ASTM E283.
  - b. Entrance Doors: Air leakage of not more than **1.0 cfm/sq. ft. (5.08 L/s per sq. m)** at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

H. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## 2.2 STOREFRONT SYSTEMS

A. Manufacturers: Kawneer Company product 350T Insulpour Thermal Entrances and Framing has been used for the Basis of Design. Subject to full compliance with requirements, the following manufactures can submit product data that sufficiently indicated that their product is better or equal to the specified product:

1. EFCO Corporation.
2. OldCastle BuildingEnvelope (OBE).
3. Tubelite Inc.

B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Exterior Framing Construction: **Thermally broken.**
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Finish: **Clear anodic finish.**
4. Fabrication Method: Field-fabricated stick system.

5. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  6. Steel Reinforcement: As required by manufacturer.
- C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

## 2.3 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation in accordance with this specification.
1. Door Construction: **1-3/4-inch (44.5-mm) overall thickness, with minimum 0.125-inch- (3.2-mm-) overall thickness, with minimum 0.125-inch- (3.2-mm-) 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.
    - a. Thermal Construction: **High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior].**
  2. Door Design: **Medium stile; 3-1/2-inch (88.9-mm) nominal width.**
  3. Glazing Stops and Gaskets: **Square**, snap-on, extruded-aluminum stops and preformed gaskets.

## 2.4 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in **Section 087100 "Door Hardware."**
- B. General: Provide entrance door hardware for each entrance door, to comply with requirements in this Section.
1. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
  2. Opening-Force Requirements:
    - a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion **and not more than 15 lbf (67 N) to open the door to its minimum required width.**
- C. Butt Hinges: BHMA A156.1, Grade 1, radius corner.
1. Nonremovable Pins: Provide setscrew in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while entrance door is closed.
  2. Exterior Hinges: **Stainless steel, with stainless steel pin.**

3. Quantities:
  - a. For doors up to **87 inches (2210 mm)** high, provide three hinges per leaf.
  - b. For doors more than **87 and up to 120 inches (2210 and up to 3048 mm)** high, provide four hinges per leaf.
- D. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.
- E. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing in accordance with UL 305.
- F. Cylinders:
  1. **As specified in Section 087100 "Door Hardware.**
  2. BHMA A156.5, Grade 1.
    - a. Keying: **to be furnished by Owner.**
- G. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- H. Operating Trim: BHMA A156.6.
- I. Removable Mullions: BHMA A156.3 extruded aluminum.
  1. When used with panic exit devices, provide **keyed** removable mullions listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing in accordance with UL 305. Use only mullions that have been tested with exit devices to be used.
- J. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.
- K. Concealed Overhead Holders and Stops: BHMA A156.8, Grade 1.
- L. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
- M. Weather Stripping: Manufacturer's standard replaceable components.
  1. Compression Type: Made of ASTM D2000 molded neoprene or ASTM D2287 molded PVC.
  2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- N. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- O. Thresholds: BHMA A156.21 raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (12.7 mm).

- P. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

## 2.5 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. Glazing Sealants: As recommended by manufacturer.

## 2.6 MATERIALS

- A. Sheet and Plate: ASTM B209 (ASTM B209M).
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).
- C. Structural Profiles: ASTM B308/B308M.
- D. Steel Reinforcement:
  - 1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
  - 2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
  - 3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.
- E. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

## 2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
  - 1. Profiles that are sharp, straight, and free of defects or deformations.
  - 2. Accurately fitted joints with ends coped or mitered.
  - 3. Physical and thermal isolation of glazing from framing members.
  - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  - 5. Provisions for field replacement of glazing from **exterior**.
  - 6. 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. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
- G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

## 2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, **AA-M12C22A41, Class I, 0.018 mm** or thicker.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions.
- B. Do not install damaged components.
- C. Fit joints to produce hairline joints free of burrs and distortion.
- D. Rigidly secure nonmovement joints.
- E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- F. Seal perimeter and other joints watertight unless otherwise indicated.
- G. Metal Protection:
  - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
  - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- H. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation.
- I. Install joint filler behind sealant as recommended by sealant manufacturer.
- J. Install components plumb and true in alignment with established lines and grades.



3.2 INSTALLATION OF GLAZING

- A. Install glazing as specified in Section 088000 "Glazing."

3.3 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE DOORS

- A. Install entrance 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 in accordance with entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

END OF SECTION 084113



## SECTION 087100 - DOOR HARDWARE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Commercial door hardware.
  - 2. Electric/Mechanical Hardware and Accessories

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Details of electrified door hardware, including wiring diagrams.
- C. Samples: For each exposed finish.
- D. Other Action Submittals:
  - 1. Door Hardware Sets: Prepared by or under the supervision of an **Architectural Hardware Consultant**, detailing fabrication and assembly of door hardware, as well as procedures and diagrams.
    - a. Format: Use same scheduling sequence and format **and use same door numbers** as in the Contract Documents.
    - b. Content: Include the following information:
      - 1) Identification number, location, hand, fire rating, and material of each door and frame.
      - 2) Type, style, function, size, quantity, and finish of each door hardware item. **Include description and function of each lockset and exit device.**
      - 3) Complete designations of every item required for each door or opening including name and manufacturer.
      - 4) Description of each electrified door hardware function.
      - 5) Final electronic lock programming shall be by the Owner.
  - 2. Keying Schedule: Keying schedule provided by Owner.

#### 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.
  - 1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner.

- B. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
- C. Source Limitations: Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- D. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to **NFPA 252 and NC Building Code requirements**.
- E. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

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

#### 1.5 COORDINATION

- A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

#### 1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: **Three** years from date of Substantial Completion, except as follows:
    - a. Locks: **Five** years from date of Substantial Completion.
    - b. Exit Devices: **Two** years from date of Substantial Completion.
    - c. Manual Closers: **10** years from date of Substantial Completion.

## PART 2 - PRODUCTS

## 2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section **and door hardware sets indicated in door and frame schedule and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.**
1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and **named manufacturers' products.**
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:
1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Sets" Article.
  2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

## 2.2 HINGES, GENERAL

- A. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- B. Hinge Base Metal: Unless otherwise indicated, provide the following:
1. Exterior Hinges: **Stainless steel, with stainless-steel pin.**
  2. Interior Hinges: **Steel with steel pins.**
  3. Hinges for Fire-Rated Assemblies: **Steel, with Steel pin.**
- C. Nonremovable 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 **outswinging exterior doors.**
- D. Fasteners: Comply with the following:
1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
  2. Wood Screws: For wood doors and frames.
  3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
  4. Screws: Phillips flat-head; **machine screws (drilled and tapped holes) for metal doors and wood screws for wood doors and frames.** Finish screw heads to match surface of hinges.

## 2.3 HINGES

- A. Butts and Hinges: BHMA A156.1.
- B. Template Hinge Dimensions: BHMA A156.7.

- C. Full Surface continuous hinges: BHMA AIS6.26 Grade 1.
- D. **Available** Manufacturers:
  - 1. Hager Companies (HAG).
  - 2. McKinney Products Company; an ASSA ABLOY Group company (MCK).
  - 3. Stanley Commercial Hardware; Div. of The Stanley Works (STH).
  - 4. Bommer Industries (BOM)
  - 5. Pemko

## 2.4 LOCKS AND LATCHES, GENERAL

- A. Accessibility Requirements: Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than **5 lbf (22 N)**.
- B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than **15 lbf (67 N)** to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- C. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors.
- D. Backset: **2-3/4 inches (70 mm)**, unless otherwise indicated.
- E. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, **with curved lip extended to protect frame, finished to match door hardware set.**

## 2.5 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:
  - 1. Bored Locks: BHMA A156.2.
- B. Bored Locks: BHMA A156.2 **Grade 1 unless Grade 2 is indicated**; Series 4000.
  - 1. Manufacturers:
    - a. BEST Hardware; a division of Stanley Security Systems. – **“NO SUBSTITUTIONS”.**

## 2.6 DOOR BOLTS

- A. Bolt Throw: Comply with testing requirements for length of bolts required for labeled fire doors.
- B. Dustproof Strikes: BHMA A156.16, **Grade 1**.
- C. Surface Bolts: BHMA A156.16 , **Grade 1**.

1. Flush Bolt Heads: Minimum of ~~1/2-inch-~~ (13-mm-) diameter rods of brass, bronze, or stainless steel with minimum ~~12-inch-~~ (305-mm-) long rod for doors up to ~~84 inches~~ (2134 mm) in height. Provide longer rods as necessary for doors exceeding ~~84 inches~~ (2134 mm).
  2. **Available** Manufacturers:
    - a. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
    - b. Hager Companies (HAG).
    - c. IVES Hardware; an Ingersoll-Rand Company (IVS).
    - d. Rockwood Manuf.
- D. Manual Flush Bolts: BHMA A156.16 , **Grade 1 unless Grade 2 is indicated**; designed for mortising into door edge.
1. **Available** Manufacturers:
    - a. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
    - b. Hager Companies (HAG).
    - c. IVES Hardware; an Ingersoll-Rand Company (IVS).
    - d. Rockwood Manuf.
- E. Automatic and Self-Latching Flush Bolts: BHMA A156.3 , **Grade 1 unless Grade 2 is indicated**; designed for mortising into door edge.
1. Manufacturers:
    - a. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
    - b. Hager Companies (HAG).
    - c. IVES Hardware; an Ingersoll-Rand Company (IVS).
    - d. Rockwood Manuf.

## 2.7 EXIT DEVICES

- A. Exit Devices: BHMA A156.3 , **Grade 1**.
- B. Accessibility Requirements: Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than ~~5 lbf~~ (22 N).
- C. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than ~~15 lbf~~ (67 N) to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- E. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- F. Removable Mullions: BHMA A156.3.
- G. Fire-Exit Removable Mullions: Provide removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing

according to UL 305 and NFPA 252. Mullions shall be used only with exit devices for which they have been tested.

- H. Outside Trim: **Lever with cylinder**; material and finish to match locksets, unless otherwise indicated.

1. Match design for locksets and latchsets, unless otherwise indicated.

- I. Manufacturers:

1. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
2. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
3. Von Duprin; an Ingersoll-Rand Company (VD).
4. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).

## 2.8 LOCK CYLINDERS AND KEYING

- A. All construction cores and permanent cores to be provided by Owner and installed by Contractor. Keys and keying to be by Owner. Contractor to coordinate details of this work with the Owners.

1. Acceptable material: Cylinders as manufactured by Best Access Systems.

## 2.9 PRODUCT SUBSTITUTIONS: No substitutions permitted.

## 2.10 CLOSERS

- A. Accessibility Requirements: Comply with the following maximum opening-force requirements:
1. Interior, Non-Fire-Rated Hinged Doors: **5 lbf (22.2 N)** applied perpendicular to door.
  2. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
- B. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than **30 lbf (133 N)** to set door in motion and not more than **15 lbf (67 N)** to open door to minimum required width.
- C. Flush Floor Plates: Provide finish cover plates for floor closers unless thresholds are indicated. Match door hardware finish, unless otherwise indicated.
- D. Recessed Floor Plates: Provide recessed floor plates with insert of floor finish material for floor closers unless thresholds are indicated. Provide extended closer spindle to accommodate thickness of floor finish.
- E. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.



- F. Surface Closers: BHMA A156.4 **Grade 1**. Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.

1. Manufacturers:
  - a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
  - b. Norton Door Controls; an ASSA ABLOY Group company (NDC).
  - c. LCN

## 2.11 PROTECTIVE TRIM UNITS

- A. Size: **2 inches** less than door width on push side and **1 inch** less than door width on pull side, by height specified in door hardware sets.
- B. Metal Protective Trim Units: BHMA A156.6; beveled top and 2 sides; fabricated from **material indicated in door hardware sets**.

## 2.12 STOPS AND HOLDERS

- A. Stops and Bumpers: BHMA A156.16 **Grade 1**.
1. Provide floor stops for doors unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.
- B. Mechanical Door Holders: BHMA A156.16.
- C. Combination Floor and Wall Stops and Holders: BHMA A156.8.
- D. Combination Overhead Stops and Holders: BHMA A156.8.
- E. Silencers for Door Frames: BHMA A156.16, Grade 1; neoprene or rubber; fabricated for drilled-in application to frame.
- F. Manufacturers:
1. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
  2. Hager Companies (HAG).
  3. IVES Hardware; an Ingersoll-Rand Company (IVS).
  4. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX).
  5. Rockwood Manufacturing Company (RM).

## 2.13 DOOR GASKETING

- A. Standard: BHMA A156.22.
- B. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
  2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
  3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- 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 gasketing on 20-minute-rated doors and on smoke-labeled doors.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Gasketing Materials: ASTM D 2000 and AAMA 701/702.
- G. Manufacturers:
1. Hager Companies (HAG).
  2. National Guard Products (NGP).
  3. Pemko Manufacturing Co. (PEM).

## 2.14 THRESHOLDS

- A. Standard: BHMA A156.21.
- B. Accessibility Requirements: Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than **1/2 inch (13 mm) high**.
- C. Thresholds for Means of Egress Doors: Comply with NFPA 101. Maximum **1/2 inch (13 mm) high**.
- D. Manufacturers:
1. Hager Companies (HAG).
  2. National Guard Products (NGP).
  3. Pemko Manufacturing Co. (PEM).

## 2.15 FABRICATION

- A. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

- B. Fasteners: Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
  - 1. Comply with NFPA 80 for fasteners of door hardware in fire-rated applications.
- C. Finishes: BHMA A156.18, as indicated in door hardware sets.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Steel Doors and Frames: Comply with DHI A115 Series. Drill and tap doors and frames for surface-applied door hardware according to ANSI A250.6.
- B. Wood Doors: Comply with DHI A115-W Series.
- C. Mounting Heights: Mount door hardware units at heights indicated **on Drawings** 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."
  - 2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
  - 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- D. 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 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- F. 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.
  - 1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
  - 2. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point **3 inches (75 mm)** from the latch, measured to the leading edge of the door.

## 3.2 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Owner will engage the Architectural Hardware Consultant to perform inspections and to prepare inspection reports as required.

## 3.3 DOOR HARDWARE SETS

## HW-1

DRS. 001A, 002A, 130A, 138A,

TO HAVE:

- 1 MORTISE LATCHING LOCK – OR EXIT DEVICE, AS REQ'D WITH LOCKING LEVER TRIM.
- 1 KEYED CYL. (BEST STANLEY)
- 1 DOOR CLOSER 4040XP X AL TB
- 1 BLADE STOP BRACKET-SPACER
- 1 DROP PLATE 4040XP-18 x AL
- 1 THRESHOLD 171A X LAR
- 1 SWEEP 315CN X LAR

\*\*\*BALANCE OF HARDWARE BY ALUM. STOREFRONT MFR./SUPPLIER.

*Note: PROX READER PRO II 5455 by Owner*

1 ELECTRIC STRIKE (COORDINATE WITH ALUM. SF SUPPLIER-LATCHING TYPE) 12/24VDC by Owner

1 POWER FILTER / TIMER #2005 SMART PAC II by Owner

1 POWER SUPPLY PS861BK 12/24VDC by Owner

**( Number of Power Supplies T.B.D. by Access Control Supplier)**PROX ACCESS CONTROL DESCRIPTION:

DOOR OPENINGS SHALL REMAIN SECURED/LOCKED AT ALL TIMES /"FREE EGRESS IN CASE OF EMERGENCY."

AUTHORIZED ACCESS VIA CREDENTIALLED "PROX CARD READER" ACTIVATION, THUS RELEASING "ELECTRIC STRIKE" FOR ENTRY FROM SECURED SIDE...

**NOTE: MECHANICAL KEY ACCESS PROVIDED FOR AUTHORIZED ENTRY WITHOUT "PROX CARD OR DURING POWER FAILURE...**

## HW-1A

DRS. 114A, 125A

TO HAVE:

- 3 BUTTS TA2314 NRP 32D 4.5 X 4.5
- 1 EXIT DEVICE 99NL-F X 990NL-R X 26D LAR
- 1 KEYED CYL. (BEST STANLEY)
- 1 DOOR CLOSER 4040XP X AL TB
- 1 KICK PLATE 8" H X 2" LDW .050 32D

- 1 THRESHOLD 171A X LAR
- 1 SWEEP 315CN X LAR
- 1 WEATHERSTRIP S88D X LAR

*Note: PROX READER PRO II 5455 by Owner*

- 1 ELECTRIC STRIKE 9600 X 630 12/24VDC *by Owner*
- 1 POWER FILTER / TIMER #2005 SMART PAC II *by Owner*
- 1 POWER SUPPLY PS861BK 12/24VDC (ALL DRS. THIS HDG.) *by Owner*  
**( Number of Power Supplies T.B.D. by Access Control Supplier)**

(Cont'd Next Page )

HW-1A (Cont'd ....)

PROX ACCESS CONTROL DESCRIPTION:

DOOR OPENINGS SHALL REMAIN SECURED/LOCKED AT ALL TIMES /"FREE EGRESS IN CASE OF EMERGENCY."

AUTHORIZED ACCESS VIA CREDENTIALLED "PROX CARD READER" ACTIVATION, THUS RELEASING "ELECTRIC STRIKE" FOR ENTRY FROM SECURED SIDE...

*NOTE: MECHANICAL KEY ACCESS PROVIDED FOR AUTHORIZED ENTRY WITHOUT "PROX CARD OR DURING POWER FAILURE...*

HW-1B  
DRS. 200A  
TO HAVE:

- 3 BUTTS TA2314 NRP 32D 4.5 X 4.5
- 1 EXIT DEVICE 99NL X 990NL-R X 26D LAR
- 2 KEYED CYL. (BEST STANLEY)
- 1 DOOR CLOSER 4040XP X AL TB
- 1 KICK PLATE 8" H X 2" LDW .050 32D
- 1 THRESHOLD 171A X LAR
- 1 SWEEP 315CN X LAR
- 1 WEATHERSTRIP S88D X LAR

*Note: PROX READER PRO II 5455 by Owner*

- 1 ELECTRIC STRIKE 9600 X 630 12/24VDC *by Owner*
- 1 POWER FILTER / TIMER #2005 SMART PAC II *by Owner*
- 1 POWER SUPPLY PS861BK 12/24VDC (ALL DRS. THIS HDG.) *by Owner*  
**( Number of Power Supplies T.B.D. by Access Control Supplier)**

PROX ACCESS CONTROL DESCRIPTION:

DOOR OPENINGS SHALL REMAIN SECURED/LOCKED AT ALL TIMES /"FREE EGRESS IN CASE OF EMERGENCY." AUTHORIZED ACCESS VIA CREDENTIALLED "PROX CARD READER" ACTIVATION, THUS RELEASING "ELECTRIC STRIKE" FOR ENTRY FROM SECURED SIDE...

*NOTE: MECHANICAL KEY ACCESS PROVIDED FOR AUTHORIZED ENTRY WITHOUT "PROX CARD OR DURING POWER FAILURE...*

HW-2  
DRS. 100A, 108A.  
TO HAVE:

- 3 BUTTS TA2714 26D 4.5 X 4.5
  - 1 STORE ROOM LOCK 93K 7D 15D 626
  - 1 CLOSER 4040 XP AL TB
  - 1 KICK PLATE 8" H X 2" LDW .050 32D
  - 1 WALL STOP 409 X 32D
  - 3 SILENCERS 608

*Note: PROX READER PRO II 5455 by Owner*

- 1 ELECTRIC STRIKE 1006CS X 630 12/24VDC by Owner
- 1 POWER FILTER / TIMER #2005 SMART PAC II by Owner
- 1 POWER SUPPLY PS861BK 12/24VDC (ALL DRS. THIS HDG.) by Owner

**( Number of Power Supplies T.B.D. by Access Control Supplier)**

PROX ACCESS CONTROL DESCRIPTION:

DOOR OPENINGS SHALL REMAIN SECURED/LOCKED AT ALL TIMES /"FREE EGRESS IN CASE OF EMERGENCY."

AUTHORIZED ACCESS VIA CREDENTIALLED "PROX CARD READER" ACTIVATION, THUS RELEASING "ELECTRIC STRIKE" FOR ENTRY FROM SECURED SIDE...

*NOTE: MECHANICAL KEY ACCESS PROVIDED FOR AUTHORIZED ENTRY WITHOUT "PROX CARD OR DURING POWER FAILURE...*

HW-2.1  
DRS. 104A.  
TO HAVE:

- 2 BUTTS TA2714 26D 4.5 X 4.5
  - 1 PASSAGE LOCK 93K ON 15D 626
  - 1 CLOSER 4040 XP AL TB
  - 2 KICK PLATE 8" H X 2" LDW .050 32D
  - 3 WALL STOP 409 X 32D
  - 3 SILENCERS 608

HW-3  
DRS. 101A, 102A, 109A, 136A, 137A  
TO HAVE:

- 3 BUTTS TA2714 26D 4.5 X 4.5
- 1 PRIVACY LOCK 93K 7L 15D 626
- 1 DOOR CLOSER 4040 XP X AL TB
- 1 KICK PLATE 6" H X 2" LDW .050 32D
- 1 WALL STOP 409 X 32D

3 SILENCERS 608

HW-4  
DR. 103A  
TO HAVE:

- 3 BUTTS TA2714 26D 4.5 X 4.5
- 1 EXIT DEVICE 99L X 996L #17 26D LAR
- 1 KEYED CYL. (BEST STANLEY)
- 1 DOOR CLOSER 4040XP X AL TB
- 1 KICK PLATE 8" H X 2" LDW .050 32D
- 1 FLOOR STOP 442 X 26D
- 3 SILENCERS 608

HW-5  
DRS. 105A, 106A, 107A, 116A.  
TO HAVE:

- 3 BUTTS TA2714 26D 4.5 X 4.5
- 1 OFFICE LOCK 93K 7AB 15D 626
- 1 FLOOR STOP 442 X 26D
- 3 SILENCERS 608

HW-6  
DRS. 111A, 301A.  
TO HAVE:

- 3 BUTTS TA2714 26D 4.5 X 4.5
- 1 STORE ROOM LOCK 93K 7D 15D 626
- 1 DOOR CLOSER 4040XP X AL TB
- 1 KICK PLATE 6" H X 2" LDW .050 32D
- 1 WALL STOP 409 X 32D
- 3 SILENCERS 608

HW-7  
PR.DRS. 112A, 139A, 206A.  
TO HAVE:

- 6 BUTTS TA2714 26D 4.5 X 4.5
- 2 FLUSH BOLTS 555 12" 26D
- 1 STORE ROOM LOCK 93K 7D-EU 15D 626
- 1 DUST PROOF STRIKE 570 26D

- 2 KICK PLATES 8" H X 2" LDW .050 32D
- 2 OH STOPS 10- 346 X 32D
- 2 SILENCERS 608
- 1 POWER TRANSFER EPT-10 x SP28

**( Number of Power Supplies T.B.D. by Access Control Supplier)**

PROX ACCESS CONTROL DESCRIPTION:

AUTHORIZED ACCESS VIA CREDENTIALLED "PROX CARD READER" ACTIVATION,  
THUS RELEASING "ELECTRIC LOCK" FOR ENTRY FROM SECURED SIDE...

*NOTE: MECHANICAL KEY ACCESS PROVIDED FOR AUTHORIZED ENTRY WITHOUT "PROX CARD  
OR DURING POWER FAILURE...*

HW-8

DRS. 117A, 200A.

TO HAVE:

- 3 BUTTS TA2314 NRP 32D 4.5 X 4.5
- 1 EXIT DEVICE 99NL X 990NL-R X 26D LAR
- 1 KEYED CYL. (BEST STANLEY)
- 1 DOOR CLOSER 4040XP X AL TB
- 1 KICK PLATE 8" H X 2" LDW .050 32D
- 1 THRESHOLD 171A X LAR
- 1 SWEEP 315CN X LAR
- 1 WEATHERSTRIP S88D X LAR

HW-8.1

DRS. 215B\*, 215C\*, 215D, 215E.

TO HAVE:

- 3 BUTTS TA2314 NRP 32D 4.5 X 4.5
- 1 EXIT DEVICE 99NL-F X 990NL-R X 26D LAR
- 1 KEYED CYL. (BEST STANLEY)
- 1 DOOR CLOSER 4040XP X AL TB
- 1 KICK PLATE 8" H X 2" LDW .050 32D
- 1 THRESHOLD 171A X LAR
- 1 SWEEP 315CN X LAR
- 1 WEATHERSTRIP S88D X LAR

(\*) NOTE: DOORS 215B & 215C TO BE EQUIPPED WITH ACCESS CONTROL.



*Note: PROX READER PRO II 5455 by Owner*

- 1 ELECTRIC STRIKE 9600 X 630 12/24VDC by Owner
- 1 POWER FILTER / TIMER #2005 SMART PAC II by Owner
- 1 POWER SUPPLY PS861BK 12/24VDC (ALL DRS. THIS HDG.) by Owner

**( Number of Power Supplies T.B.D. by Access Control Supplier)**

PROX ACCESS CONTROL DESCRIPTION:

DOOR OPENINGS SHALL REMAIN SECURED/LOCKED AT ALL TIMES /"FREE EGRESS IN CASE OF EMERGENCY."

AUTHORIZED ACCESS VIA CREDENTIALLED "PROX CARD READER" ACTIVATION, THUS RELEASING "ELECTRIC STRIKE" FOR ENTRY FROM SECURED SIDE...

*NOTE: MECHANICAL KEY ACCESS PROVIDED FOR AUTHORIZED ENTRY WITHOUT "PROX CARD OR DURING POWER FAILURE...*

HW-9

DRS. 126A, 127A, 128A, 129A, 140A.

TO HAVE:

- 3 BUTTS TA2714 26D 4.5 X 4.5
- 1 PRIVACY LOCK 93K 7L 15D 626
- 1 KICK PLATE 8" H X 2" LDW .050 32D
- 1 WALL STOP 409 X 32D
- 3 SILENCERS 608

HW-10

DR. 135A

TO HAVE:

- 3 BUTTS TA2714 26D 4.5 X 4.5
- 1 PUSH PLATE 70C 4 X 16 32D
- 1 PULL PLATE 102 X 70C 4 X 16 32D
- 1 CLOSER 4040XP X AL TB
- 1 KICK PLATE 8" H X 2" LDW .050 32D
- 1 WALL STOP 409 X 32D
- 3 SILENCERS 608

HW-11

DRS. 141A, 142A

TO HAVE:

- 3 BUTTS TA2714 26D 4.5 X 4.5
- 1 OFFICE LOCK 93K 7AB 15D 626
- 1 DOOR CLOSER 4040XP X AL TB
- 1 KICKPLATE 8" H X 2" LDW .050 32D
- 1 WALL STOP 409 X 32D
- 3 SILENCERS 608

HW-12

DRS. 202A, 208A, 209A, 212A, 216A, 217A, 302A.

TO HAVE:

- 3 BUTTS TA2714 26D 4.5 X 4.5
  - 1 STORE ROOM LOCK 93K 7D 15D 626
  - 1 CLOSER 4040 XP AL TB
  - 1 KICK PLATE 8" H X 2" LDW .050 32D
  - 1 WALL STOP 409 X 32D
  - 3 SILENCERS 608

*Note: PROX READER PRO II 5455 by Owner*

- 1 ELECTRIC STRIKE 1006CS X 630 12/24VDC *by Owner*
  - 1 POWER FILTER / TIMER #2005 SMART PAC II *by Owner*
  - 1 POWER SUPPLY PS861BK 12/24VDC (ALL DRS. THIS HDG.) *by Owner*  
**( Number of Power Supplies T.B.D. by Access Control Supplier)**

HW-13

OH DRS. 200B, 200C, 200D, 200E, 200F, 215A.

TO HAVE:

ALL HARDWARE DEVICES-LOCKING-CONTROLS,ETC. SHALL BE BY THE O.H. DOOR MFR./SUPPLIER.

END OF SECTION

## SECTION 088000 - GLAZING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Insulating glass.
  - 2. Miscellaneous glazing materials.

#### 1.2 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

#### 1.3 PREINSTALLATION MEETINGS

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

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Delegated Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For glass.
- B. Product test reports.
- C. Preconstruction adhesion and compatibility test report.
- D. Sample warranties.

#### 1.6 QUALITY ASSURANCE

- A. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

## 1.7 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
  - 1. Warranty Period: **10** years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for 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 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 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:
  - 1. Design Wind Pressures: As indicated on Drawings.
  - 2. Thermal Loads: Design glazing to resist thermal stress breakage induced by differential temperature conditions and limited air circulation within individual glass lites and insulated glazing units.
- C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
  - 1. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on most current non-beta version of LBL's WINDOW computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
  - 2. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on most current non-beta version of LBL's WINDOW computer program.
  - 3. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

## 2.2 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. NGA Publications: "Glazing Manual."
  - 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
  - 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
  - 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of **the SGCC or another certification agency acceptable to authorities having jurisdiction**. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the IGCC.
- D. Thickness: Where glass thickness is indicated, it is 1" thick insulated glass to be coordinated with aluminum doors/framing systems.
- E. Strength: Where glass is indicated, provide fully tempered safety glass.

## 2.3 GLASS PRODUCTS

## 2.4 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.
  - 1. Sealing System: Dual seal, with **manufacturer's standard** primary and secondary sealants to meet all specified requirements.
  - 2. Perimeter Spacer: **Manufacturer's standard spacer material and construction**.
  - 3. Desiccant: Molecular sieve or silica gel, or a blend of both.

## 2.5 GLAZING SEALANTS

- A. General:
  - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: **As selected by Owner from manufacturer's full range of industry colors.**

## 2.6 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Setting Blocks:
  1. Type recommended in writing by sealant or glass manufacturer.
- C. Spacers:
  1. Type recommended in writing by sealant or glass manufacturer.
- D. Edge Blocks:
  1. Type recommended in writing by sealant or glass manufacturer.

## PART 3 - EXECUTION

### 3.1 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

### 3.2 GASKET GLAZING (DRY)

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

### 3.3 CLEANING AND PROTECTION

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

### 3.4 INSULATING GLASS SCHEDULE

- A. Low-E-Coated, Clear Insulating Glass Type:
  - 1. Overall Unit Thickness: **1 inch (25 mm)**.
  - 2. Minimum Thickness of Each Glass Lite: **4 mm**.
  - 3. Outdoor Lite: **Fully tempered** float glass.
  - 4. Interspace Content: **Argon**.
  - 5. Indoor Lite: **Fully tempered** float glass.
  - 6. Low-E Coating: **Pyrolytic or sputtered on second or third** surface.
  - 7. Safety glazing required.

END OF SECTION 088000



## SECTION 092900 - GYPSUM BOARD

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.

#### 1.2 ACTION SUBMITTALS

- A. Product data.
- B. Shop Drawings: Show locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other work.
- C. Samples: For each texture finish indicated on same backing indicated for Work.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

#### 2.2 GYPSUM BOARD, GENERAL

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

#### 2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Wallboard: ASTM C1396/C1396M.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Certainteed; SAINT-GOBAIN.
  - b. Georgia-Pacific Gypsum LLC.
  - c. Gold Bond Building Products, LLC provided by National Gypsum Company.
  - d. USG Corporation.
- B. Gypsum Board, Type X: ASTM C1396/C1396M for walls and ceiling unless otherwise indicated.
  1. Thickness: 5/8 inch (15.9 mm).
  2. Long Edges: **Tapered and featured (rounded or beveled) for prefilling.**
- C. Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Certainteed; SAINT-GOBAIN.
    - b. Georgia-Pacific Gypsum LLC.
    - c. Gold Bond Building Products, LLC provided by National Gypsum Company.
    - d. USG Corporation.
  2. Core: **5/8 inch (15.9 mm), Type X.**
  3. Long Edges: Tapered.
  4. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

## 2.4 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Certainteed; SAINT-GOBAIN.
    - b. Custom Building Products.
    - c. USG Corporation.
  2. Thickness: **5/8 inch (15.9 mm) As indicated on Drawings.**
  3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

## 2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
  1. Material: **Galvanized or aluminum-coated steel sheet or rolled zinc.**
  2. Shapes:
    - a. Cornerbead.
    - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    - c. L-Bead: L-shaped; exposed long flange receives joint compound.

- d. Expansion (control) joint.

## 2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
  - 1. Interior Gypsum Board: Paper.
  - 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
  - 1. Prefilling: At open joints, **rounded or beveled panel edges**, and damaged surface areas, use setting-type taping compound.
  - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use **drying-type, all-purpose** compound.
    - a. Use setting-type compound for installing paper-faced metal trim accessories.
  - 3. Fill Coat: For second coat, use **drying-type, all-purpose** compound.
  - 4. Finish Coat: For third coat, use **drying-type, all-purpose** compound.
- D. Joint Compound for Tile Backing Panels:
  - 1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
  - 2. Cementitious Backer Units: As recommended by backer unit manufacturer.

## 2.7 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
  - 1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
  - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
  - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- D. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

- E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF PANELS

- A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- B. Comply with ASTM C840.
- C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/2-inch- (12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- D. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

### 3.2 FINISHING OF GYPSUM BOARD

- A. Prefill open joints, **rounded or beveled edges**, and damaged surface areas.
- B. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- C. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
  - 1. Level 2: Ceiling plenum areas, concealed areas, and where indicated.
  - 2. Level 4: **At panel surfaces that will be exposed to view unless otherwise indicated**
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
- D. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.
- F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

### 3.3 APPLICATION OF TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

3.4 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900

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## SECTION 093013 - CERAMIC TILING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Porcelain tile.
  - 2. Stone thresholds.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples:
  - 1. Each type and composition of tile and for each color and finish required. **For ceramic mosaic tile in color blend patterns, provide samples of each color blend.**
  - 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required.
  - 3. Stone thresholds.

#### 1.3 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.**

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications:
  - 1. Installer is **to be a member of the National Tile Contractors Association for a minimum of five years..**
  - 2. Installer employs **Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.**
- B. 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 mockup of **each type of** floor tile installation.
  - 2. Build mockup of **each type of** wall tile installation.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

### 2.2 TILE PRODUCTS

- A. Ceramic Tile Type **CT-1: Mosaic porcelain floor tile**.
  1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. **Daltile – Continental Slate.**
  2. Face Size: 3x3 dot mounted on 12' x 24" sheets.
  3. Thickness: 1/4".
  4. Face: **As indicated.**
  5. Dynamic Coefficient of Friction: Not less than 0.42.
  6. Tile Color, Glaze, and Pattern: **As selected by Owner/Architect from manufacturer's full range.**
  7. Grout Color: **As selected by Owner/Architect from manufacturer's full range.**
- B. Ceramic Tile Type **CT-2: Unglazed porcelain wall tile**.
  1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. **Daltile – Continental Slate.**
  2. Module Size: **6 by 6 inches (152 by 152 mm).**
  3. Thickness: **5/16 inch (8 mm).**
  4. Face: **Pattern of design indicated, with manufacturer's standard edges.**
  5. Tile Color and Pattern: **As selected by Architect from manufacturer's full range.**
  6. Grout Color: **As selected by Architect from manufacturer's full range.**
  7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable **and matching characteristics of adjoining flat tile.** Provide shapes as follows, selected from manufacturer's standard shapes:
    - a. Base Cove: Surface bullnose, module size 6x12 inches.



- b. Corner Base Outcorner: 1x6
- c. Bullnose Cap: 3x12

## 2.3 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, with lower edge of bevel aligned with or up to **1/16 inch (1.5 mm)** above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to **1/2 inch (12.7 mm)** or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C 503/C 503M, with a minimum abrasion resistance of **10** according to ASTM C 1353 or ASTM C 241/C 241M and with honed finish.
  - 1. Description: Uniform, fine- to medium-grained white stone with gray veining.

## 2.4 SETTING MATERIALS

- A. Latex modified-Portland Cement Mortar (Thinset): ANSI A118.4.
  - 1. Provide prepackaged, dry-mortar mix combined with liquid-latex additive at Project site.
  - 2. For wall applications, provide nonsagging mortar.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Bonsal American, an Oldcastle company.
  - 2. Custom Building Products.
  - 3. MAPEI Corporation.

## 2.5 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. Standard Cement Grout: ANSI A118.6.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Bonsal American, an Oldcastle company.
    - b. Custom Building Products.
    - c. MAPEI Corporation.

## 2.6 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. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

## 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 the Work.
  - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
  - 2. Verify that concrete substrates for tile floors installed with **thinset mortar** comply with surface finish requirements in ANSI A108.01 for installations indicated.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with **thinset mortar** with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Blending: For tile exhibiting color variations, 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.

### 3.3 CERAMIC TILE INSTALLATION

- A. Comply with 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. Tile floors consisting of tiles 8 by 8 inches (200 by 200 mm) or larger.
- 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. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting bed thickness so that tiles are flush.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
  - 1. Porcelain Wall Tile: **1/8" to 1/4 inch** to be selected by Owner.
  - 2. Porcelain Mosaic Floor Tile: determined by mosaic sheet spacing.
- H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- I. Grout Sealer: Apply grout sealer to **cementitious** grout joints **in tile floors** according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.
- J. 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.**
- K. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- L. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

### 3.4 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. **Interior Floor Installations on all On-Ground Concrete Subfloor: except for Showers.**
  - 1. Ceramic Tile Installation **TCNA F113-13**; with cementitious bond coat.
    - a. Ceramic Tile Type: **CT-1**.
    - b. Grout: **Standard unsanded cement** grout.

**B. Interior Floor Installations on all On-Ground Concrete Subfloor at Showers as shown on drawings Sheet A9:**

1. Ceramic Tile Installation **TCNA #B422C-17**; with cementitious bond coat and waterproof membrane.
  - a. Ceramic Tile Type: **CT-1**.
  - b. Grout: **Standard unsanded cement** grout.

**C. Interior Wall Installations, Wood Studs with water resistant gypsum board (typical except in Showers and on CMU walls):**

1. Ceramic Tile Installation **TCNA W242-13**; organic adhesive on water resistant gypsum board. This installation is standard throughout the project except in showers and tile applied to CMU.
  - a. Ceramic Tile Type: **CT-2**.
  - b. Grout: **Standard unsanded cement** grout.

**D. Interior Wall Installations, Wood Studs with cement backer board at both showers with waterproof membrane:**

1. Ceramic Tile Installation **TCNA W244E-13**.
  - a. Ceramic Tile Type: **CT-2**.
  - b. Grout: **Standard unsanded cement** grout.

**E. Interior Wall Installations, Tile installed on CMU walls:**

1. Ceramic Tile Installation **TCNA W202I-13 w/ latex-portland cement mortar**.
  - a. Ceramic Tile Type: **CT-2**.
  - b. Grout: **Standard unsanded cement** grout.

END OF SECTION 093013

## SECTION 095113 - ACOUSTICAL PANEL CEILINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

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

#### 1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Coordination Drawings: Drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
  - 1. Ceiling suspension assembly 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.
- C. Samples: For each acoustical panel, for each exposed suspension system member, and for each color and texture required.
- D. Product test reports.
- E. Research/evaluation reports.
- F. Maintenance data.

#### 1.3 QUALITY ASSURANCE

- A. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory.
- B. Seismic Standard: Comply with the following:
  - 1. ASTM E 580.
  - 2. CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings--Seismic Zones 0-2."
  - 3. CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies--Seismic Zones 3 & 4."
  - 4. NC Building Code.

#### 1.4 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 Units: Full-size units equal to **2.0** percent of quantity installed, but not fewer than 10 units.
  - 2. Suspension System Components: Quantity of each exposed component equal to **2.0** percent of quantity installed, but not fewer than components.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
  - 2. Products: Subject to compliance with requirements, provide one of the products specified.

#### 2.2 GENERAL

- A. Acoustical Panel Standard: Comply with ASTM E 1264.
- B. Metal Suspension System Standard: Comply with ASTM C 635.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.
  - 1. Anchors in Concrete: **Expansion** anchors fabricated from corrosion-resistant materials, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to **five** times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
  - 2. 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 hangers of type indicated, and with capability to sustain, without failure, a load equal to **10** times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
- D. Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire; ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
  - 1. Size: Select wire diameter so its stress at three 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- (2.69-mm-) diameter wire.

- E. Seismic struts and seismic clips.
- F. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

## 2.3 ACOUSTICAL PANELS

- A. Products:
  - 1. Fissured panel as manufactured by Armstrong or approved equal substitution in accordance with procedures outlined in Product Requirements Section 016000.
- B. Classification: panels.
  - 1. Type and Form: Type III, mineral base with painted finish; Form **2, water felted with C D pattern.**
- C. Color: **White.**
- D. NRC: .55
- E. CAC: 35.
- F. AC: Not less than 170.
- G. Edge Detail: Angled Tegal.
- H. Thickness: **5/8 inch (15 mm).**
- I. Size: **24 by 24 inches (610 by 610 mm).**

## 2.4 METAL SUSPENSION SYSTEM

- A. Products:
  - 1. Prelude XL 15/16" Exposed Tee suspension system or approved equal substitution in accordance with procedures outlined in Product Requirements Section 016000.
- B. Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation, with prefinished **15/16-inch- (24-mm-)** wide metal caps on flanges.
  - 1. Structural Classification: **Intermediate**-duty system.
  - 2. End Condition of Cross Runners: **Override (stepped)** type.
  - 3. Cap Material: **Steel or aluminum** cold-rolled sheet.
  - 4. Cap Finish: **Painted in color as selected from manufacturer's full range.**
  - 5. Color: To be selected from full range of manufacturers colors.

## PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with **ASTM C 636** and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. 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 tiles at borders.
- C. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers, use trapezes or equivalent devices.
  - 1. Do not support ceilings directly from ceiling finish, permanent metal forms or floor deck; anchor securely into roof structural system.
  - 2. Do not attach hangers to steel deck tabs **or to steel roof deck**.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Screw attach moldings to substrate with concealed fasteners at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.66 m). Miter corners accurately and connect securely.
- 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.

END OF SECTION 09511



## SECTION 096513 - RESILIENT BASE AND ACCESSORIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Vinyl base.
  - 2. Vinyl stair accessories.
  - 3. Vinyl molding accessories.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

#### 2.2 VINYL BASE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Armstrong World Industries, Inc.
  - 2. Flexco.
  - 3. Johnsonite; a Tarkett company.
  - 4. Roppe Corporation.
- B. Product Standard: ASTM F1861, Type TV (vinyl, thermoplastic).
  - 1. Group: **I (solid, homogeneous).**
  - 2. Style and Location:
    - a. Style B, Cove: **Provide in areas with resilient floor coverings and carpet.**
- C. Minimum Thickness: **0.125 inch (3.2 mm).**
- D. Height: **4 inches (102 mm).**
- E. Lengths: **Coils in manufacturer's standard length.**
- F. Outside Corners: **Job formed.** Provide a sample of corner for approval by Owner before proceeding.

- G. Inside Corners: **Job formed**. Provide a sample of corner for approval by Owner before proceeding.
- H. Colors and Patterns: **As selected by Owner from full manufacturer's range of colors**.

## 2.3 VINYL STAIR ACCESSORIES

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Flexco.
  - 2. Johnsonite; a Tarkett company.
  - 3. Roppe Corporation.
  - 4. The R.C. Musson Rubber Co.
- C. Stair Treads: ASTM F2169, Type TV (vinyl, thermoplastic).
  - 1. Class: **1 (smooth, flat)**.
  - 2. Group: **1 (embedded abrasive strips)**.
  - 3. Nosing Style: **Square, adjustable to cover angles between 60 and 90 degrees**.
  - 4. Nosing Height: **1-1/2 inches (38 mm) <Insert dimension>**.
  - 5. Thickness: **1/4 inch (6 mm) and tapered to back edge**.
  - 6. Size: Lengths and depths to fit each stair tread in **one piece**.
- D. Landing Tile: **Matching treads; produced by same manufacturer as treads and recommended by manufacturer for installation with treads**.
- E. Colors and Patterns: **As selected by Owner from full manufacturer's range of colors..**

## 2.4 VINYL MOLDING ACCESSORY <Insert drawing designation>

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Armstrong World Industries, Inc.
  - 2. Flexco.
  - 3. Johnsonite; a Tarkett company.
  - 4. Roppe Corporation.
- B. Description: Vinyl **joiner for tile and carpet, transition strips, etc.**
- C. Profile and Dimensions: As approved by the Owner.
- D. Colors and Patterns: **As selected by Owner from full manufacturer's range of colors..**

## 2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
  - 4. Moisture Testing: Perform tests so that each test area does not exceed **1000 sq. ft. (304.8 sq. m)** and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of **3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)** in 24 hours.
    - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum **75** percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until materials are the same temperature as space where they are to be installed.

- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

### 3.2 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Job-Formed Corners: Provide samples of typical corner installation for Owner's approval before proceeding with installation.
  - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than **3 inches (76 mm)** in length.
    - a. Form without producing discoloration (whitening) at bends.
  - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than **3 inches (76 mm)** in length.
    - a. **Miter or cope** corners to minimize open joints.

### 3.3 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
  - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
  - 2. Tightly adhere to substrates throughout length of each piece.
  - 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

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## SECTION 096519 - RESILIENT TILE FLOORING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Vinyl composition floor tile.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and pattern specified.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

#### 2.2 VINYL COMPOSITION FLOOR TILE <Insert drawing designation>

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Armstrong Flooring, Inc.
  - 2. Congoleum Flooring.
  - 3. Johnsonite; a Tarkett company.
- B. Tile Standard: ASTM F1066, **Class 2, through pattern.**

- C. Wearing Surface: **Smooth**.
- D. Thickness: **0.125 inch (3.2 mm)**.
- E. Size: 12 by 12 inches (305 by 305 mm).
- F. Colors and Patterns: Selected from manufacturer full colors and patterns.

## 2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than pH.
  - 4. Moisture Testing: Perform tests so that each test area does not exceed **200 sq. ft. (18.6 sq. m)**, and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of **3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)**.
    - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum **75** percent relative humidity level measurement.
- C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.



- D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- E. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
  - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

### 3.2 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  - 1. Lay tiles **square with room axis border pattern as indicated on floor finish layout**.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
  - 1. Lay tiles **with grain direction alternating in adjacent tiles (basket-weave pattern)**. Provide sample of tile layout for Owner's final approval.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply **two** coat(s).

END OF SECTION 096519

## SECTION 096813 - MODULAR FLOORING FOR COMMERCIAL APPLICATIONS

### **PART 1 GENERAL**

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

A. Textile composite flooring modules as shown on the drawings and schedules and as indicated by the requirements of this section.

#### **1.02 RELATED DOCUMENTS**

A. Drawings and General Provisions of the Contract (including General and Supplementary Conditions and Division 1 sections) apply to the work in this section only.

#### **1.03 RELATED SECTIONS**

A. Other Division 9 sections for floor finishes related to this section but not the work of this section.

B. Division 3 Concrete - not included work this section.

C. Division 7 Thermal and Moisture Protection - not included work this section.

#### **1.04 QUALITY ASSURANCE AND REGULATORY REQUIREMENTS**

A. Qualifications of flooring installation contractor: All work shall be done by installation firms specializing in commercial flooring and carpet installation. It is required, that the firm or individual shall be a member of the Floor Covering Installation Contractors Association (FCICA) and/or certified by the Certified Floorcovering Installers Association (CFI). Flooring contractor to be specialty contractor normally engaged in this type of work and shall have three (3) years minimum documented experience in commercial installation of similar flooring materials and participation in manufacturer's environmental program including responsible flooring removal, recycling, and installation.

B. Flooring contractor will be responsible for the proper product installation, including floor preparation in all the areas indicated in the drawings to receive Kinetex modules. The installation standard will be as listed in The Carpet and Rug Institute's Standard for Installation of Commercial Carpet CRI-104, the standard that establishes the minimum installation procedures.

C. Flooring contractor to provide owner a written warranty that guarantees the completed installation to be free from defects in materials and workmanship for a period of no less than two (2) years after job completion.

D. Manufacturer qualifications: Manufacturing facility to ISO 14001 certified and have a min-

imum of 20 years experience in the manufacture of commercial flooring.

E. Manufacturer to offer a reclamation program for the recycling of existing broadloom carpet, modular carpet tile and textile composite flooring.

F. All warranties must be issued by the manufacturer as standard published warranties on all types of flooring modules within this document. Second source warranties that involve parties other than the textile composite flooring manufacturer are unacceptable. If the product fails to perform as warranted when installed according to the J+J Flooring Group's Kinetex installation instruction and maintained according to J+J Flooring Group's Kinetex maintenance instructions, the affected area will be repaired or replaced at the expense of the manufacturer. J+J Flooring Group will provide standard published written performance warranties for the following:

1. Lifetime product performance. Excessive wear means no more than five (5%) percent loss of pile fiber weight.
2. Lifetime static protection, meaning built-in protection below 3.0 kv as tested under AATCC-134.
3. Lifetime Stain Removal
4. Lifetime Colorfastness (Light and Crocking)
5. Lifetime Edge Ravel
6. Lifetime Delamination
7. Lifetime Dimensional Stability

G. Manufacturer to provide field service experts to assist in project start-up as required by the job and will notify owner, architect, general contractor, or another designated contact if any installation instructions are not followed.

H. Provide flooring material to meet the following test performance criteria as tested by a recognized independent testing laboratory. Certified test reports shall be submitted by the manufacturer for each test method. Requirements listed below must be met by all products being submitted for approval:

1. Pill Test / DOC-FF-1-70 (ASTM D-2589) - Requirement: Pass
2. Flooring Radiant Panel / ASTM E-648 - Requirement: Class I (Above .45 w/cm)
3. CRI VOC Chamber Test/Indoor Air Quality test (CRI-IAQ) Green Label Plus™ Test.
4. Lightfastness: Rating of not less than 5 on International Grey Scale after 40 SFU's when tested in accordance with AATCC Test Method 16E.
5. Crockfastness: Minimum stain rating on International Grey Scale of not less than 5 wet or dry when tested in accordance with AATCC Test Method 165.

6. Atmospheric Fading: Burned Gas shall not be less than 5 on International Grey Scale after two cycles on each test as per AATCC Test Method 129 Ozone and AATCC Test Method 23.
7. Noise Reduction Coefficient (ASTM C 423-02): NRC Rating of 0.30
8. Impact Insulation Classification (ASTM E 492-09): IIC Rating of 64

### **1.05 SUBMITTALS**

- A. Submit to architect and/or owner ten (10) days prior to bid, two (2) 6.5" x 6.5" (minimum size) finished samples of the exact type of flooring proposed, including quality, pattern, color and backing.
- B. Submit to architect and/or owner ten (10) days before bid, any proposed substitutions for consideration. Submit at least three (3) references of installations using the same flooring technology, as described within this text. Include contact names and telephone numbers.
- C. Submit manufacturer's warranties, installation instructions, and maintenance instructions before bid date.
- D. Submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required flammability tests as well as other testing requirements as listed under 1.04 F.

### **1.06 ENVIRONMENTAL/FIELD CONDITIONS**

- A. Deliver all materials to the installation site in the manufacturer's original packaging and in good condition. Packaging to contain manufacturer's name and marks, identification number, shipping and handling instructions and related information.
- B. Delivered and stored materials must be available for inspection as required by the owner, architect, general contractor and/or the manufacturer.
- C. Sub-floor preparation is to include all required work to prepare the existing floor for installation of the product as specified in this document. Sub-floor preparation shall meet all conditions as specified in J+J Flooring Group's Kinetex textile composite flooring installation instructions.
- D. Sub-floor preparation will include, as required, the removal and repair of the existing floor surface. It is required that the floor of a renovation project be inspected before the bid date.
- E. All materials, including adhesives, are to be delivered to the site of installation at a minimum of 48 hours prior to the start of installation and stored in a clean and dry room that measures above 65°F and below 95°F and measures between 10% and 65% relative humidity (RH). To maintain temperature and relative humidity, permanent heating and air conditioning systems (HVAC) must be in operation. Place pallets of textile composite flooring modules on a

flat surface (do not double stack pallets). After work is completed, the ambient room temperature should remain at 65°F and relative humidity between 10% and 65% for 48 hours. These materials and related adhesives shall be protected from the direct flow of heat from heating fixtures and appliances such as hot-air registers, radiators, or other. Site conditions shall include those specified in the flooring manufacturer's installation instructions and shall also include sufficient heat, light and power required for effective and efficient working condition.

F. Once the temperature and relative humidity in area for installation have been stabilized, loose lay the modules within the installation area and allow them to precondition for 48 hours prior to installation. Module installation shall not commence until painting and finishing work is complete and ceiling and overhead work is tested, approved and completed. Traffic shall be closed during the installation of the textile composite flooring products. Verify concrete slabs are dry per the standards for bond and moisture tests listed in the manufacturer's installation instructions.

## **1.07 SUBSTITUTIONS**

- A. All Bid submittals must conform to the specifications in this document.
- B. All test results to be in accordance with a certified independent testing laboratory.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

A. Acceptable Manufacturer: Kinetex, a brand of J+J Flooring Group, P.O. Box 1287, Dalton, GA, 30722. (800) 241-4586. JJ-KINETEX.COM. Please contact Kristina Crisp, 423.827.2266, kristina.crisp@jj-jjflooringgroup.com

*Any alternate manufacturer and/or product must meet or exceed those requirements specified under all sections of this document in pattern, color, and fiber. Any substitutions must be made in accordance with Section 1.00 of this document.*

### **2.02 TEXTILE COMPOSITE FLOORING MATERIALS**

- A. Kinetex flooring modules (tiles):
  - 1. Product: **As selected by Owner from Umbra/Umbra Stripe styles/patterns.**
  - 2. Color: To be chosen from standard colorways
  - 3. Backing: Polyester Cushion Felt
  - 4. Dye Method: Solution Dyed
  - 5. Fiber Type: Polyester
  - 6. Total Weight (Nominal Average): 4.5 oz - 5.2 oz / square foot

7. Pattern Repeat: N/A
8. Soil Release: Yes
9. Standard Size: 18" x 36" (approximate)
10. Warranties: Lifetime Product Performance, Colorfastness to Light & Crocking, Stain Removal, Static Protection, Protection from Edge Ravel and Delamination; Life-time Dimensional Stability.
11. Testing Specifications - Pill Test: Yes
12. Testing Specifications - Flooring Radiant Panel: Class 1
13. Testing Specifications - Smoke Density: Less than 450 flaming (ASTM E 662)
14. Testing Specifications - Static Test: Less than 3 kv (AATCC-134)
15. Recycled content: Minimum of 50% recycled content
16. NSF/ANSI 140 Platinum Certified
17. Closed-loop recyclable

## **2.03 ADHESIVES**

A. Kinetex® Adhesive, an aggressive, pressure-sensitive adhesive designed for the installation of Kinetex textile composite flooring modules is required.

## **2.04 ACCESSORIES**

A. Kinetex requires protective transition 3/16-inch to other floor covering thickness. Provide transition/reducing strips tapered to meet abutting materials as indicated in the drawings.

B. Provide aluminum edge with lip to protect Kinetex edge.

## **PART 3 EXECUTION**

### **3.01 INSPECTION**

A. Examine and verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive installation of modules.

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

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are dry enough and ready for flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F 710; obtain instructions if test results are not within limits recommended by J+J Flooring Group.

E. Verify that required floor-mounted utilities are in correct location.

F. J+J Flooring Group requires that Kinetex textile composite flooring be inspected prior to installation for proper style, color and potential defects. No claims will be honored if the modules are installed with visible defects. Should there be a problem, call J+J Flooring Group's Customer Relations Department at 800.241.4586.

### **3.02 PREPARATION**

A. Starting installation constitutes acceptance of sub-floor conditions.

B. SURFACE PREPARATION- Dust, dirt, debris and non-compatible adhesive must be removed before the installation begins. Surfaces must be smooth and level with all holes and cracks filled with Portland cement-based patch reinforced with polymers. Kinetex Adhesive cannot be applied to any substrate where chemical or solvent-based cleaners have been used.

C. LATEX ADHESIVES - Old latex adhesives must be mechanically scraped down to a bare residue. Latex adhesive residues must be smooth and level with all holes and cracks filled with a Portland cement-based patch reinforced with polymers, or encapsulated with TriSeal Sealer.  
*Note: Failure to remove or seal, old latex adhesive may cause installation failure, shifting, buckling or edge curling; these conditions will not be covered under warranty.*

D. CUT BACK ADHESIVES - Must be wet mechanically scraped to a minimum residue and encapsulated with TriSeal Sealer.  
*Note: Failure to remove or seal old cut back adhesive may cause installation failure, shifting, buckling or edge curling; these conditions will not be covered under warranty.*

E. CONCRETE MOISTURE TESTING and pH TESTING - Substrate surfaces must be tested for moisture emission. It is the responsibility of the owner or owner's representative to perform moisture testing prior to starting the installation. ASTM-F 2170-2 relative humidity probe moisture testing is required. Acceptable relative humidity probe testing results are up to 95% RH. Alkalinity tests should also be performed per ASTM F 710. The maximum acceptable pH is 9.0.  
*Note: pH readings of 9.0 - 11.00, XL Brands DriSeal Concrete Moisture Sealer is required.*

### **SUBFLOORS**

F. New Concrete - New concrete must be fully cured and free of moisture (see ASTM F 710). New concrete requires a curing period of approximately 90 days.

G. Old Concrete - Old concrete must be checked for moisture. Dry, dusty, porous floors must be primed or encapsulated with TriSeal Sealer.



*Note: Primers will not correct a moisture problem.*

H. Wood - Wood floors must be smooth and level. If the floor is uneven, an approved underlayment will be required. Old finishes must be tested for compatibility with adhesives or removed and porous wood primed.

I. Terrazzo / Marble - Level all grout lines with Portland cement-based patch reinforced with polymers. Glossy surfaces must be sanded for proper adhesive bond. Waxes and similar finishes must be removed.

J. Other Hard Surfaces (VCT/VAT) - Tiles must be well secured to the floor or removed. Broken, damaged or loose tiles must be replaced. Waxes and similar finishes must be removed from VCT before applying adhesive. Existing sheet vinyl is not a suitable substrate for modular installation and must be removed.

K. Carpet - Remove old carpet and carpet adhesives by scraping or other mechanical means. Any remaining adhesive residues may be covered with a Portland based patching compound or encapsulated with TriSeal Sealer.

### **3.03 INSTALLATION OF TEXTILE COMPOSITE FLOORING**

A. Install flooring in strict accordance with the finish drawings and J+J Flooring Group's Kinetex installation instructions.

B. FULL SPREAD ADHESIVE SYSTEM - Kinetex requires full spread use of Kinetex Adhesive for all Kinetex flooring modules. The spread rate for Kinetex Adhesive is approximately 1080 square feet per four gallon pail and can be spread using a 1/16" x 1/32" x 1/32" U-notched trowel or applied using a 3/8" foam or nap roller. Allow to dry until transparent or adhesive does not transfer to finger when touched. Drying time will vary with temperature, humidity and air velocity, however modules must be installed within two hours after adhesive has dried.

*Note: Inadequate amounts of adhesive can cause modules to shift and move and will not be covered by warranty. J+J Flooring Group will not be responsible for the adhesive bond where other adhesives have been used.*

C. MODULE PLACEMENT - Arrows are printed on the module backing to show pile/machine direction. A tight installation without compression is mandatory for optimum performance and appearance of the modular installation. It is critical that each module uniformly touch each adjoining module without a gap. To ensure a clean tight fit, do not pull/tug or slid-in modules, but instead lay each module into its location against the adjoining module. Use your hands to press/form the module into place where the new module meets the previously installed module. Some **Kinetex products requires quarter turn install method. Others can be installed in a Parquet, Basketweave, Herringbone and Ashlar method. Installation method is to selected by the Owner and in accordance with Manufacturers recommendations.**

*Note: To reposition a Kinetex module during installation, remove it by gently lifting all four sides of the module with a spatula or putty knife, rotating around each side of the module doing*

*a little at a time. The very center of the module should be the last part of the module touching the floor upon removal. Do not stretch a module while it is in the adhesive in order to align next to an adjoin modular. An attempt to stretch will likely result in the module pulling back to its original position. NEVER ATTEMPT TO REMOVE A MODULE ALL AT ONCE BY PULLING ONE OR ONLY TWO SIDES OF THE MODULAR. DOING SO MAY LEAD TO DISTORTING THE MODULE.*

D. **PALLET AND BUNDLE SEQUENCING** - It is very important to install Kinetex modules in the order they were manufactured; this is easily accomplished by selecting pallets in sequential order and following the numbers located on each bundle of modules. Typically, an installation will begin with the lowest bundle numbers and progress through the highest numbers until the project is complete. Installing modules by bundle sequence will assure the most even uniform look possible. (For layout and installation instructions refer to J+J Flooring Group's Installation Instructions or CRI 104 standards.)

E. **STAIRS** - Use single or double undercut stair nosing and cut modules. Then, using full spread Kinetex Adhesive, install modules on steps and risers, inserting the stair nosing edge and the top of the riser edge of each module into the vinyl undercut.

F. **COMPLETING INSTALLATION** - To avoid dislodging modules, do not walk on or move furniture onto modules until the area is completely anchored. Roll entire area with 75-100 lb. roller in both directions (north-south and east-west) after completion of installation. It is also required that sheets of plywood or hardboard be laid over the new modular surface when transporting heavy furniture on carts or dollies. As a final step, vacuum the entire area with an upright vacuum.

### **3.04 INSTALLATION OF ACCESSORIES**

A. Install accessories as required by drawings and per manufacturer's specifications.

### **3.05 CLEANING AND PROTECTION**

A. Use a moist cloth when wet; if dry, use a solvent based product applied to a towel then worked onto the Kinetex module for removal of contaminants such as adhesive, paint, oil and grease. Follow J+J Flooring Group's maintenance guidelines.

B. Clean and vacuum surfaces.

## SECTION 099114 - EXTERIOR PAINTING (MPI STANDARDS)

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Surface preparation and application of paint systems on **exterior substrates including the following exterior substrates:**
  - a. Concrete.
  - b. Fiber-cement board.
  - c. Concrete masonry units (CMUs).
  - d. Steel and iron.
  - e. Galvanized metal.
  - f. Aluminum (not anodized or otherwise coated).
  - g. Wood.

## 1.2 ACTION SUBMITTALS

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

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

## B. Samples: For each type of topcoat product.

## C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in the Exterior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

## 1.3 QUALITY ASSURANCE

## A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
  - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
  - b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.

- a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
  1. **Benjamin Moore & Co.**
  2. **PPG Paints; PPG Industries, Inc.**
  3. **Sherwin-Williams.**
- B. Products: Subject to compliance with requirements, **provide one of the products** listed in the Exterior Painting Schedule for the paint category indicated.

### 2.2 PAINT PRODUCTS

- A. MPI Standards: Provide products complying with MPI standards indicated and listed in its "MPI Approved Products List."
- B. 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 topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: **As selected by Owner from manufacturer's full range.**

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- B. Proceed with coating application only after unsatisfactory conditions have been corrected.
  1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

### 3.3 INSTALLATION

- A. Apply paints in accordance with manufacturer's written instructions and recommendations in "MPI Manual."
- B. 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.

### 3.4 CLEANING AND PROTECTION

- A. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- B. 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.
- C. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.5 EXTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
  - 1. Latex System **MPI EXT 3.1A**:
    - a. Prime Coat: Primer, alkali resistant, water based, **MPI #3**.
    - b. Intermediate Coat: Latex, exterior, matching topcoat.
    - c. Low-Sheen Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), **MPI #15**.
- B. Concrete Substrates, Traffic Surfaces:
  - 1. Latex Floor Paint System **MPI EXT 3.2A**:
    - a. Prime Coat: Floor paint, latex, matching topcoat.

- b. Intermediate Coat: Floor paint, latex, matching topcoat.
  - c. Topcoat: Floor paint, latex, low gloss (maximum MPI Gloss Level 3), **MPI #60.**
- C. Cement Board Substrates:
  - 1. Latex System **MPI EXT 3.3J:**
    - a. Alkali-Resistant Prime Coat: Primer, alkali resistant, water based, **MPI #3.**
    - b. Intermediate Coat: Latex, exterior, matching topcoat.
    - c. Low-Sheen Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), **MPI #15.**
- D. CMU Substrates:
  - 1. Latex System **MPI EXT 4.2A:**
    - a. Prime Coat: Block filler, latex, interior/exterior, **MPI #4.**
    - b. Intermediate Coat: Latex, exterior, matching topcoat.
    - c. Low-Sheen Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), **MPI #15.**
- E. Steel and Iron Substrates:
  - 1. Water-Based Light Industrial Coating System **MPI EXT 5.1B:**
    - a. Zinc-Rich Prime Coat: Primer, zinc rich, inorganic, **MPI #19.**
    - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
    - c. Semigloss Topcoat: Light industrial coating, exterior, water based, semigloss (MPI Gloss Level 5), **MPI #163.**
  - 2. Aluminum Paint System **MPI EXT 5.1K:**
    - a. Alkyd Prime Coat: Primer, alkyd, anti-corrosive, for metal, **MPI #79.**
    - b. Intermediate Coat: Aluminum paint, matching topcoat.
    - c. Topcoat: Aluminum paint, **MPI #1.**
- F. Galvanized-Metal Substrates:
  - 1. Latex System **MPI EXT 5.3A:**
    - a. Cementitious Prime Coat: Primer, galvanized, cementitious, **MPI #26.**
    - b. Intermediate Coat: Latex, exterior, matching topcoat.
    - c. Low-Sheen Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), **MPI #15.**
  - 2. Aluminum Paint System **MPI EXT 5.3F:**
    - a. Prime Coat: Primer, galvanized, cementitious, **MPI #26.**

- b. Intermediate Coat: Aluminum paint, matching topcoat.
- c. Topcoat: Aluminum paint, **MPI #1**.

G. Aluminum Substrates:

1. Latex System **MPI EXT 5.4H**:

- a. Prime Coat: Primer, quick dry, for aluminum, **MPI #95**.
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Low-Sheen Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), **MPI #15**.

H. Wood Substrates: Glued-laminated construction.

1. Latex over Alkyd Primer System **MPI EXT 6.1A**:

- a. Prime Coat: Primer, alkyd for exterior wood, **MPI #5**.
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Low-Sheen Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), **MPI #15**.

I. Wood Substrates: Exposed framing.

1. Alkyd System **MPI EXT 6.2C**:

- a. Prime Coat: Primer, alkyd for exterior wood, **MPI #5**.
- b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
- c. Semigloss Topcoat: Alkyd, exterior, semigloss (MPI Gloss Level 5), **MPI #94**.

J. Wood Substrates: **Wood trim**.

1. Alkyd System **MPI EXT 6.3B**:

- a. Prime Coat: Primer, alkyd for exterior wood, **MPI #5**.
- b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
- c. Semigloss Topcoat: Alkyd, exterior, semigloss (MPI Gloss Level 5)[, **MPI #94**].

K. Wood Substrates: Wood-based panel products.

1. Latex over Latex Primer System **MPI EXT 6.4K**:

- a. Prime Coat: Primer, latex for exterior wood, **MPI #6**.
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Low-Sheen Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), **MPI #15**.

END OF SECTION 099114



## SECTION 099124 - INTERIOR PAINTING (MPI STANDARDS)

### PART 1 - GENERAL

#### 1.1 SUMMARY

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

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
  - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
- B. Samples: For each type of topcoat product.
- C. Product List: Use same designations indicated on Drawings and in the Interior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

#### 1.3 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
    - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
    - b. Other Items: Architect will designate items or areas required.
  - 2. Final approval of color selections will be based on mockups.
    - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

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

1. **Benjamin Moore & Co.**
2. **PPG Paints; PPG Industries, Inc.**
3. **Sherwin-Williams.**

- B. Products: Subject to compliance with MPI requirements, **provide one of the products** listed in the Interior Painting Schedule for the paint category indicated.

## 2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."
- B. Material Compatibility:
1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: **As selected by Owner from manufacturer's full range.**
1. Maximum of **Ten** percent of surface area will be painted with deep tones.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- B. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
- C. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

### 3.3 INSTALLATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
- B. 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.
- C. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work as approved by Owner:
  - 1. Paint the following work may be required (when approved by Owner) where exposed in equipment rooms:
    - a. Equipment, including panelboards.
    - b. Uninsulated metal piping.
    - c. Uninsulated plastic piping.
    - d. Pipe hangers and supports.
    - e. Metal conduit.
    - f. Plastic conduit.
    - g. Tanks that do not have factory-applied final finishes.
    - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
  - 2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

### 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 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
  - 1. Latex System, **MPI INT 3.1A**:
    - a. Prime Coat: Primer, alkali resistant, water based, **MPI #3**.

- b. Intermediate Coat: Latex, interior, matching topcoat.
  - c. Topcoat: Latex, interior (MPI Gloss Level 3), **MPI #52.**
- B. Concrete Substrates, Traffic Surfaces:
  - 1. Latex Floor Enamel System, **MPI INT 3.2A:**
    - a. Prime Coat: Floor paint, latex, matching topcoat.
    - b. Intermediate Coat: Floor paint, latex, matching topcoat.
    - c. Topcoat: Floor paint, latex, low gloss (maximum MPI Gloss Level 3), **MPI #60.**
- C. Cement Board Substrates:
  - 1. Latex System, **MPI INT 3.3A:**
    - a. Prime Coat: Primer, alkali resistant, water based, **MPI #3.**
    - b. Intermediate Coat: Latex, interior, matching topcoat.
    - c. Topcoat: Latex, interior (MPI Gloss Level 3) **MPI #52.**
- D. CMU Substrates:
  - 1. High-Performance Architectural Latex System, **MPI INT 4.2P:**
    - a. Block Filler: Latex, interior/exterior, **MPI #4.**
    - b. Prime Coat: Primer, alkali resistant, water based, **MPI #3.**
    - c. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
    - d. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 4), **MPI #140.**
- E. Steel Substrates:
  - 1. Latex System, Alkyd Primer, **MPI INT 5.1QQ:**
    - a. Prime Coat: Primer, alkyd, anticorrosive, for metal, **MPI #79.**
    - b. Prime Coat: Shop primer specified in Section where substrate is specified.
    - c. Intermediate Coat: Latex, interior, matching topcoat.
    - d. Topcoat: Latex, interior, semigloss (MPI Gloss Level 5), **MPI #54.**
  - 2. Aluminum Paint System **MPI INT 5.1M:**
    - a. Prime Coat: Primer, alkyd, quick dry, for metal, **MPI #76.**
    - b. Intermediate Coat: Aluminum paint, matching topcoat.

- c. Topcoat: Aluminum paint, **MPI #1**.
- F. Galvanized-Metal Substrates:
  - 1. Latex System, **MPI INT 5.3A**:
    - a. Prime Coat: Primer, galvanized, cementitious, **MPI #26**.
    - b. Intermediate Coat: Latex, interior, matching topcoat.
    - c. Topcoat: Latex, interior, semigloss (MPI Gloss Level 5), **MPI #54**.
- G. Aluminum (Not Anodized or Otherwise Coated) Substrates:
  - 1. Latex System, **MPI INT 5.4H**:
    - a. Prime Coat: Primer, quick dry, for aluminum, **MPI #95**.
    - b. Intermediate Coat: Latex, interior, matching topcoat.
    - c. Topcoat: Latex, interior (MPI Gloss Level 4), **MPI #43**.
- H. Wood Substrates: **Wood trim, Architectural woodwork, Doors, Windows and wood board paneling**.
  - 1. High-Performance Architectural Latex System, **MPI INT 6.3A**:
    - a. Prime Coat: Primer, latex, for interior wood, **MPI #39**.
    - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
    - c. Topcoat: Latex, interior, high performance architectural, semigloss (MPI Gloss Level 5), **MPI #141**.
- I. Wood Substrates: **Wood paneling and casework**.
  - 1. High-Performance Architectural Latex System, **MPI INT 6.4S**:
    - a. Prime Coat: Primer, latex, for interior wood, **MPI #39**.
    - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
    - c. Topcoat: Latex, interior, high performance architectural, semigloss (MPI Gloss Level 5), **MPI #141**.
- J. Wood Substrates: Traffic surfaces, including **floors and stairs**.
  - 1. Latex Porch and Floor Enamel System, **MPI INT 6.5G**:
    - a. Prime Coat: Primer sealer, alkyd, interior, **MPI #45**.

- b. Intermediate Coat: Floor paint, latex, matching topcoat.
- c. Topcoat: Floor paint, latex, low gloss (maximum MPI Gloss Level 3), **MPI #60.**

K. **Gypsum Board** Substrates:

- 1. High-Performance Architectural Latex System, **MPI INT 9.2B:**
  - a. Prime Coat: Primer sealer, latex, interior, **MPI #50.**
  - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
  - c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 4), **MPI #140.**

END OF SECTION 099124

## SECTION 099300 - STAINING AND TRANSPARENT FINISHING

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes surface preparation and the application of wood finishes on the following substrates:
  - 1. Interior Substrates:
    - a. Dressed lumber (finish carpentry).
    - b. Exposed wood panel products.

## 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each finish and for each color and texture required.
- C. Product List: Printout of MPI's current "MPI Approved Products List" for each product category specified in Part 2, with the product proposed for use highlighted.

## 1.3 QUALITY ASSURANCE

- A. MPI Standards:
  - 1. Products: Complying with MPI standards indicated and listed in its "MPI Approved Products List."
  - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and finish systems indicated.
- B. Mockups: Apply benchmark samples of each finish system indicated and each color 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 type of finish system and substrate.
    - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
    - b. Other Items: Architect will designate items or areas required.
  - 2. Final approval of stain color selections will be based on benchmark samples.
    - a. If preliminary stain color selections are not approved, apply additional benchmark samples of additional stain colors selected by Architect at no added cost to Owner.

#### 1.4 EXTRA MATERIALS

- 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 **5** percent, but not less than **1 gal. (3.8 L)** of each material and color applied.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS, GENERAL

- A. Material Compatibility:
  - 1. Provide materials for use within each finish 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 finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.
- B. VOC Content of Field-Applied Interior Primers, Stains, and Transparent Finishes: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to primers, stains, and transparent finishes that are applied in a fabrication or finishing shop:
- C. Stain Colors: **As selected by Owner/Architect from manufacturer's full range.**

#### 2.2 WOOD FILLERS

- A. Wood Filler Paste: MPI #91.

#### 2.3 STAINS

- A. Exterior Semitransparent Stain (Solvent Based): MPI #13.
- B. Exterior Solid-Color Stain (Solvent Based): MPI #14.
- C. Exterior, Solid-Color Latex Stain: MPI #16.
- D. Stain for Wood Decks: MPI #33.
- E. Interior Wood Stain (Semitransparent): MPI #90.



## 2.4 POLYURETHANE FINISHES

- A. Interior, Oil-Modified, Clear Urethane (Satin): MPI #57, Gloss Level 4.

## 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.
  - 1. Maximum Moisture Content of Wood Substrates: 15 percent when measured with an electronic moisture meter.
  - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes.
  - 3. Begin finish application only after unsatisfactory conditions have been corrected and surfaces are dry.
  - 4. Beginning application of finish system constitutes Contractor's acceptance of substrate and conditions.

### 3.2 PREPARATION AND APPLICATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.
- C. Protect work of other trades against damage from finish application. Correct damage 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 finished wood surfaces.

### 3.3 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

- A. Finish Carpentry Substrates:
  - 1. Polyurethane Varnish Over Stain System: MPI INT 6.3E.
    - a. Stain Coat: Interior wood stain (semitransparent).
    - b. **Two** Finish Coats: Interior, oil-modified, clear urethane (**satin**).
- B. Exposed Wood Panel-Product Substrates:
  - 1. Polyurethane Varnish Over Stain System: MPI INT 6.4E.

- a. Stain Coat: Interior wood stain (semitransparent).
- b. **Two** Finish Coats: Interior, oil-modified, clear urethane (**sat**in).

END OF SECTION 099300

## SECTION 101400 - SIGNAGE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Panel signs.

#### 1.2 DEFINITIONS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for signs.
  - 1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
  - 2. Provide message list, typestyles, graphic elements, **including tactile characters and Braille**, and layout for each sign.
  - 3. Wiring Diagrams: Power, signal, and control wiring (if required and coordinate with electrician).
- C. Samples: For each sign type and for each color and texture required.

#### 1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with applicable provisions in NC Building Code Chapter #11 "Accessibility" and ANSI A117.1..
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).

- B. Polycarbonate Sheet: Of thickness indicated, manufactured by extrusion process, coated on both surfaces with abrasion-resistant coating:
1. Impact Resistance: 16 ft-lbf/in. (854 J/m) per ASTM D 256, Method A.
  2. Tensile Strength: 9000 lbf/sq. in. (62 MPa) per ASTM D 638.
  3. Flexural Modulus of Elasticity: 340,000 lbf/sq. in. (2345 MPa) per ASTM D 790.
  4. Heat Deflection: 265 deg F (129 deg C) at 264 lbf/sq. in. (1.82 MPa) per ASTM D 648.
  5. Abrasion Resistance: 1.5 percent maximum haze increase for 100 revolutions of a Taber abraser with a load of 500 g per ASTM D 1044.

## 2.2 PANEL SIGNS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide or a comparable product by one of the following:
1. ACE Sign Systems, Inc.
  2. Advance Corporation; Braille-Tac Division.
  3. Allen Industries Architectural Signage
  4. Allenite Signs; Allen Marking Products, Inc.
  5. APCO Graphics, Inc.
  6. ASI-Modulex, Inc.
  7. Best Sign Systems Inc.
  8. Bunting Graphics, Inc.
  9. Fossil Industries, Inc.
  10. Gemini Incorporated.
  11. Grimco, Inc.
  12. Innerface Sign Systems, Inc.
  13. InPro Corporation
  14. Matthews International Corporation; Bronze Division.
  15. Mills Manufacturing Company.
  16. Mohawk Sign Systems.
  17. Nelson-Harkins Industries.
  18. Seton Identification Products.
  19. Signature Signs, Incorporated.
  20. Supersine Company (The)
- C. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner, complying with the following requirements:
1. Acrylic Sheet: **0.080 inch (2.03 mm)** min. thick unless thicker sheet is required for engraving copy.
  2. Edge Condition: **Square cut.**
  3. Corner Condition: **Square.**
  4. Mounting: **Unframed.**
    - a. Manufacturer's standard anchors for substrates encountered.
  5. Color: **As selected by Architect from manufacturer's full range.**

6. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch (0.8 mm) above surface with contrasting colors.
- D. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.
  1. Panel Material: **Opaque acrylic sheet or Photopolymer.**
  2. Raised-Copy Thickness: Not less than 1/32 inch (0.8 mm).
- E. Engraved Copy: Machine engrave letters, numbers, symbols, and other graphic devices into panel sign on face indicated to produce precisely formed copy, incised to uniform depth.
  1. Engraved Plastic Laminate: Engrave through exposed face ply of plastic-laminate sheet to expose contrasting core ply.
  2. Engraved Opaque Acrylic Sheet: Fill engraved copy with enamel.
  3. Face-Engraved Clear Acrylic Sheet: Fill engraved copy with enamel. Apply opaque background color coating to back face of acrylic sheet.

## 2.3 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. Furnish inserts, as required, to be set into concrete or masonry work.

## 2.4 ACRYLIC SHEET FINISHES

- A. Colored Coatings for Acrylic Sheet: For copy **and background** colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for **five** years for application intended.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Locate signs and accessories as required, using mounting methods of types described and complying with manufacturer's written instructions.
  1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
  2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches (75 mm) of sign without encountering protruding objects or standing within swing of door.

- B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
1. Two-Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
  2. Hook-and-Loop Tapes: Mount signs to smooth, nonporous surfaces.
  3. Magnetic Tape: Mount signs to smooth, nonporous surfaces.
  4. Silicone-Adhesive Mounting: Attach signs to irregular, porous, or vinyl-covered surfaces.
  5. 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.
  6. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.

END OF SECTION 101400

## SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Public-use washroom accessories.
  - 2. Private-use bathroom accessories.
  - 3. Underlavatory guards.

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule:
  - 1. Identify products using designations indicated on Drawings.

### PART 2 - PRODUCTS

#### 2.1 PUBLIC-USE WASHROOM ACCESSORIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
  - 1. American Specialties, Inc.
  - 2. Bobrick Washroom Equipment, Inc.
  - 3. Bradley Corporation.
- D. Toilet Tissue (Roll) Dispenser:
  - 1. Basis-of-Design Product: Refer to drawings.
  - 2. Description: **Single-roll dispenser.**
  - 3. Mounting: **Surface mounted.**
  - 4. Material and Finish: **Stainless steel, No. 4 finish (satin).**
- E. Combination Towel (Folded) Dispenser/Waste Receptacle: Refer to Drawings.

1. Description: Combination unit for dispensing C-fold or multifold towels, with removable waste receptacle.
  2. Mounting: **Recessed with projecting receptacle.**
    - a. Designed for nominal **4-inch (100-mm)** wall depth.
  3. Minimum Towel-Dispenser Capacity: **600 C-fold or 800 multifold paper towels.**
  4. Minimum Waste-Receptacle Capacity: **12 gal. (45.4 L).**
  5. Material and Finish: **Stainless steel, No. 4 finish (satin).**
  6. Lockset: Tumbler type for towel-dispenser compartment.
- F. Grab Bar: Refer to drawings
1. Mounting: Flanges with **concealed** fasteners.
  2. Material: Stainless steel, **0.05 inch (1.3 mm)** thick.
    - a. Finish: **Smooth, No. 4, satin finish on ends and slip-resistant texture in grip area.**
  3. Outside Diameter: **1-1/2 inches (38 mm).**
  4. Configuration and Length: **As indicated on Drawings.**
- G. Mirror Unit: Refer to Drawings
1. Frame: **Stainless-steel channel.**
    - a. Corners: **Manufacturer's standard.**
  2. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
    - a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
  3. Size: **As indicated on Drawings.**

## 2.2 UNDERLAVATORY GUARDS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
  1. Plumberex Specialty Products, Inc.
  2. TCI Products.
  3. Truebro, Inc.
- D. Underlavatory Guard: Refer to drawings



1. Description: Insulating pipe covering for supply and drain piping assemblies, that prevent direct contact with and burns from piping, and allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded-plastic, white.

## 2.3 FABRICATION

- A. 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.

END OF SECTION 102800

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## SECTION 104413 - FIRE EXTINGUISHER CABINETS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes fire protection cabinets for fire extinguishers.

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Maintenance data.

#### 1.3 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. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- C. Coordinate sizes and locations of fire protection cabinets with wall depths.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- B. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

#### 2.2 FIRE PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
  - 1. Products: Subject to compliance with requirements, **provide one of the following:**
    - a. J. L. Industries, Inc., a division of Activar Construction Products Group;.

- b. Larsen's Manufacturing Company;.
  - c. Potter Roemer LLC;
- B. Cabinet Construction: **1-hour fire rated.**
  - 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- (1.1-mm-) thick, cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick, fire-barrier material. Provide factory-drilled mounting holes.
- C. Cabinet Material: **Steel** sheet.
- D. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.
  - 1. Rolled-Edge Trim with depth coordinated with stud depth, extinguisher size and egress/accessibility requirement for projection into corridors.
- E. Cabinet Trim Material: **Steel sheet.**
- F. Door Material: **Steel sheet.**
- G. Door Style: **Fully glazed panel with frame.**
- H. Door Glazing: **Tempered break glass.**
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
- 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. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
  - 3. Door Lock: **Cam lock that allows door to be opened during emergency by pulling sharply on door handle.**
  - 4. 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 glazing.**
      - 2) Application Process: **Pressure-sensitive vinyl letters.**
      - 3) Lettering Color: **Red.**
      - 4) Orientation: **Vertical.**
- K. Finishes:

1. Steel: **Baked enamel or powder coat.**
  - a. Color and Gloss: **As selected by Owner/Architect from manufacturer's full range.**

## 2.3 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. Miter and weld joints and grind smooth.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Examine walls and partitions for suitable framing depth and blocking where **semirecessed** cabinets will be installed and prepare recesses as required by type and size of cabinet and trim style.
- B. Install fire protection cabinets in locations and at mounting heights **at heights acceptable to authorities having jurisdiction.**
- C. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
- D. Identification: Apply **vinyl lettering** at locations indicated.
- E. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- F. 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 104413



## SECTION 105113 - METAL LOCKERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Welded athletic lockers.
  - 2. Locker benches.

#### 1.2 PREINSTALLATION MEETINGS

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

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Include locker identification system and numbering sequence.
- B. Samples: For each color specified.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

#### 1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
  - 1. Warranty Period for Welded Metal Lockers: **Lifetime** from date of Substantial Completion.

## PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: For lockers **and locker benches** indicated to be accessible, comply with applicable provisions in **ICC A117.1**

## 2.2 WELDED ATHLETIC LOCKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. List Industries Inc.
  2. LockersMFG.
  3. Penco Products, Inc.
  4. Republic Storage Systems, LLC.
  5. Top Tier Storage Products.
- B. Perforated Doors: One piece; fabricated from 0.075-inch (1.90-mm) nominal-thickness steel sheet with manufacturer's standard diamond perforations; formed into channel shape with double bend at **vertical edges and with right-angle single bend at horizontal edges and latch point (bottom) and right-angle single bend at remaining edges for box lockers.**
1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches (381 mm) wide; welded to inner face of doors.
- C. Expanded-Metal Doors: Fabricated from 0.090-inch (2.28-mm) nominal-thickness expanded metal; welded to 0.105-inch (2.66-mm) nominal-thickness steel angle frame; with 0.090-inch (2.28-mm) nominal-thickness, steel sheet lock panel backed by 0.060-inch (1.52-mm) nominal-thickness, steel sheet retainer welded to door frame.
- D. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
1. Tops and Bottoms: 0.060-inch (1.52-mm) nominal thickness, with single bend at edges.
  2. Backs: 0.048-inch (1.21-mm) nominal thickness.
  3. Shelves: 0.060-inch (1.52-mm) nominal thickness, with double bend at front and single bend at sides and back.
- E. Frames: Channel formed; fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet or 0.097-inch (2.45-mm) nominal-thickness steel angles; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
- F. Reinforced Bottoms: Structural channels, formed from **0.060-inch (1.52-mm)** nominal-thickness steel sheet; welded to front and rear of side-panel frames.
- G. Hinges:
1. Hinges: Manufacturer's standard, steel, continuous or knuckle type.



- H. Recessed Door Handle and Latch: Stainless steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
  - 1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in cylinder locks, or padlocks; positive automatic latching and prelocking.
    - a. Latch Hooks: Equip doors 48 inches (1219 mm) and higher with three latch hooks and doors less than 48 inches (1219 mm) high with two latch hooks; fabricated from 0.120-inch (3.04-mm) nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
    - b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism.
  - 2. Single-Point Latching: Nonmoving latch hook **with steel padlock loop that projects through recessed cup and is finished to match metal locker body.**
    - a. Latch Hook: Equip each door with one latch hook.
- I. Door Handle and Latch for Box Lockers: Stainless steel strike plate with integral pull; with steel padlock loop that projects through metal locker door.
- J. Locks: **Combination padlocks to be supplied by Owner.**
- K. Identification Plates: Manufacturer's standard, etched, embossed, or stamped **aluminum** plates, with numbers and letters at least 3/8 inch (9 mm) high.
- L. Hooks: Manufacturer's standard ball-pointed, aluminum or steel; zinc plated.
- M. Coat Rods: Manufacturer's standard.
- N. Continuous Zee Base: 4 inches (102 mm) high; fabricated from 0.075-inch (1.90-mm) nominal-thickness steel sheet.
- O. Continuous Sloping Tops: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet, with a pitch of approximately 20 degrees.
  - 1. Closures: **Hipped**-end type.
- P. Recess Trim: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet.
- Q. Filler Panels: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet.
- R. Boxed End Panels: Fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet.
- S. Finished End Panels: Fabricated from 0.024-inch (0.61-mm) nominal-thickness steel sheet to cover unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of non-recessed metal lockers; finished to match lockers.
- T. Materials:
  - 1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.

2. Expanded Metal: ASTM F1267, Type II (flattened), Class I (uncoated), 3/4-inch (19-mm) steel mesh, with at least 70 percent open area.

U. Finish: Baked enamel or powder coat.

1. Color: **As selected by Owner from manufacturer's full range.**

## 2.3 LOCKS

A. Combination Padlock: **Provided by Owner.**

## 2.4 LOCKER BENCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ASI Storage Solutions.
2. Lyon LLC.
3. Top Tier Storage Products.

B. Provide bench units with overall assembly height of **17-1/2 inches (445 mm).**

C. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.

1. Size: **Provide 20-inch (508- to 610-mm-) wide tops for accessible benches.**
2. Laminated clear hardwood with one coat of clear sealer on all surfaces and one coat of clear lacquer on top and sides.

D. Fixed-Bench Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors.

E. Materials:

1. Stainless Steel Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 304.

## 2.5 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments.

C. Equipment: Provide each locker with an identification plate and the following equipment:

1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
2. Coat Rods: **For each compartment of each locker In lieu of ceiling hook for metal lockers 18 inches (457 mm) deep or more.**

- D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds smooth and flush.
- E. Accessible Lockers: Fabricate as follows:
  - 1. Locate bottom shelf no lower than 15 inches (381 mm) above the floor.
  - 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches (1219 mm) above the floor.
- F. Continuous Zee Base: Fabricated in lengths as long as practical to enclose base and base ends; finished to match lockers.
- G. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.
- H. Recess Trim: Fabricated with minimum 2-1/2-inch (64-mm) face width and in lengths as long as practical; finished to match lockers.
- I. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.
- J. Boxed End Panels: Fabricated with 1-inch- (25-mm-) wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.
- K. Finished End Panels: Fabricated to conceal unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.
- L. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install lockers level, plumb, and true; shim as required, using concealed shims.
  - 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches (910 mm) o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
  - 2. Anchor single rows of metal lockers to walls near top **of lockers and to floor**.
  - 3. Anchor back-to-back metal lockers to floor.
- B. Welded Lockers: Connect groups together with manufacturer's standard fasteners, with no exposed fasteners on face frames.
- C. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach recess trim to recessed metal lockers with concealed clips.
  2. Attach filler panels with concealed fasteners.
  3. Attach sloping-top units to metal lockers, with closures at exposed ends.
  4. Attach boxed end panels using concealed fasteners to conceal exposed ends of non-recessed metal lockers.
- D. Fixed Benches: Provide no fewer than two pedestals for each bench, uniformly spaced not more than 72 inches (1830 mm) apart.

END OF SECTION 105113

## SECTION 15010H

### BASIC HVAC REQUIREMENTS

August 9, 2022

#### 1. PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Basic HVAC Requirements specifically applicable to Division 15 Sections, in addition to Division 1 - General Requirements.

##### 1.2 SCOPE OF WORK

- A. Provide central HVAC equipment including, but not limited to, VRF multi-split system, split heat pump, AHU, gas furnace, controls, thermostats, exhaust fans, piping, ducting, air distribution equipment, duct smoke detectors with alarms etc., and other required materials to produce complete and operating HVAC system as shown on drawings for the new Transylvania County Emergency Services Base, Transylvania County, North Carolina.
- B. Provide demolition of fixtures and materials made obsolete by upfit and remove from site. Owner retains salvage rights.
- C. Obtain all permits, pay all fees and request inspection from authority having jurisdiction.
- D. All work and materials shall be guaranteed for one year from date of substantial completion.
- E. Questions - Please e-mail ([derek@simseengineers.com](mailto:derek@simseengineers.com)) questions to Engineer in lieu of telephone calls. This allows us to better understand the questions and respond when not present to receive telephone calls.

##### 1.3 WORK SEQUENCE

- A. Coordinate construction and utility outages (if any) with Owner, Engineer, all other trades and utility companies.
- B. Visit site before submitting bid to confirm existing conditions. Notify Engineer in writing of discrepancies in Contract Documents and existing conditions.

##### 1.4 SUBMITTALS

- A. Submit under provisions of Contract Documents.
- B. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal. Identify items with marks to match those shown on drawings.
- C. Mark dimensions and values in units to match those specified.
- D. Architect shall approve all colors.
- E. All submittals shall have the General Contractor's stamp, with approval signature.
- F. Highlight deviations from specified materials.
- G. Shop Drawings: 6 sets, including 3 for maintenance manuals.
- H. Product Data: 6 sets, including 3 sets for maintenance manuals. Data shall include the following, but not limited to:
  - 1. VRF Multi-Split Systems, Heat Pumps, Air Handling Units, Gas Fired Furnaces
  - 2. Insulation
  - 3. Air Distribution Equipment
  - 4. Exhaust Fans
  - 5. Valves
  - 6. Controls
- I. Certifications: 3 copies
- J. Test Reports: 3 copies
- K. Warranties (Guarantees): 6 copies, including 3 for maintenance manuals.
- L. Maintenance Manuals: 3 complete sets with individual sets each of this data bound in 10 1/2 x 11 1/2 loose-leaf 3-ring binders, 1 1/2", 2", or 3" ring size, with rigid permanent vinyl covered back and front. Separators with index tabs and

loose-leaf sheet protectors shall be provided. One set shall have all sheets individually encased in clear, plastic document protectors.

#### 1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable North Carolina State Building Codes.
- B. Fire Protection: Conform to NFPA.
- C. Electrical: National Electric Code.
- D. Life Safety Code, NFPA 101.
- E. All codes shall be the most recent edition.
- F. The Contractor shall install all materials per the North Carolina State Building Code. Any work that does not comply shall be made to comply at the Contractor's expense.
- G. All equipment shall be UL approved for purpose specified.
- H. Install all materials per manufacturer's instructions.

#### 1.6 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- B. Prepare record drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding. Submit all changes on Record Documents as a requirement of project close out.
- C. Refer to Architectural drawings for dimensions, locations, cabinets, etc. Do not scale HVAC Drawings.
- D. Conceal all duct, piping, etc. except where the Architect/Engineer grants specific permission.
- E. Arrange HVAC work in a neat, well organized manner with piping and similar services running parallel with primary lines of the building construction.
- F. Locate operating and control equipment properly to provide easy access, and arrange entire mechanical work with adequate access for operation and maintenance.
- G. Give right-of-way to piping which must slope for drainage.
- H. Advise other trades of openings required in their work for the subsequent move-in of large units of mechanical work (equipment).
- I. Coordination Drawings: For locations where several elements of mechanical (or combined mechanical and electrical) work must be sequenced and positioned with precision in order to fit into the available space, prepare coordination drawings (shop drawings) showing the actual dimensions (at accurate scale) required for the installation. Prepare and submit coordination drawings prior to purchase-fabrication-installation of any of the elements involved in the coordination.

#### 1.7 SUBSTITUTIONS

All products listed are to establish design and quality standards, not to limit submittals. Substitutions may be accepted if approved as equivalent. Contact Engineer prior to bid with any questions. All substitutions must be submitted within 10 days after bid or supply as specified. Highlight substitution deviations from materials specified. Cost incurred to modify project to install substituted materials shall be the responsibility of the Contractor requesting the substitution.

- 1.8 Provide Valve Directory indicating number, size, manufacturer, location, function, and normal position. Valve tag numbers shall be as specified.
- 1.9 Mechanical Equipment: Show the following information for all mechanical equipment:
  - Nameplate designation
  - Manufacturer's nameplate data
  - Location of equipment
  - Area served
  - Complete parts drawing and list
  - Manufacturer's operating instructions
  - Manufacturer's maintenance instructions
  - Manufacturer's repair manuals
  - Manufacturer's installation instructions

Nearest supplier for parts and replacements with telephone number  
Nearest service organization for equipment with telephone number

1.10 Control Data:

Control diagrams and wiring diagrams where applicable. Description of control systems.  
Catalog data, maintenance and calibration instruction for all components.  
Control supplier and address  
Control installer and address

1.11 Maintenance Instruction: A typewritten form of instructions for maintenance of the systems in itemized form and with time schedule for maintenance work, shall be furnished. The instructions shall list each item of mechanical equipment requiring inspection, lubrication or service and describe the performance of such maintenance. The list shall include the type of bearings for each piece of equipment, the type of and frequency of lubrication required. The operating personnel shall be instructed in the care of the system in accordance with the typewritten instructions.

2. PART 2 DESCRIPTION OF WORK

2.1 GENERAL DESCRIPTION OF WORK

- A. Coordinate work with other trades.
- B. All major pieces of material shall be produced by the same manufacturer. Provide Lamicore labels.
- C. HVAC Contractor shall provide all penetrations, etc. and patching required to install HVAC work.
- D. Coordinate all required line voltage starters, disconnects, switches with Electrical Contractor for installation. Coordinate electrical requirements for equipment supplied with Electrical Contractor prior to ordering equipment.
- E. Provide low voltage controls and control transformers.

2.2 DUCTWORK:

Rectangular duct shall be galvanized steel with interior insulation. Exposed round duct shall be spiral without insulation. Fabricated in accordance with SMACNA low pressure duct standards. Seal all joints with a rubberized joint sealer.

Independently support ductwork from building structure.

1. GALVANIZED STEEL LOW PRESSURE DUCT CONSTRUCTION

STL U.S. STD GAGE	DUCT DIMENSIONS IN INCHES	CONSTRUCTION TRANSVERSE JOINTS
24	UP THRU 12 13 THRU 18 19 THRU 30	S SLIP, DRIVE SLIP S SLIP, DRIVE SLIP BAR SLIP, DRIVE SLIP
22	31 THRU 42 43 THRU 54	POCKET LOCK ON 4' CENTERS, MECHANICAL BOLTED GASKETED, 20 GAGE MECHANICAL, GASKETED, 20 GAGE BOLTED
20	55 THRU 60	MECHANICAL BOLTED, GASKETED 18 GAGE JOINT ON 4' CENTERS 1½ x 1½ x 1/8 angles 2 feet from joint.

- 2. Longitudinal joints may be either Pittsburghed or snap locked.
- 3. Where round duct is indicated it shall be minimum 24 gage and otherwise conform to schedule for low pressure duct.
- 4. Branch take offs shall be throated with the area of the throat being 1.5 times the area of the branch. Takeoff shall incorporate single blade damper constructed of hemmed 24 gage steel with at least 2 galvanized strap hinges, connected to ¼" control rod operating through a nylon bearing.
- 5. Suspension of duct shall consist of 24 gage galvanized strap for duct through 18". For duct 19" through 30" use ¼" rod and 1 ¼" x 1 ¼" x ¼" galvanized angle on 4' centers, for duct through 60" use 3/8" rod and 2" x 2" x 1/8"

galvanized angle on 3' centers.

#### GALVANIZED STEEL MEDIUM PRESSURE DUCT CONSTRUCTION

1. Medium pressure duct, 2" – 5" WG, or that duct in a VAV system between fan and terminal box shall be constructed of steel at least 2 U.S. gages heavier than specified for low pressure duct.
2. Test duct for leakage by applying a static pressure of at least 7" WG once the duct has been assembled but before terminals or fans are connected.

#### 2.3 CONDENSATE PIPING:

Schedule 40 PVC piping. Provide PVC fitting covers.

#### 2.4 REFRIGERANT PIPING:

Copper, approved for use by unit manufacturers. Insulate suction line with Armoflex. Seal and paint insulation exposed to weather. Secure 5 feet on center.

#### 2.5 WIRING

All control wiring (120V and less) to be complete to all motorized equipment, and control devices listed in this specification and shown on the mechanical drawings, shall be done under Division 15. The Contractor shall refer to Electrical plans and specifications to determine the source of electrical energy for the various control circuits. All wiring shall be in conduit, shall conform with Division 16 of these specifications, all local codes, the National Electrical Code, and shall be installed by an approved licensed electrician. Wiring diagrams indicating wire sizes and conduit runs for all electrical work that is required to be installed under this contract shall be submitted to the Engineer for prior approval before work is begun. Upon completion of the work, the wiring diagrams shall be revised to incorporate any additions or corrections and two copies of the "as installed" diagrams shall be furnished to the Owner and one to the Engineer on reproducible sepia paper.

Wiring shown on electrical plans is for mechanical equipment scheduled. Any equipment provided by the Contractor that differs from that scheduled in electrical characteristics that requires additional voltage, electrical design and/or electrical cost changes shall be the responsibility of this Contractor. Any cost incurred for additional electrical design and/or electrical changes due to any equipment other than equipment scheduled, shall be the responsibility of this Contractor.

In general interlock wiring between pieces of mechanical equipment shall be done under Division 15M (Example: Exhaust fan interlock with air handling unit).

- 2.6 FOUNDATIONS: All concrete foundations anchor forms, or pads indicated on the drawings that may be necessary and required for the installation of equipment specified under this contract, shall be furnished and installed. Provide anchor bolts for the equipment foundations/pads.
- 2.7 MISCELLANEOUS STEEL SUPPORTS: All supporting steel grillage, steel angles, channels, pipe or structural steel stands, and anchoring devices that may be required to adequately and rigidly support either piping, insulation, or equipment installed under this contract, shall be provided and installed.
- 2.8 CHASES AND OPENINGS: Lay out all chases and openings, required for the execution of this work well in advance of the structural work. Provide thimbles in walls and partitions. Thimbles shall be standard weight galvanized steel pipe.
- 2.9 HVAC SYSTEM IDENTIFICATION:
  - A. Piping System: All piping installed under this division of the specifications shall be identified with labels.
  - B. Painting: Piping in mechanical rooms to be painted. Refer to "Painting Mechanical Work."
  - C. Method of Marking: Colored stencil letter that designate the material being handled, shall be applied at not more than 15 foot intervals on straight pipe runs, adjacent to valves and where pipe passes through walls and floors. Piping shall be marked at all the equipment connections. All piping shall be identified.



- D. Identification: Lettering shall be stenciled in block letters, size as scheduled below. Letters on covered (insulated) pipe shall be stenciled on covering. On uncovered pipe, painted bands shall be wide enough (See Table 1) to accommodate required letters. Letters shall be positioned so that it can be easily read by a man standing on the floor. Lettering on parallel groups of lines shall be neatly lined up. Surfaces of piping or insulation finished in dark colored shall be lettered in white; and that finished in light colors shall be lettered in black.

All lines also shall be marked with arrows indicating the direction of flow.

TABLE 1

<u>Outside Diameter of Pipe or Converting (Inches)</u>	<u>Size of Letter (Inches)</u>
1/2 to 1-1/4	1/2
1-1/2 to 2	3/4
2-1/2 to 8	1-1/4

All dimensions are given in inches.

## 2.10 VALVE IDENTIFICATION

- A. Tags: Polished brass with 1/4" high stamp-engraved lettering, different shapes for each generic piping service.
- B. Application: Tag every valve and control device in each mechanical-work piping system; exclude check valves, valves within equipment units, and valves in fan coil units.
- C. Valve Schedule: Prepare and submit valve tag schedules (in duplicate), listing each tagged valve by location, service, and tag description. Install each page of one copy of the valve schedule in glazed frames, and mount where directed.

## 2.11 EQUIPMENT

- A. Signs: Provide engraved plastic-laminate signs at locations of major equipment units and primary control devices. Provide text of sufficient clarity and lettering of sufficient size to convey adequate information at each location, and mount permanently in an appropriate and effective location. Comply with recognized industry standards for color and design.
- B. Selection: Refer to instances where either a plastic-laminate sign or plasticized tag might be appropriate to the Engineer for resolution.

## 2.12 ACCESSIBILITY:

- A. No valves, controls, unions, etc., shall be placed in any pipe line at a location that will be inaccessible after the system is completed.
- B. Any control dampers, fire dampers, controls, valves and piping controls, expansion joints, or other apparatus which must be located in an inaccessible location shall be provided with suitable access doors (fitted in a framed hole) which will permit proper operation and servicing of the apparatus. Access doors aforementioned includes access doors in walls, ceilings, ductwork, and, where required, a combination of above. Access doors to be piano hinged.

## 2.13 EXCAVATING FOR MECHANICAL WORK

- A. General: The work of this article is defined to include whatever excavating and backfilling (but excluding insulating backfill) is necessary to install the mechanical work. Coordinate the work with other excavating and backfilling in the same area, including dewatering, floor protection provisions, and other temporary facilities. Coordinate the work with other work in the same area, including other underground services, landscape development, paving, and floor slabs on grade. Coordinate with weather conditions and provide temporary facilities needed for protection and proper performance of excavating and backfilling.
- B. General Standards: Except as otherwise indicated, comply with the applicable provisions of the Division 2 sections, for mechanical work excavating and backfilling. Refer instances of uncertain applicability to the Engineer for resolution before proceeding.
- C. Rock Excavation shall be defined as the removal of a formation that cannot be excavated without systematic drilling and blasting or without the use of pneumatic tools. All rock excavation/removal shall be performed by the General

Contractor. The Plumbing, Mechanical, and Electrical subcontractors shall lay out their work and perform all normal or earth excavation. Should these subcontractors encounter rock (bulk or trench), it shall be removed by the General Contractor using allowable funds. The General Contractor shall be responsible for providing fill material for backfill of rock excavations. Rock may be used for structural fill provided it is broken down by the excavation and compaction equipment into particles with a maximum dimension of 6". Otherwise, it must be removed from the site and legally disposed of. Placement of rock in the fill or removal from the site shall be done by the General Contractor at no additional cost to the Owner.

- D. Piping Support: Support pipe 4" and smaller directly on undisturbed soil. Support pipe 6" and larger, on compacted and shaped sub-base material of depth shown but not less than 6" deep. Compact previously disturbed and unsatisfactory subsoil to provide adequate, uniform support for mechanical work; or excavate and replace with stable sub-base material or lean concrete.
- E. Sequencing: Delay backfill and encasement of piping until testing of piping system has been completed.

## 2.14 PAINTING HVAC WORK

- A. General: All piping in the mechanical rooms (3) to be painted in the colors as scheduled hereinafter. Refer to Contract Documents for type of paint to be used. All other piping in building requires no painting other than the sizing of the insulation jackets. Contractor to provide color stenciling of piping for identification; touching up paint that is chipped or scratched from mechanical equipment supplied; and 2 coats of black rust preventative on all exposed support metal and hangers mounted outdoors and in mechanical rooms.
- B. Cleaning: Exterior surfaces of piping, materials, or equipment that is to be painted or insulated shall be cleaned to remove lint, grease and oil.

Ductwork, coils, fans and casing shall be cleaned on the inside before fans and filters are operated. After the equipment has been used for any purpose such as adjusting, testing, or temporary ventilation, filters shall be cleaned or replaced, as necessary, and supply, exhaust and return ducts shall be cleaned. All coils are to be combed to remove lint.

All components of the mechanical systems shall be cleaned on outside of dust, trash, paint and masonry dropping, and left in first class condition. Belt drives shall be adjusted for proper tension and sheaves aligned. All motor and equipment bearings shall be lubricated as recommended by the individual manufacturer and oil reservoir shall be left full.

## 2.15 TESTS

- A. Provide written test results to the Engineer. Provide one week notice prior to all tests.
- B. Adjustments shall be coordinated with cleaning and testing to assure equipment performance as specified.

The entire temperature control system shall be adjusted and placed in operation by the manufacturer. Readjustments necessary to accomplish the specified results during the first year of operation shall be made without cost to the Owner.

Air duct systems shall be adjusted and balanced so that air quantities are regulated to deliver or remove the required cfm at each supply, return and exhaust terminal as specified or shown on the drawings. Distribution from air terminals shall be free from drafts, and uniform over the face of each air terminal.

Adjustments shall be made so that splitters and volume adjusters close to air terminals will have the least pressure drop consistent with volume requirements. Additional pressure drop required for balancing of shorter runs shall be obtained by adjustment of the dampers at branch duct take-offs. Adjusting fan drives shall be used for making final adjustments of total air quantities. Provide all labor and/or replacement and furnishing of extra sheaves of different sizes to accomplish the scheduled specified quantities.

Direct reading velocity meters may be used for comparative adjustment of individual air terminals, but air quantities in trunk ducts shall be measured by means of pitot tube traverses. Factory fabricated plugged or capped openings for pitot tubes shall be provided as required.

Settings of dampers, splitters, and other volume adjusting devices shall be permanently marked so that they can be restored if disturbed at any time.

Record all fan static pressures, equipment rpm's and ammeter readings at each motor.

- C. General: Capacities of air handling unit, fans, and other related equipment shall be determined by operating tests of not less than eight hours duration, after stable conditions have been established.

Tabulate the final readings and analysis, and deliver four typewritten copies of the completed reports to the Engineers. The Contractor shall advise the Engineers in writing not less than 10 days in advance of when final testing and balancing will begin.

All labor and technical personnel, instruments and appliances for balancing and tests shall be furnished. If gauges, thermometers, etc., which are to be left permanently installed are used for tests, they shall not be installed until just prior to the tests to avoid possible changes in calibration.

Water and electricity will be furnished by the Owner for the final operating tests.

All unfired pressure vessels furnished under this division shall be constructed, inspected and stamped in accordance with applicable sections of the ASME Codes. Data shall include inspector's National Board registration number.

### 3. PART 3 HVAC WORK CLOSEOUT

- 3.1 General: Refer to the Division 1 sections for general closeout requirements. Maintain a daily log of operational data on mechanical equipment and systems through the closeout period; record hours of operation, assigned personnel, fuel consumption and similar information; submit copy to Owner.
- 3.2 Record Drawings: For HVAC work, give special attention to the complete and accurate recording of underground piping, ductwork, other concealed and non-accessible work, branching arrangement and valve location for piping systems, locations of dampers and coils in duct systems, locations of control system sensors and other control devices, and work of change orders where not shown accurately by contract documents. Submit to Engineer at end of project one set of reproducible sepia's that show all recorded changes in the mechanical work.
- 3.3 Closeout Equipment/Systems Operations: Sequence operations properly so that work of project will not be damaged or endangered. Coordinate with seasonal requirements. Operation each item of equipment and each system in a test run of appropriate duration (with the Engineer present, and with the Owner's operating personnel present), to demonstrate sustained, satisfactory performance. Adjust and correct operations as required for proper performance. Clean and lubricate each system, and replace dirty filters, excessively worn parts and similar expendable items of the work.
- 3.4 Operating Instructions: Conduct a day walk-through instruction seminar for the Owner's personnel to be involved in the continued operation and maintenance of mechanical equipment and systems. Explain the identification system, operation diagrams, emergency and alarm provisions, sequencing requirements, seasonal provisions, security, safety, efficiency, and similar features of the systems.
- 3.5 Training: Contractor to provide training on all major equipment, controls, etc., as part of the contract.
- 3.6 Turn-Over of Operations: At the time of substantial completion, turn over the prime responsibility for operation of the mechanical equipment and systems to the Owner's operating personnel. However, until the time of final acceptance, provide one full-time employee, who is completely familiar with the work, to consult with and continue training with the Owner's personnel.

END OF SECTION

## SECTION 15010P

### BASIC PLUMBING REQUIREMENTS

August 9, 2022

#### 1. PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Basic Plumbing Requirements specifically applicable to Division 15 Sections, in addition to Division 1 - General Requirements.

##### 1.2 SCOPE OF WORK

- A. Provide controls, valves, piping, plumbing fixtures, and other required materials to produce complete and operating plumbing system and fuel gas system as shown on drawings for the new Transylvania County Emergency Services Base, Transylvania County, North Carolina.
- B. Provide demolition of fixtures and materials made obsolete by upfit and remove from site. Owner retains salvage rights.
- C. Obtain all permits, pay all fees and request inspection from authority having jurisdiction.
- D. All work and materials shall be guaranteed for one year from date of substantial completion.
- E. Provide for water service during construction. The Owner will be responsible for bill.
- F. Questions - Please e-mail ([derek@simseengineers.com](mailto:derek@simseengineers.com)) questions to Engineer in lieu of telephone calls. This allows us to better understand the questions and respond when not present to receive telephone calls.

##### 1.3 WORK SEQUENCE

- A. Coordinate construction and utility outages (if any) with Owner, Engineer, all other trades and utility companies.
- B. Visit site before submitting bid to confirm existing conditions. Notify Engineer of discrepancies in the Contract Documents and existing conditions.

##### 1.4 SUBMITTALS

- A. Submit under provisions of Contract Documents.
- B. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal. Identify items with marks to match those shown on drawings.
- C. Mark dimensions and values in units to match those specified.
- D. Architect shall approve all colors.
- E. All submittals shall have the General Contractor's stamp, with approval signature.
- F. Highlight deviations from specified materials.
- G. Shop Drawings: 6 sets, including 3 for maintenance manuals.
- H. Product Data: 6 sets, including 3 sets for maintenance manuals. Data shall include the following, but not limited to:
  - 1. Pressure Reducing Valve
  - 2. Insulation
  - 3. Plumbing Fixtures
  - 4. Floor Drains, Cleanouts, Accessories
  - 5. Valves
  - 6. Water Heater
- I. Certifications: 3 copies
- J. Test Reports: 3 copies
- K. Warranties (Guarantees): 6 copies, including 3 for maintenance manuals.

- L. Maintenance Manuals: 3 complete sets with individual sets of this data bound in 10 1/2 x 11 1/2 loose-leaf 3-ring binders, 1/2", 2", or 3" ring size, with rigid permanent vinyl covered back and front. Separators with index tabs and loose-leaf sheet protectors shall be provided. One set shall have all sheets individually encased in clear, plastic document protectors.

#### 1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable North Carolina State Building Codes.
- B. Fire Protection: Conform to NFPA.
- C. Electrical: National Electric Code.
- D. Life Safety Code, NFPA 101.
- E. All codes shall be the most recent edition.
- F. The Contractor shall install all materials per the North Carolina State Building Code. Any work that does not comply shall be made to comply at the Contractor's expense.
- G. All equipment shall be UL approved for purpose specified.
- H. Install all materials per manufacturer's instructions.
- I. Coordinate installation with local health department prior to any construction.

#### 1.6 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- B. Prepare record drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding. Submit all changes on Record Documents as a requirement of project close out.
- C. Refer to Architectural drawings for dimensions, locations, cabinets, etc. Do not scale Plumbing Drawings.
- D. Conceal all piping except where the Architect/Engineer grants specific permission.
- E. Arrange mechanical work in a neat, well organized manner with piping and similar services running parallel with primary lines of the building construction.
- F. Locate operating and control equipment properly to provide easy access, and arrange entire mechanical work with adequate access for operation and maintenance.
- G. Give right-of-way to piping which must slope for drainage.
- H. Advise other trades of openings required in their work for the subsequent move-in of large units of mechanical work (equipment).
- I. Coordination Drawings: For locations where several elements of mechanical (or combined mechanical and electrical) work must be sequenced and positioned with precision in order to fit into the available space, prepare coordination drawings (shop drawings) showing the actual dimensions (at accurate scale) required for the installation. Prepare and submit coordination drawings prior to purchase-fabrication-installation of any of the elements involved in the coordination.

#### 1.7 SUBSTITUTIONS

All products listed are to establish design and quality standards, not to limit submittals. Substitutions may be accepted if approved as equivalent. Contact Engineer prior to bid with any questions. All substitutions must be submitted within 10 days after bid or supply as specified. Highlight substitution deviations from materials specified. Cost incurred to the project to install substituted materials shall be the responsibility of the Contractor requesting the substitution.

- 1.8 Provide Valve Directory indicating number, size, manufacturer, location, function, and normal position. Valve tag numbers shall be as specified.
- 1.9 Plumbing Equipment: Show the following information for all plumbing equipment:
  - Nameplate designation
  - Manufacturer's nameplate data
  - Location of equipment
  - Area served
  - Complete parts drawing and list

Manufacturer's operating instructions  
Manufacturer's maintenance instructions  
Manufacturer's repair manuals  
Manufacturer's installation instructions  
Nearest supplier for parts and replacements with telephone number  
Nearest service organization for equipment with telephone number

1.10 Control Data:

Provide control diagrams and wiring diagrams where applicable. Description of control systems.  
Catalog data, maintenance and calibration instruction for all components.  
Control supplier and address  
Control installer and address

1.11 Maintenance Instruction: A typewritten form of instructions for maintenance of the systems in itemized form and with time schedule for maintenance work, shall be furnished. The instructions shall list each item of mechanical equipment requiring inspection, lubrication or service and describe the performance of such maintenance. The list shall include the type of bearings for each piece of equipment, the type of and frequency of lubrication required. The operating personnel shall be instructed in the care of the system in accordance with the typewritten instructions.

2. PART 2 DESCRIPTION OF WORK

2.1 GENERAL DESCRIPTION OF WORK

- A. Coordinate work with other trades.
- B. Plumbing Contractor shall provide all fuel gas, water, soil and vent piping.
- C. Provide all new valves, fixtures, pipes, pumps, insulation, etc. and other required material.
- D. All major pieces of material shall be produced by the same manufacturer.
- E. Plumbing Contractor shall provide all penetrations, etc. and patching required to install plumbing work.
- F. Provide stops for each fixture. Exposed stops and supplies shall be chrome plated.
- G. Coordinate all required starters, disconnects, switches with Electrical Contractor for installation. Coordinate electrical requirements for equipment supplied with Electrical Contractor prior to ordering equipment.
- H. Provide warning tape in trench with buried pipe. Locate tape 6" below finish grade directly above pipe.

2.2 PIPING:

- A. Cold water and hot water. From 5' from building and distribution: Copper, annealed "K" below grade and under slab. Minimal joints under slab. Rigid "L" above grade. Insulate piping above grade with 1" pre-formed fiberglass pipe insulation. Provide pre-formed PVC fitting covers. 36" below grade. Solder shall be lead free. Braze joints below grade. PEX is an acceptable substitute for copper.
- B. Soil Piping: PVC, Schedule 40 except cast iron under traffic areas.
- C. Vent Piping: Schedule 40 PVC. Coordinate vents through roof with Architect. Paint to match roof. Coordinate flashing with roofing manufacturer. Flashing provided by roofing manufacturer.
- D. Fuel Gas Piping, Schedule 40, black steel.
- E. Independently support piping with threaded rods and hangers, channel trapeze, channel and clamps, or some other approved method from the building structure.

2.3 FIXTURES

- A. See fixture schedule on drawing.

2.4 WIRING

All control wiring (120V and less) to be complete to all motorized equipment, and control devices listed in this specification and shown on the mechanical drawings, shall be done under Division 15. The Contractor shall refer to Electrical plans and specifications to determine the source of electrical energy for the various control circuits. All wiring

shall be in conduit, shall conform with Division 16 of these specifications, all local codes, the National Electrical Code, and shall be installed by an approved licensed electrician. Wiring diagrams indicating wire sizes and conduit runs for all electrical work that is required to be installed under this contract shall be submitted to the Engineer for prior approval before work is begun. Upon completion of the work, the wiring diagrams shall be revised to incorporate any additions or corrections and two copies of the "as installed" diagrams shall be furnished to the Owner and one to the Engineer on reproducible sepia paper.

Wiring shown on electrical plans is for plumbing equipment scheduled. Any equipment provided by the Contractor that differs from that scheduled in electrical characteristics that requires additional voltage, electrical design and/or electrical cost changes shall be the responsibility of this Contractor. Any cost incurred for additional electrical design and/or electrical changes due to any equipment other than equipment scheduled, shall be the responsibility of this Contractor.

In general interlock wiring between pieces of plumbing equipment shall be done under Division 15P.

- 2.5 FOUNDATIONS: All concrete foundations anchor forms, or pads indicated on the drawings that may be necessary and required for the installation of equipment specified under this contract, shall be furnished and installed. Provide anchor bolts for the equipment foundations/pads.
- 2.6 MISCELLANEOUS STEEL SUPPORTS: All supporting steel grillage, steel angles, channels, pipe or structural steel stands, and anchoring devices that may be required to adequately and rigidly support either piping, insulation, or equipment installed under this contract, shall be provided and installed.
- 2.7 CHASES AND OPENINGS: Lay out all chases and openings, required for the execution of this work well in advance of the structural work. Provide thimbles in walls and partitions. Thimbles shall be standard weight galvanized steel pipe.
- 2.8 PLUMBING SYSTEM IDENTIFICATION:
  - A. Piping System: All piping installed under this division of the specifications shall be identified as follows:
  - B. Painting: Piping in mechanical rooms to be painted. Refer to "Painting Plumbing Work."
  - C. Method of Marking: Colored stencil letter that designate the material being handled, shall be applied at not more than 15 foot intervals on straight pipe runs, adjacent to valves and where pipe passes through walls and floors. Piping shall be marked at all the equipment connections. All piping shall be identified.
  - D. Identification: Lettering shall be stenciled in block letters, size as scheduled below. Letters on covered (insulated) pipe shall be stenciled on covering. On uncovered pipe, painted bands shall be wide enough (See Table 1) to accommodate required letters. Letters shall be positioned so that it can be easily read by a man standing on the floor. Lettering on parallel groups of lines shall be neatly lined up. Surfaces of piping or insulation finished in dark colored shall be lettered in white; and that finished in light colors shall be lettered in black.

All lines also shall be marked with arrows indicating the direction of flow.

TABLE 1

<u>Outside Diameter of Pipe or Converting (Inches)</u>	<u>Size of Letter (Inches)</u>
1/2 to 1-1/4	1/2
1-1/2 to 2	3/4
2-1/2 to 8	1-1/4

All dimensions are given in inches.

## 2.9 VALVE IDENTIFICATION

- A. Tags: Polished brass with 1/4" high stamp-engraved lettering, different shapes for each generic piping service.

- B. Application: Tag every valve and control device in each plumbing-work piping system; exclude check valves, valves within equipment units, and valves in fan coil units.
- C. Valve Schedule: Prepare and submit valve tag schedules (in duplicate), listing each tagged valve by location, service, and tag description. Install each page of one copy of the valve schedule in glazed frames, and mount where directed.

## 2.10 EQUIPMENT

- A. Signs: Provide engraved plastic-laminate signs at locations of major equipment units and primary control devices. Provide text of sufficient clarity and lettering of sufficient size to convey adequate information at each location, and mount permanently in an appropriate and effective location. Comply with recognized industry standards for color and design.
- B. Selection: Refer to instances where either a plastic-laminate sign or plasticized tag might be appropriate to the Engineer for resolution.

## 2.11 ACCESSIBILITY:

- A. No valves, controls, unions, etc., shall be placed in any pipe line at a location that will be inaccessible after the system is completed.
- B. Any controls, valves and piping controls, expansion joints, or other apparatus which must be located in an inaccessible location shall be provided with suitable access doors (fitted in a framed hole) which will permit proper operation and servicing of the apparatus. Access doors aforementioned includes access doors in walls, ceilings, and, where required, a combination of above. Access doors to be piano hinged.
- C. Floor drains and floor sinks shall not be installed under equipment. They must be visible and easily accessible. Place them straddling the front edge of equipment. They are a tripping hazard if they are placed too far into the room.

## 2.12 EXCAVATING FOR PLUMBING WORK

- A. General: The work of this article is defined to include whatever excavating and backfilling (but excluding insulating backfill) is necessary to install the plumbing work. Coordinate the work with other excavating and backfilling in the same area, including dewatering, floor protection provisions, and other temporary facilities. Coordinate the work with other work in the same area, including other underground services, landscape development, paving, and floor slabs on grade. Coordinate with weather conditions and provide temporary facilities needed for protection and proper performance of excavating and backfilling.
- B. General Standards: Except as otherwise indicated, comply with the applicable provisions of the Division 2 sections, for plumbing work excavating and backfilling. Refer instances of uncertain applicability to the Engineer for resolution before proceeding.
- C. Rock Excavation shall be defined as the removal of a formation that cannot be excavated without systematic drilling and blasting or without the use of pneumatic tools. All rock excavation/removal shall be performed by the General Contractor. The Plumbing, Mechanical, and Electrical subcontractors shall lay out their work and perform all normal or earth excavation. Should these subcontractors encounter rock (bulk or trench), it shall be removed by the General Contractor using allowable funds. The General Contractor shall be responsible for providing fill material for backfill of rock excavations. Rock may be used for structural fill provided it is broken down by the excavation and compaction equipment into particles with a maximum dimension of 6". Otherwise, it must be removed from the site and legally disposed of. Placement of rock in the fill or removal from the site shall be done by the General Contractor at no additional cost to the Owner.
- D. Piping Support: Support pipe 4" and smaller directly on undisturbed soil. Support pipe 6" and larger, on compacted and shaped sub-base material of depth shown but not less than 6" deep. Compact previously disturbed and unsatisfactory subsoil to provide adequate, uniform support for plumbing work; or excavate and replace with stable sub-base material or lean concrete.
- E. Water Bearing Pipe: Except as otherwise specifically indicated, place exterior underground water bearing pipe (including drainage lines) a minimum of 36" below grade (measured to top of pipe).
- F. Sequencing: Delay backfill and encasement of piping until testing of piping system has been completed.



## 2.13 PAINTING PLUMBING WORK

- A. General: All piping in the mechanical rooms to be painted in the colors as scheduled hereinafter. Refer to Contract Documents for type of paint to be used. All other piping in building requires no painting other than the sizing of the insulation jackets. Contractor to provide color stenciling of piping for identification; touching up paint that is chipped or scratched from mechanical equipment supplied; and 2 coats of black rust preventative on all exposed support metal and hangers mounted outdoors and in mechanical rooms.
- B. Color Coding Scheme: (Unless violates OSHA Standards)  
Domestic Water, Cold: Kelly or Safety Green with White arrows and letters.  
Domestic Water, Hot: Safety Green with Red arrows and letters.  
Fuel Gas, Safety yellow with Red arrows and letters.
- C. Cleaning, Testing, Adjustments and Inspections shall be accomplished in accordance with the following instructions and requirements. Provide temporary fill and drainage lines, wherever required, and connect them to the piping systems for these procedures and, finally, upon completion disconnect and remove these temporary lines.
- D. Cleaning and Oiling: All piping systems shall be thoroughly cleaned of grease, iron cuttings, welding slag, loose scale and other refuse. Should any pipe, valves, traps, strainers, and other specialties, and equipment be stopped up by refuse, disconnect, clean and reconnect such pipe, equipment and material. All strainer baskets shall be removed, cleaned and replaced.

Exterior surfaces of piping, materials, or equipment that is to be painted or insulated shall be cleaned to remove lint, grease and oil.

## 2.14 TESTS

Provide written test results to the Engineer. Provide one week notice prior to all tests.

- A. Soil Lines, Waste & Vent Stacks. After the lines and various connections are in place, all openings, including vents, shall be carefully closed and the whole system filled with water to ten feet of head and test for 6 hours. Any pipe, fitting or joint showing defect shall be immediately removed and replaced and the test reapplied.
- B. Domestic Water Lines. After lines are in place and before concealing, all water lines shall be subjected to a hydrostatic pressure of 150 psi. for a period of at least 6 hours.
- C. Fuel Gas Line, After lines are in place and before concealing, all fuel gas lines shall be subjected to a pressure of 30 psi. for a period of at least 6 hours.
- D. Adjustments shall be coordinated with cleaning and testing to assure equipment performance as specified. Water and electricity will be furnished by the Owner for the final operating tests.

All unfired pressure vessels furnished under this division shall be constructed, inspected and stamped in accordance with applicable sections of the ASME Codes. Data shall include inspector's National Board registration number.

## 3. PART 3 PLUMBING WORK CLOSEOUT

- 3.1 General: Refer to the Division 1 sections for general closeout requirements. Maintain a daily log of operational data on plumbing equipment and systems through the closeout period; record hours of operation, assigned personnel, fuel consumption and similar information; submit copy to Owner.
- 3.2 Record Drawings: For plumbing work, give special attention to the complete and accurate recording of underground piping, other concealed and non-accessible work, branching arrangement and valve locations (including valve numbers that match those numbers shown on the valve schedule) for piping systems, locations of control system sensors and other control devices, and work of change orders where not shown accurately by contract documents. Submit to Engineer at end of project one set of reproducible sepia's that show all recorded changes in the mechanical work.

- 3.3 Operating Instructions: Conduct a walk-through instruction seminar for the Owner's personnel to be involved in the continued operation and maintenance of plumbing equipment and systems. Explain the identification system, operation diagrams, emergency and alarm provisions, sequencing requirements, seasonal provisions, security, safety, efficiency, and similar features of the systems.
- 3.4 Training: Contractor to provide training on all major equipment, controls, etc., as part of the contract.
- 3.5 Turn-Over of Operations: At the time of substantial completion, turn over the prime responsibility for operation of the plumbing equipment and systems to the Owner's operating personnel. However, until the time of final acceptance, provide one full-time employee, who is completely familiar with the work, to consult with and continue training with the Owner's personnel.

END OF SECTION

## SECTION 15050

### BASIC MECHANICAL MATERIALS AND METHODS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Piping materials and installation instructions common to most piping systems.
  - 2. Dielectric fittings.
  - 3. Sleeves.
  - 4. Escutcheons.
  - 5. Mechanical demolition.
  - 6. Equipment installation requirements common to equipment sections.
  - 7. Supports and anchorages.

##### 1.2 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

##### 1.3 SUBMITTALS

- A. Welding certificates.

##### 1.4 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

- B. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

## PART 2 - PRODUCTS

### 2.1 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 15 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

### 2.2 JOINING MATERIALS

- A. Refer to individual Division 15 piping Sections for special joining materials not listed below.
- B. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- C. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.
- D. Welding Filler Metals: Comply with AWS D10.12.
- E. Solvent Cements for Joining Plastic Piping:
  - 1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

### 2.3 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).
- D. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
- E. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

## 2.4 SLEEVES

- A. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

## 2.5 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

## 2.6 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
  - 3. Packaging: Premixed and factory packaged.

# PART 3 - EXECUTION

## 3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.

- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors.
- M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
- N. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials.
- O. Verify final equipment locations for roughing-in.
- P. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### 3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

### 3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
  - 1. Install unions, in piping **NPS 2 (DN 50)** and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.

3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

#### 3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

#### 3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

END OF SECTION

## SECTION 15055

### MOTORS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes basic requirements for **factory** installed motors.
- B. See individual Sections for application of motors and reference to specific motor requirements for motor-driven equipment.

##### 1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

##### 1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices and features that comply with the following:
  - 1. Compatible with the following:
    - a. Magnetic controllers.
  - 2. Matched to torque and horsepower requirements of the load.
  - 3. Matched to ratings and characteristics of supply circuit and required control sequence.
- B. Coordinate motor support with requirements for driven load; access for maintenance and motor replacement; installation of accessories, belts, belt guards; and adjustment of sliding rails for belt tensioning.
- C. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

#### PART 2 - PRODUCTS

##### 2.1 MOTOR REQUIREMENTS

- A. Motor requirements apply to **factory** installed motors except as follows:
  - 1. Different ratings, performance, or characteristics for motor are specified in another Section.



2. Motorized-equipment manufacturer requires ratings, performance, or characteristics, other than those specified in this Section, to meet performance specified.

## 2.2 MOTOR CHARACTERISTICS

- A. Motors **3/4 HP** and Larger: Three phase.
- B. Motors Smaller Than **1/2 HP**: Single phase.
- C. Frequency Rating: 60 Hz.
- D. Voltage Rating: NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.
- E. Service Factor: 1.15 for open dripproof motors; 1.0 for totally enclosed motors.
- F. Duty: Continuous duty at ambient temperature of **105 deg F (40 deg C)** and at altitude of **3300 feet (1005 m)** above sea level.
- G. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
- H. Enclosure: Open dripproof.

## 2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: **Premium**, as defined in NEMA MG 1.
- C. Stator: Copper windings, unless otherwise indicated.
  1. Multispeed motors shall have separate winding for each speed.
- D. Rotor: Squirrel cage, unless otherwise indicated.
- E. Bearings: Double-shielded, prelubricated ball bearings suitable for radial and thrust loading.
- F. Temperature Rise: Match insulation rating, unless otherwise indicated.
- G. Insulation: Class F, unless otherwise indicated.
- H. Code Letter Designation:
  1. Motors Smaller Than **15 HP**: Manufacturer's standard starting characteristic.
- I. Enclosure: Cast iron for motors **7.5 hp** and larger; rolled steel for motors smaller than **7.5 hp**.
  1. Finish: **Gray enamel**.

## 2.4 SINGLE-PHASE MOTORS

- A. Type: One of the following, to suit starting torque and requirements of specific motor application:
  - 1. Permanent-split capacitor.
- B. Shaded-Pole Motors: For motors 1/20 hp and smaller only.
- C. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.
- D. Bearings: Ball type for belt-connected motors and other motors with high radial forces on motor shaft; sealed, prelubricated-sleeve type for other single-phase motors.
- E. Source Quality Control for Field-Installed Motors: Perform the following tests on each motor according to NEMA MG 1:
  - 1. Measure winding resistance.
  - 2. Read no-load current and speed at rated voltage and frequency.
  - 3. Measure locked rotor current at rated frequency.
  - 4. Perform high-potential test.

## PART 3 - EXECUTION

### 3.1 FIELD-INSTALLED MOTOR INSTALLATION

- A. Anchor each motor assembly to base, adjustable rails, or other support, arranged and sized according to manufacturer's written instructions. Attach by bolting. Level and align with load transfer link.

### 3.2 FIELD QUALITY CONTROL FOR FIELD-INSTALLED MOTORS

- A. Prepare for acceptance tests.
  - 1. Align motors, bases, shafts, pulleys, and belts. Tension belts according to manufacturer's written instructions.
  - 2. Verify bearing lubrication.
  - 3. Run each motor with its controller. Demonstrate correct rotation, alignment, and speed at motor design load.
  - 4. Test interlocks and control and safety features for proper operation.
  - 5. Verify that current and voltage for each phase comply with nameplate rating and NEMA MG 1 tolerances.
- B. Perform the following field tests and inspections and prepare test reports:
  - 1. Perform electrical tests and visual and mechanical inspections **except** optional tests and inspections stated in NETA ATS on **factory** installed motors. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION

## SECTION 15060

### HANGERS AND SUPPORTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Steel pipe hangers and supports.
  - 2. Trapeze pipe hangers.
  - 3. Metal framing systems.
  - 4. Thermal-hanger shield inserts.
  - 5. Fastener systems.
  - 6. Equipment supports.
- B. See Division 5 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
- C. See Division 15 Section(s) "**Metal Ducts**" for duct hangers and supports.

##### 1.2 DEFINITIONS

- A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

##### 1.3 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

##### 1.4 SUBMITTALS

- A. Product Data: For the following:
  - 1. Steel pipe hangers and supports.
  - 2. Thermal-hanger shield inserts.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
  - 1. Trapeze pipe hangers. Include Product Data for components.
  - 2. Metal framing systems. Include Product Data for components.
  - 3. Equipment supports.
- C. Welding certificates.

## 1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### 2.2 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:
  - 1. B-Line Systems, Inc.; a division of Cooper Industries.
  - 2. ERICO/Michigan Hanger Co.
  - 3. Globe Pipe Hanger Products, Inc.
  - 4. Grinnell Corp.
  - 5. PHS Industries, Inc.
  - 6. Piping Technology & Products, Inc.
- C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

### 2.3 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

### 2.4 METAL FRAMING SYSTEMS

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. Power-Strut Div.; Tyco International, Ltd.
4. Thomas & Betts Corporation.
5. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

## 2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: **100-psig- (690-kPa-)** minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: **Water-repellent treated, ASTM C 533, Type I calcium silicate.**

D. Insulation-Insert Material for Hot Piping: **Water-repellent treated, ASTM C 533, Type I calcium silicate.**

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend **2 inches (50 mm)** beyond sheet metal shield for piping operating below ambient air temperature.

## 2.6 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type **zinc-coated** steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

- a. B-Line Systems, Inc.; a division of Cooper Industries.
- b. Empire Industries, Inc.
- c. Hilti, Inc.
- d. ITW Ramset/Red Head.
- e. MKT Fastening, LLC.

## 2.7 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

## 2.8 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

## PART 3 - EXECUTION

### 3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, **NPS 1/2 to NPS 30 (DN 15 to DN 750)**.
  - 2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, **NPS 3/4 to NPS 24 (DN 20 to DN 600)**, requiring clamp flexibility and up to **4 inches (100 mm)** of insulation.
  - 3. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, **NPS 1/2 to NPS 8 (DN 15 to DN 200)**.
  - 4. Pipe Saddle Supports (MSS Type 36): For support of pipes, **NPS 4 to NPS 36 (DN 100 to DN 900)**, with steel pipe base stanchion support and cast-iron floor flange.
- F. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, **NPS 3/4 to NPS 20 (DN 20 to DN 500)**.
  - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, **NPS 3/4 to NPS 20 (DN 20 to DN 500)**, if longer ends are required for riser clamps.
- G. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
  - 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.

3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
  6. C-Clamps (MSS Type 23): For structural shapes.
  7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    - a. Light (MSS Type 31): 750 lb (340 kg).
    - b. Medium (MSS Type 32): 1500 lb (680 kg).
    - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
  8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
  9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- H. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
  3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- I. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- J. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

### 3.2 HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
  1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
  2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- D. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- E. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

- F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- G. Install lateral bracing with pipe hangers and supports to prevent swaying.
- H. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- I. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.
- J. Insulated Piping: Comply with the following:
  - 1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.
  - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
  - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
  - 4. Shield Dimensions for Pipe: Not less than the following:
    - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
    - b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
  - 5. Insert Material: Length at least as long as protective shield.
  - 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### 3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for **trapeze pipe hangers**.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.



### 3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

### 3.5 PAINTING

- A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

## SECTION 15081

### DUCT INSULATION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes semirigid and flexible duct, insulating cements, field-applied jackets, AND accessories and attachments.

##### 1.2 SUBMITTALS

- A. Product Data: Thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.
- B. Shop Drawings: Shop fabrication and installation details for the following:
  - 1. Removable insulation sections at access panels.
  - 2. Application of field-applied jackets.
  - 3. Applications at linkages for control devices.

##### 1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products with flame-spread and smoke-developed indices of 25 and 50, respectively, according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Mineral-Fiber Insulation:
    - a. CertainTeed Manson.
    - b. Knauf FiberGlass GmbH.
    - c. Owens-Corning Fiberglas Corp.
    - d. Schuller International, Inc.

## 2.2 INSULATION MATERIALS

- A. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.
- B. Field-Applied Jackets: ASTM C 921, Type 1, unless otherwise indicated.
  - 1. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.
- C. Accessories and Attachments:
  - 1. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. (270 g/sq. m).
  - 2. Bands: Aluminum 3/4 inch (19 mm) wide.
  - 3. Wire: 0.080-inch (2.0-mm), nickel-copper alloy; 0.062-inch (1.6-mm), soft-annealed, stainless steel; or 0.062-inch (1.6-mm), soft-annealed, galvanized steel.

## PART 3 - EXECUTION

### 3.1 GENERAL APPLICATION REQUIREMENTS

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- E. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- F. Apply insulation with the least number of joints practical.
- G. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
- H. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.
- I. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- J. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

- K. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.

### 3.2 DUCT AND PLENUM APPLICATION SCHEDULE

- A. Service: Round, supply-air, return-air, and outside-air ducts, concealed, within thermal barrier.
  - 1. Material: **Mineral-fiber blanket.**
  - 2. Thickness: **2 inches (50 mm).**
  - 3. Number of Layers: **One.**
  - 4. Field-Applied Jacket: **Foil and paper.**
  - 5. Vapor Retarder Required: **Yes.**
- B. Service: Rectangular, supply-air, return-air, and outside-air ducts, concealed, outside thermal barrier.
  - 1. Material: **Mineral-fiber blanket.**
  - 2. Thickness: **3 inches (50 mm).**
  - 3. Number of Layers: **One.**
  - 4. Field-Applied Jacket: **Foil and paper.**
  - 5. Vapor Retarder Required: **Yes.**

END OF SECTION

## SECTION 15083

### PIPE INSULATION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes semirigid and flexible piping insulation, insulating cements, field-applied jackets, accessories and attachments, and sealing compounds.

##### 1.2 SUBMITTALS

- A. Product Data: Thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.
- B. Shop Drawings: Shop fabrication and installation details for the following:
  - 1. Application of protective shields, saddles, and inserts at pipe hangers for each type of insulation and hanger.
  - 2. Insulation application at pipe expansion joints for each type of insulation.
  - 3. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
  - 4. Removable insulation at piping specialties and equipment connections.
  - 5. Application of field-applied jackets.

##### 1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products with flame-spread and smoke-developed indices of 25 and 50, respectively, according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Mineral-Fiber Insulation:
    - a. CertainTeed Manson.
    - b. Knauf FiberGlass GmbH.
    - c. Owens-Corning Fiberglas Corp.
    - d. Schuller International, Inc.

## 2.2 PIPE INSULATION MATERIALS

- A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:
  - 1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.
  - 2. Blanket Insulation: Comply with ASTM C 553, Type II, without facing.
  - 3. Fire-Resistant Adhesive: Comply with MIL-A-3316C Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.
  - 4. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
  - 5. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
  - 6. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.
  - 7. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.
- B. Field-Applied Jackets: ASTM C 921, Type 1, unless otherwise indicated.
  - 1. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.
- C. Accessories and Attachments:
  - 1. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. (270 g/sq. m).
  - 2. Bands: 3/4 inch (19 mm) wide aluminum.
  - 3. Wire: 0.080-inch (2.0-mm), nickel-copper alloy; 0.062-inch (1.6-mm), soft-annealed, stainless steel; or 0.062-inch (1.6-mm), soft-annealed, galvanized steel.

## PART 3 - EXECUTION

### 3.1 GENERAL APPLICATION REQUIREMENTS

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- E. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- F. Apply insulation with the least number of joints practical.
- G. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

- H. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.
- I. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- J. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

### 3.2 PIPE INSULATION APPLICATION SCHEDULE

- A. Service: Domestic cold water.
  - 1. Operating Temperature: 35 to 60 deg F (2 to 15 deg C).
  - 2. Insulation Material: **Mineral-fiber preformed pipe.**
  - 3. Insulation Thickness: Apply the following insulation thicknesses:
    - a. **Copper Pipe, Thru 2": 1"**
  - 4. Vapor Retarder Required: **Yes.**
- B. Service: Domestic hot and recirculated hot water.
  - 1. Operating Temperature: 60 to 140 deg F (15 to 60 deg C).
  - 2. Insulation Material: **Mineral fiber.**
  - 3. Insulation Thickness: 1"
  - 4. Field-Applied Jacket: **Foil and paper.**
- C. Service: Rainwater conductors and roof drain bodies.
  - 1. Operating Temperature: 32 to 100 deg F (0 to 38 deg C).
  - 2. Insulation Material: **Mineral fiber.**
  - 3. Insulation Thickness: 1"
  - 4. Field-Applied Jacket: **Foil and paper.**
  - 5. Vapor Retarder Required: **Yes.**

END OF SECTION

## SECTION 15110

### VALVES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following general-duty valves:
  - 1. Copper-alloy ball valves.
  - 2. Bronze check valves.
  - 3. Bronze gate valves.
  - 4. Bronze globe valves.
- B. See Division 2 piping Sections for general-duty and specialty valves for site construction piping.
- C. See Division 13 fire-suppression piping and fire pump Sections for fire-protection valves.

##### 1.2 SUBMITTALS

- A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; furnished specialties; and accessories.

##### 1.3 QUALITY ASSURANCE

- A. ASME Compliance: ASME B31.9 for building services piping valves.
  - 1. Exceptions: Domestic hot- and cold-water piping valves unless referenced.
- B. NSF Compliance: NSF 61 for valve materials for potable-water service.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.



## 2.2 VALVES, GENERAL

- A. Refer to Part 3 "Valve Applications" Article for applications of valves.
- B. Bronze Valves: **NPS 2 (DN 50)** and Smaller: Threaded ends, unless otherwise indicated.
- C. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- D. Valve Sizes: Same as upstream pipe, unless otherwise indicated.
- E. Valve Actuators:
  - 1. Handwheel: For valves other than quarter-turn types.
  - 2. Lever Handle: For quarter-turn valves **NPS 6 (DN 150)** and smaller, except plug valves.
- F. Extended Valve Stems: On insulated valves.
- G. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.
- H. Valve Bypass and Drain Connections: MSS SP-45.

## 2.3 COPPER-ALLOY BALL VALVES

- A. Manufacturers:
  - 1. One-Piece, Copper-Alloy Ball Valves:
    - a. Conbraco Industries, Inc.; Apollo Div.
    - b. Crane Co.; Crane Valve Group; Jenkins Valves.
    - c. Crane Co.; Crane Valve Group; Stockham Div.
    - d. Grinnell Corporation.
    - e. NIBCO INC.
  - 2. Two-Piece, Copper-Alloy Ball Valves:
    - a. Conbraco Industries, Inc.; Apollo Div.
    - b. Crane Co.; Crane Valve Group; Crane Valves.
    - c. Crane Co.; Crane Valve Group; Jenkins Valves.
    - d. Crane Co.; Crane Valve Group; Stockham Div.
    - e. Grinnell Corporation.
    - f. Hammond Valve.
    - g. Milwaukee Valve Company.
    - h. NIBCO INC.
- B. Copper-Alloy Ball Valves, General: MSS SP-110.
- C. One-Piece, Copper-Alloy Ball Valves: Brass or bronze body with chrome-plated bronze ball, PTFE or TFE seats, and **400-psig (2760-kPa) minimum** CWP rating.
- D. Two-Piece, Copper-Alloy Ball Valves: **Brass or bronze** body with **full-port**, chrome-plated bronze ball; **PTFE or TFE** seats; and **600-psig (4140-kPa)** minimum CWP rating and blowout-proof stem.

## 2.4 BRONZE CHECK VALVES

### A. Manufacturers:

#### 1. Type 1, Bronze, Horizontal Lift Check Valves with Metal Disc:

- a. Cincinnati Valve Co.
- b. Crane Co.; Crane Valve Group; Crane Valves.
- c. Crane Co.; Crane Valve Group; Stockham Div.
- d. Red-White Valve Corp.
- e. Walworth Co.

#### 2. Type 1, Bronze, Vertical Lift Check Valves with Metal Disc:

- a. Cincinnati Valve Co.
- b. Crane Co.; Crane Valve Group; Crane Valves.
- c. Crane Co.; Crane Valve Group; Jenkins Valves.
- d. Red-White Valve Corp.

#### 3. Type 3, Bronze, Swing Check Valves with Metal Disc:

- a. Crane Co.; Crane Valve Group; Crane Valves.
- b. Crane Co.; Crane Valve Group; Jenkins Valves.
- c. Crane Co.; Crane Valve Group; Stockham Div.
- d. Grinnell Corporation.
- e. Hammond Valve.
- f. Milwaukee Valve Company.
- g. NIBCO INC.
- h. Powell, Wm. Co.
- i. Red-White Valve Corp.
- j. Walworth Co.

### B. Bronze Check Valves, General: MSS SP-80.

### C. Type 1, Class 125, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.

### D. Type 1, Class 125, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.

### E. Type 1, Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.

### F. Type 1, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.

### G. Type 2, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.

### H. Type 3, Class 125, Bronze, Swing Check Valves: Bronze body with bronze disc and seat.

### I. Type 3, Class 150, Bronze, Swing Check Valves: Bronze body with bronze disc and seat.

## 2.5 BRONZE GATE VALVES

### A. Manufacturers:

#### 1. Type 1, Bronze, Nonrising-Stem Gate Valves:

- a. Crane Co.; Crane Valve Group; Crane Valves.
    - b. Crane Co.; Crane Valve Group; Jenkins Valves.
    - c. Crane Co.; Crane Valve Group; Stockham Div.
    - d. Grinnell Corporation.
    - e. Hammond Valve.
    - f. Milwaukee Valve Company.
    - g. NIBCO INC.
    - h. Powell, Wm. Co.
    - i. Red-White Valve Corp.
    - j. Walworth Co.
  - 2. Type 2, Bronze, Rising-Stem, Solid-Wedge Gate Valves:
    - a. Crane Co.; Crane Valve Group; Crane Valves.
    - b. Crane Co.; Crane Valve Group; Jenkins Valves.
    - c. Crane Co.; Crane Valve Group; Stockham Div.
    - d. Grinnell Corporation.
    - e. Hammond Valve.
    - f. Milwaukee Valve Company.
    - g. NIBCO INC.
    - h. Powell, Wm. Co.
    - i. Red-White Valve Corp.
    - j. Walworth Co.
  - 3. Type 3, Bronze, Rising-Stem, Split-Wedge Gate Valves:
    - a. Cincinnati Valve Co.
    - b. Crane Co.; Crane Valve Group; Jenkins Valves.
    - c. Grinnell Corporation.
    - d. NIBCO INC.
  - B. Bronze Gate Valves, General: MSS SP-80, with ferrous-alloy handwheel.
  - C. Type 1, Class 125, Bronze Gate Valves: Bronze body with nonrising stem and bronze solid wedge **and union-ring bonnet**.
  - D. Type 1, Class 150, Bronze Gate Valves: Bronze body with nonrising stem and bronze solid wedge **and union-ring bonnet**.
  - E. Type 2, Class 125, Bronze Gate Valves: Bronze body with rising stem and bronze solid wedge **and union-ring bonnet**.
  - F. Type 2, Class 150, Bronze Gate Valves: Bronze body with rising stem and bronze solid wedge **and union-ring bonnet**.
  - G. Type 3, Class 125, Bronze Gate Valves: Bronze body with rising stem and bronze split wedge **and union-ring bonnet**.
  - H. Type 3, Class 150, Bronze Gate Valves: Bronze body with rising stem and bronze split wedge **and union-ring bonnet**.
- 2.6 BRONZE GLOBE VALVES
- A. Manufacturers:

1. Type 1, Bronze Globe Valves with Metal Disc:
    - a. Crane Co.; Crane Valve Group; Crane Valves.
    - b. Crane Co.; Crane Valve Group; Jenkins Valves.
    - c. Crane Co.; Crane Valve Group; Stockham Div.
    - d. Grinnell Corporation.
    - e. Hammond Valve.
    - f. Legend Valve & Fitting, Inc.
    - g. Milwaukee Valve Company.
    - h. NIBCO INC.
    - i. Powell, Wm. Co.
    - j. Red-White Valve Corp.
    - k. Walworth Co.
  2. Type 3, Bronze Globe Valves with Renewable Seat and Metal Disc:
    - a. Crane Co.; Crane Valve Group; Crane Valves.
    - b. Crane Co.; Crane Valve Group; Jenkins Valves.
    - c. Crane Co.; Crane Valve Group; Stockham Div.
    - d. Grinnell Corporation.
    - e. Hammond Valve.
    - f. Milwaukee Valve Company.
    - g. NIBCO INC.
    - h. Walworth Co.
- B. Bronze Globe Valves, General: MSS SP-80, with ferrous-alloy handwheel.
- C. Type 1, Class 125, Bronze Globe Valves: Bronze body with bronze disc **and union-ring bonnet**.
- D. Type 1, Class 150, Bronze Globe Valves: Bronze body with bronze disc **and union-ring bonnet**.
- E. Type 3, Class 125, Bronze Globe Valves: Bronze body with bronze disc and renewable seat. **Include union-ring bonnet.**
- F. Type 3, Class 150, Bronze Globe Valves: Bronze body with bronze disc and renewable seat. **Include union-ring bonnet.**

## PART 3 - EXECUTION

### 3.1 VALVE APPLICATIONS

- A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:
1. Shutoff Service: Ball, **or gate** valves.
  2. Throttling Service: Angle, ball, or globe valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Domestic Water Piping: Use the following types of valves:
1. Ball Valves, **NPS 2 (DN 50)** and Smaller: **One Two** -piece, **400-psig (2760-kPa)** CWP rating, copper alloy.

2. Lift Check Valves, **NPS 2 (DN 50)** and Smaller: Type 2, Class **125 150**, **horizontal or vertical**, bronze.
3. Swing Check Valves, **NPS 2 (DN 50)** and Smaller: Type 4, Class **125 150**, bronze.
4. Gate Valves, **NPS 2 (DN 50)** and Smaller: Type **1 2**, Class **125 150**, bronze.
5. Globe Valves, **NPS 2 (DN 50)** and Smaller: Type 2, Class **125 150**, bronze.

### 3.2 VALVE INSTALLATION

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem movement.
- F. Install check valves for proper direction of flow and as follows:
  1. Swing Check Valves: In horizontal position with hinge pin level.
  2. Dual-Plate Check Valves: In horizontal or vertical position, between flanges.
  3. Lift Check Valves: With stem upright and plumb.

### 3.3 JOINT CONSTRUCTION

- A. Refer to Division 15 Section **"Basic Mechanical Materials and Methods"** for basic piping joint construction.
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

### 3.4 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION

## SECTION 15140

### DOMESTIC WATER PIPING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes domestic water piping inside the building.
- B. See Division 15 Section "Plumbing Specialties" for water distribution piping specialties.

##### 1.2 SUBMITTALS

- A. Field quality-control test reports.

##### 1.3 QUALITY ASSURANCE

- A. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.

#### PART 2 - PRODUCTS

##### 2.1 PIPING MATERIALS

- A. Refer to Part 3 "Pipe and Fitting Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- C. Hard Copper Tube: **ASTM B 88, Types L (ASTM B 88M, Types B and C)**, water tube, drawn temper.
  - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought- copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
  - 2. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

##### 2.2 VALVES

- A. Bronze, general-duty valves are specified in Division 15 Section "Valves."
- B. Balancing and drain valves are specified in Division 15 Section "Plumbing Specialties."

## PART 3 - EXECUTION

### 3.1 PIPE AND FITTING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- B. Aboveground Domestic Water Piping: Use the following piping materials for each size range:
  - 1. NPS 1 (DN 25) and Smaller: Hard copper tube, **Type L (Type B)**; copper pressure fittings; and soldered joints.
  - 2. NPS 2 (DN 50): Hard copper tube, **Type L (Type B)**; copper pressure fittings; and soldered joints.
- C. Below Ground Water Piping: Use the following piping materials:
  - 1. NPS 2 (DN50): Soft copper tube, annealed, Type K; copper pressure fittings and brazed joints.

### 3.2 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  - 1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 (DN 50) and smaller.
  - 2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 (DN 50) and smaller.
  - 3. Hot-Water-Piping, Balancing Duty: **Memory-stop** balancing valves.
  - 4. Drain Duty: Hose-end drain valves.
- B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 (DN 50) and smaller.
- C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
  - 1. Install hose-end drain valves at low points in water mains, risers, and branches.
  - 2. Install stop-and-waste drain valves where indicated.
- D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 (DN 50) and smaller. Balancing valves are specified in Division 15 Section "Plumbing Specialties."

### 3.3 PIPING INSTALLATION

- A. Basic piping installation requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- B. Install domestic water piping level and plumb.

### 3.4 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

### 3.5 HANGER AND SUPPORT INSTALLATION

- A. Pipe hanger and support devices are specified in Division 15 Section "Hangers and Supports." Install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
    - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet (30 m): MSS Type 49, spring cushion rolls, if indicated.
- B. Install supports according to Division 15 Section "Hangers and Supports."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch (10 mm).
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
  - 2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
  - 3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
- F. Install supports for vertical copper tubing every 10 feet (3 m).
- G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.6 CONNECTIONS

- 1. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
- 2. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection.

### 3.7 FIELD QUALITY CONTROL

- A. Inspect domestic water piping as follows:
  - 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.



2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
  - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test domestic water piping as follows:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

### 3.8 CLEANING

- A. Clean and disinfect potable domestic water piping using purging and disinfecting procedures prescribed by authorities having jurisdiction.
- B. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities.

END OF SECTION

## SECTION 15150

### SANITARY WASTE AND VENT PIPING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following soil and waste, sanitary drainage and vent piping inside the building:

- 1. Pipe, tube, and fittings.

##### 1.2 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

- 1. Soil, Waste, and Vent Piping: **10-foot head of water (30 kPa)**.

##### 1.3 SUBMITTALS

- A. Field quality-control inspection and test reports.

##### 1.4 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; and "NSF-drain" for plastic drain piping.

#### PART 2 - PRODUCTS

##### 2.1 PIPING MATERIALS

- A. **Solid-Wall** PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.
  - 1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS

- A. Special pipe fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
- B. Aboveground, soil, waste, and vent piping **NPS 4 (DN 100) and smaller** shall be the following:
  - 1. **Solid-wall** PVC pipe, PVC socket fittings, and solvent-cemented joints.
- C. Underground, soil, waste, and vent piping **NPS 4 (DN 100) and smaller** shall be the following:
  - 1. **Solid-wall** PVC pipe, PVC socket fittings, and solvent-cemented joints.

### 3.2 PIPING INSTALLATION

- A. Basic piping installation requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- B. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- C. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- D. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- E. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- F. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
  - 1. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
  - 2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- G. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- H. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.
- I. Install underground **PVC** soil and waste drainage piping according to ASTM D 2321.

- J. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

### 3.3 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- B. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

### 3.4 HANGER AND SUPPORT INSTALLATION

- A. Pipe hangers and supports are specified in Division 15 Section "Hangers and Supports." Install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
    - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 15 Section "Hangers and Supports."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.
- E. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
  - 2. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
  - 3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
- F. Install supports for vertical PVC piping every 48 inches (1200 mm).
- G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.5 CONNECTIONS

- A. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- B. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "**Plumbing Fixtures**]."
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.

### 3.6 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction.
  1. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  2. Prepare reports for tests and required corrective action.

### 3.7 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION

## SECTION 15195

### FACILITY NATURAL-GAS PIPING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Pipes, tubes, and fittings.
  - 2. Piping specialties.
  - 3. Piping and tubing joining materials.
  - 4. Valves.
  - 5. Pressure regulators.

##### 1.2 PERFORMANCE REQUIREMENTS

- A. Minimum Operating-Pressure Ratings:
  - 1. Piping and Valves: 100 psig (690 kPa) minimum unless otherwise indicated.
  - 2. Service Regulators: 65 psig (450 kPa) minimum unless otherwise indicated.
- B. Natural-Gas System Pressures within Buildings: Pressure is 0.5 psig (3.45 kPa) or less.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.
- C. Delegated-Design Submittal: For natural-gas piping and equipment indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Detail fabrication and assembly of seismic restraints.
  - 2. Design Calculations: Calculate requirements for selecting seismic restraints.
- D. Welding certificates.
- E. Field quality-control reports.
- F. Operation and maintenance data.

#### 1.4 QUALITY ASSURANCE

- A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

### PART 2 - PRODUCTS

#### 2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
  - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
  - 2. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
  - 3. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
    - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

#### 2.2 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for natural gas.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

#### 2.3 MANUAL GAS SHUTOFF VALVES

- A. General Requirements for Metallic Valves, **NPS 2 (DN 50)** and Smaller: Comply with ASME B16.33.
  - 1. CWP Rating: **125 psig (862 kPa)**.
  - 2. Threaded Ends: Comply with ASME B1.20.1.
  - 3. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves **1 inch (25 mm)** and smaller.
  - 4. Service Mark: Valves **1-1/4 inches (32 mm)** to **NPS 2 (DN 50)** shall have initials "WOG" permanently marked on valve body.
- B. Bronze Plug Valves: MSS SP-78.
  - 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
    - a. Lee Brass Company.
    - b. McDonald, A. Y. Mfg. Co.

2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig (862 kPa).
7. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

## 2.4 PRESSURE REGULATORS

### A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 (DN 50) and smaller.

### B. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
  - a. Eaton Corporation; Controls Div.
  - b. Harper Wyman Co.
  - c. Maxitrol Company.
  - d. SCP, Inc.
2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 2 psig (13.8 kPa).

## 2.5 LABELING AND IDENTIFYING

- A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored yellow.

## PART 3 - EXECUTION

### 3.1 INDOOR PIPING INSTALLATION

- A. Comply with the **International Fuel Gas Code** for installation and purging of natural-gas piping.



- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.
- H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.
- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and branch connections.
- K. Verify final equipment locations for roughing-in.
- L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
  - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches (75 mm) long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- Q. Connect branch piping from top or side of horizontal piping.
- R. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment.
- S. Do not use natural-gas piping as grounding electrode.
- T. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

- U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 15 Section "Sleeves and Sleeve Seals for HVAC Piping."
- V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 15 Section "Escutcheons for HVAC Piping."

### 3.2 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing or copper connector.
- B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

### 3.3 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
  - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
  - 2. Cut threads full and clean using sharp dies.
  - 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
  - 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
  - 5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Welded Joints:
  - 1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
  - 2. Bevel plain ends of steel pipe.
  - 3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

### 3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hangers and supports specified in Division 15 Section "Hangers and Supports."
- B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
  - 1. **NPS 1 (DN 25)** and Smaller: Maximum span, **96 inches (2438 mm)**; minimum rod size, **3/8 inch (10 mm)**.
  - 2. **NPS 1-1/4 (DN 32)**: Maximum span, **108 inches (2743 mm)**; minimum rod size, **3/8 inch (10 mm)**.
  - 3. **NPS 1-1/2 and NPS 2 (DN 40 and DN 50)**: Maximum span, **108 inches (2743 mm)**; minimum rod size, **3/8 inch (10 mm)**.

### 3.5 CONNECTIONS

- A. Connect to utility's gas main according to utility's procedures and requirements.
- B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.
- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within **72 inches (1800 mm)** of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

### 3.6 LABELING AND IDENTIFYING

- A. Comply with requirements in Division 15 Section "Mechanical Identification" for piping and valve identification.
- B. Install detectable warning tape directly above gas piping, **12 inches (300 mm)** below finished grade, except **6 inches (150 mm)** below subgrade under pavements and slabs.

### 3.7 FIELD QUALITY CONTROL

- A. Test, inspect, and purge natural gas according to **the International Fuel Gas Code** and authorities having jurisdiction.
- B. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.8 OUTDOOR PIPING SCHEDULE

- A. Aboveground natural-gas piping shall be **one of** the following:
  - 1. Steel pipe with malleable-iron fittings and threaded joints.

### 3.9 INDOOR PIPING SCHEDULE

- A. Aboveground, branch piping **NPS 2 (DN 50)** and smaller shall be the following:
  - 1. Steel pipe with malleable-iron fittings and threaded joints.

### 3.10 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Valves for pipe sizes **NPS 2 (DN 50)** and smaller at service meter shall be the following:
  - 1. Bronze plug valve.

- B. Distribution piping valves for pipe sizes **NPS 2 (DN 50)** and smaller shall be the following:
  - 1. Bronze plug valve.
- C. Valves in branch piping for single appliance shall be the following:
  - 1. Bronze plug valve.

END OF SECTION

SECTION 15410  
PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes plumbing fixtures and related components.

1.2 DEFINITIONS

- A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

1.3 SUBMITTALS

- A. Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.
- B. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; and Public Law 101-336, "Americans with Disabilities Act"; about plumbing fixtures for people with disabilities.
- B. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- C. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
  - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

## 2.2 LAVATORY FAUCETS

- A. Lavatory Faucet: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
  - 1. Products: See Fixture Schedule on drawings.
  - 2. Body Material: Cast brass.
  - 3. Finish: Polished chrome plate.

## 2.3 SINK FAUCETS

- A. Sink Faucet: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
  - 1. Manufacturers:
    - a. As listed on the drawings.
  - 2. Body Material: Cast brass.
  - 3. Finish: Polished chrome plate.

## 2.4 TOILET SEATS

- A. Toilet Seat: Solid plastic.
  - 1. Manufacturers:
    - a. As listed on the drawings.
  - 2. Configuration: Open front without cover.
  - 3. Size: Elongated.
  - 4. Class: Heavy-duty commercial.
  - 5. Hinge Type: CK, check.
  - 6. Color: White.

## 2.5 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Guard: Manufactured, plastic covering for hot- and cold-water supplies and trap and drain piping and complying with ADA requirements.

## 2.6 WATER CLOSETS

- A. Water Closets: Accessible, floor-mounting, floor-outlet, vitreous-china fixture.
  - 1. Products:
    - a. As listed in the plumbing fixture schedule on the drawings.
  - 2. Style: Flush valve.
    - a. Bowl Type: Elongated. Include bolt caps matching fixture.

- b. Design Consumption: 1.6 gal./flush (6 L/flush).
  - c. Color: White.
- 3. Toilet Seat: As listed herein.

## 2.7 LAVATORIES:

- A. Lavatories: Accessible, wall- and wall-hanging, vitreous china fixture.
  - 1. Products:
    - a. As listed in the plumbing fixture schedule on the drawings.

## 2.8 SERVICE BASINS

- A. Service Basins,: Flush-to-wall, floor-mounting precast terrazzo basin with rim guard. As listed on the drawings.

## PART 3 - EXECUTION

### 3.1 FIXTURE INSTALLATION

- A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.
  - 1. Use carrier supports without waste fitting for fixtures with tubular waste piping.
  - 2. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- D. Install wall-hanging fixtures with tubular waste piping attached to supports.
- E. Install counter-mounting fixtures in and attached to casework.
- F. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.
- G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
- H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- I. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
- J. Install toilet seats on water closets.

- K. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- L. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- M. Install traps on fixture outlets.
  - 1. Exception: Omit trap on fixtures with integral traps.
- N. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.
- O. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.

### 3.2 CONNECTIONS

- A. Connect water supplies from water distribution piping to fixtures.
- B. Connect drain piping from fixtures to drainage piping.
- C. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.
- D. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.

### 3.3 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 15410



## SECTION 15415

### DRINKING FOUNTAINS AND WATER COOLERS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Type PB, pressure with bubbler, Style W, wall-mounting water coolers.
  - 2. Fixture supports.

##### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and maintenance data.

##### 1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; **Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act";** for fixtures for people with disabilities.
- C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- D. ARI Standard: Comply with ARI's "Directory of Certified Drinking Water Coolers" for style classifications.
- E. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers and with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.
- F. ASHRAE Standard: Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants" for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant unless otherwise indicated.

## PART 2 - PRODUCTS

### 2.1 DRINKING FOUNTAINS

### 2.2 PRESSURE WATER COOLERS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

#### B. Water Coolers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Elkay Manufacturing Co.
  - b. Halsey Taylor.
  - c. Haws Corporation.
2. Description: **Accessible**, ARI 1010, Type PB, pressure with bubbler, Style W, wall-mounting water cooler for **adult**-mounting height.
  - a. Cabinet: **Bilevel with two attached cabinets all stainless steel.**
  - b. Bubbler: One, with adjustable stream regulator, located on each cabinet deck.
  - c. Control: **Push bar.**
  - d. Supply: **NPS 3/8 (DN 10)** with ball, gate, or globe valve.
  - e. Filter: One or more water filters complying with NSF 42 and NSF 53 for cyst and lead reduction to below EPA standards; with capacity sized for unit peak flow rate.
  - f. Drain(s): Grid with **NPS 1-1/4 (DN 32)** minimum horizontal waste and trap complying with ASME A112.18.1.
  - g. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.
    - 1) Capacity: **8 gph (0.0084 L/s)** of **50 deg F (10 deg C)** cooled water from **80 deg F (27 deg C)** inlet water and **90 deg F (32 deg C)** ambient air temperature.
    - 2) Electrical Characteristics: **1/6 hp; 120-V ac; single phase; 60 Hz.**

## PART 3 - EXECUTION

### 3.1 APPLICATIONS

- A. Use off-floor supports for wall-mounting fixtures, unless otherwise indicated.

### 3.2 INSTALLATION

- A. Install off-floor supports affixed to building substrate and attach wall-mounting fixtures, unless otherwise indicated.
- B. Install fixtures level and plumb.

- C. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Division 15 Section "Valves."
- D. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.
- E. Install pipe escutcheons at wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding pipe fittings. Escutcheons are specified in Division 15 Section "Escutcheons for Plumbing Piping."
- F. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 7 Section "Joint Sealants."

### 3.3 CONNECTIONS

- A. Connect fixtures with water supplies, traps, and risers, and with soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Ground equipment according to Division 16 Section "Grounding and Bonding."
- C. Connect wiring according to Division 16 Section "Conductors and Cables."

### 3.4 FIELD QUALITY CONTROL

- A. Water Cooler Testing: After electrical circuitry has been energized, test for compliance with requirements. Test and adjust controls and safeties.
  - 1. Remove and replace malfunctioning units and retest as specified above.
  - 2. Report test results in writing.

### 3.5 ADJUSTING

- A. Adjust fixture flow regulators for proper flow and stream height.
- B. Adjust water cooler temperature settings.

END OF SECTION

## SECTION 15430

### PLUMBING SPECIALTIES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following plumbing specialties:

1. Balancing valves.
2. Miscellaneous piping specialties.
3. Cleanouts.
4. Floor drains.

##### 1.2 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:

1. Domestic Water Piping: **125 psig (860 kPa)**.
2. Sanitary Waste and Vent Piping: **10-foot head of water (30 kPa)**.
3. Storm Drainage Piping: **10-foot head of water (30 kPa)**.

##### 1.3 SUBMITTALS

- A. Product Data: Include rated capacities and indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:
1. Water hammer arresters, air vents, and trap seal primer valves and systems.
- B. Field quality-control test reports.

##### 1.4 QUALITY ASSURANCE

- A. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
1. Products: Subject to compliance with requirements, provide one of the products specified.
  2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering

### 2.2 MISCELLANEOUS PIPING SPECIALTIES

- A. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.

### 2.3 CLEANOUTS

- A. Cleanouts: Comply with **ASME A112.36.2M**.
1. Application: **Floor cleanout, Wall cleanout.**
  2. Products:
    - a. Josam Co.
    - b. Smith, Jay R. Mfg. Co.
    - c. Tyler Pipe, Wade Div.
    - d. Zurn Industries
  3. Body or Ferrule Material: **Cast Iron.**
  4. Clamping Device: **Required.**
  5. Outlet Connection: **Threaded.**
  6. Closure: **Plastic plug.**
  7. Adjustable Housing Material: **Cast iron with set-screws or other device.**
  8. Frame and Cover Material and Finish: **Nickel-bronze, copper alloy.**
  9. Frame and Cover Shape: **Round.**
  10. Top Loading Classification: **Medium Duty.**

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.
- B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
1. Size same as drainage piping up to **NPS 4 (DN 100)**. Use **NPS 4 (DN 100)** for larger drainage piping unless larger cleanout is indicated.
  2. Locate at each change in direction of piping greater than 45 deg rees.

3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
  4. Locate at base of each vertical soil and waste stack.
- C. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.
  - D. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.
  - E. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.
  - F. Fasten recessed-type plumbing specialties to reinforcement built into walls.
  - G. Install wood-blocking reinforcement for wall-mounting and recessed-type plumbing specialties.
  - H. Install individual shutoff valve in each water supply to plumbing specialties. Use ball, gate, or globe valve if specific valve is not indicated. Install shutoff valves in accessible locations. Refer to Division 15 Section "Valves" for general-duty ball, butterfly, check, gate, and globe valves.
  - I. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

### 3.2 CONNECTIONS

- A. Install piping adjacent to equipment to allow service and maintenance.

### 3.3 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

## SECTION 15671

### HEAT PUMP UNITS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes air-cooled condensing units.

##### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Wiring diagrams.
- C. Operation and maintenance data.
- D. LEED Submittals:
  - 1. Credit EA 4: Manufacturers' product data for refrigerants, including printed statement that refrigerants are free of HCFCs.

##### 1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Fabricate and label refrigeration system according to ASHRAE 15, "Safety Code for Mechanical Refrigeration."
  - 1. Units shall be designed to operate with HCFC-free refrigerants.

##### 1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of heat pump units that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period (Compressor Only): **Five** years from date of Substantial Completion.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

Sims Group Consulting Engineers, P.C.

2220 Transylvania County Emergency Services Base

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

## 2.2 HEAT PUMP UNITS, AIR COOLED, 1 TO 5 TONS (3.5 TO 17.6 kW)

### A. Manufacturers:

1. Carrier Corporation; Carrier Air Conditioning Div.
2. Lennox Industries Inc.
3. Rheem Manufacturing Air Conditioning Div.
4. Trane Co. (The); Worldwide Applied Systems Group.
5. York International Corp.

### B. Description: Factory assembled and tested, consisting of compressor, condenser coil, fan, motors, refrigerant reservoir, and operating controls.

### C. Compressor: Scroll, hermetically sealed, with rubber vibration isolators.

1. Motor: **Single** speed, and includes thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
2. Accumulator: Suction tube.
3. Refrigerant Charge: **R-407C, R-410A.**

### D. Condenser Coil: Seamless copper-tube, aluminum-fin coil; circuited for integral liquid subcooler, with removable drain pan and brass service valves with service ports.

### E. Condenser Fan: Direct-drive, aluminum propeller fan; with permanently lubricated, totally enclosed fan motor with thermal-overload protection **and ball bearings.**

### F. Accessories:

1. Crankcase heater.
2. Cycle Protector: Automatic-reset timer to prevent rapid compressor cycling.
3. Electronic programmable thermostat to control condensing unit and evaporator fan.
4. Evaporator Freeze Thermostat: Temperature-actuated switch that stops unit when evaporator reaches freezing temperature.
5. Filter-dryer.
6. High-Pressure Switch: Automatic-reset switch cycles compressor off on high refrigerant pressure.
7. Liquid-line solenoid.
8. Low Ambient Controller: Cycles condenser fan to permit operation down to **0 deg F (minus 18 deg C).**
9. Low-Pressure Switch: Automatic-reset switch cycles compressor off on low refrigerant pressure.
10. Thermostatic expansion valve.
11. Time-Delay Relay: Continues operation of evaporator fan after compressor shuts off.

### G. Unit Casing: Galvanized steel, finished with baked enamel; with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Mount service valves, fittings, and gage ports on exterior of casing.

### H. Verification of Performance: Rate condensing units according to ARI 210/240.



## 2.3 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate heat pump units according to **ARI 210/240**.
  - 1. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
  - 2. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
- B. Testing Requirements: Factory test sound-power-level ratings according to ARI 270.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install units level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.
- B. Install heat pump units on concrete base. Concrete base is specified in Division 15 Section "Basic Mechanical Materials and Methods," and concrete materials and installation requirements are specified in Division 3.
- C. Maintain manufacturer's recommended clearances for service and maintenance.
- D. Connect refrigerant piping to air-cooled heat pump units; maintain required access to unit. Install furnished field-mounted accessories. Refrigerant piping and specialties are specified in Division 15 Section "Refrigerant Piping."

### 3.2 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
  - 1. Perform electrical test and visual and mechanical inspection.
  - 2. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
  - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
  - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  - 5. Verify proper airflow over coils.
- B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

## SECTION 15815

### METAL DUCTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

###### B. Related Sections:

1. Section 15820 "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.
2. Section 15950 "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.

##### 1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" **and ASCE/SEI 7**.
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

##### 1.3 ACTION SUBMITTALS

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

###### B. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

#### 1.4 QUALITY ASSURANCE

- A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

### PART 2 - PRODUCTS

#### 2.1 RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

#### 2.2 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: **G60 (Z180)**.
  - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
  - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- D. Tie Rods: Galvanized steel, **1/4-inch (6-mm)** minimum diameter for lengths **36 inches (900 mm)** or less; **3/8-inch (10-mm)** minimum diameter for lengths longer than **36 inches (900 mm)**.

## 2.3 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
  2. Tape Width: **4 inches (102 mm)**.
  3. Sealant: Modified styrene acrylic.
  4. Water resistant.
  5. Mold and mildew resistant.
  6. Maximum Static-Pressure Class: **10-inch wg (2500 Pa)**, positive and negative.
  7. Service: Indoor and outdoor.
  8. Service Temperature: **Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C)**.
  9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
  10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  11. Sealant 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."
- C. Water-Based Joint and Seam Sealant:
1. Application Method: Brush on.
  2. Solids Content: Minimum 65 percent.
  3. Shore A Hardness: Minimum 20.
  4. Water resistant.
  5. Mold and mildew resistant.
  6. VOC: Maximum 75 g/L (less water).
  7. Maximum Static-Pressure Class: **10-inch wg (2500 Pa)**, positive and negative.
  8. Service: Indoor or outdoor.
  9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- D. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
  2. Type: S.
  3. Grade: NS.
  4. Class: 25.
  5. Use: O.
  6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  7. Sealant 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."
- E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

## 2.4 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," **Table 5-1** (**Table 5-1M**), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- G. Trapeze and Riser Supports:
  - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
  - 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
  - 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

## PART 3 - EXECUTION

### 3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of **1 inch (25 mm)**, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least **1-1/2 inches (38 mm)**.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 15820 "Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

### 3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

### 3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
  - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 2. Outdoor, Supply-Air Ducts: Seal Class A.
  - 3. Outdoor, Exhaust Ducts: Seal Class C.
  - 4. Outdoor, Return-Air Ducts: Seal Class C.
  - 5. Unconditioned Space, Supply-Air Ducts in Pressure Classes **2-Inch wg (500 Pa)** and Lower: Seal Class B.
  - 6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than **2-Inch wg (500 Pa)**: Seal Class A.
  - 7. Unconditioned Space, Exhaust Ducts: Seal Class C.
  - 8. Unconditioned Space, Return-Air Ducts: Seal Class B.
  - 9. Conditioned Space, Supply-Air Ducts in Pressure Classes **2-Inch wg (500 Pa)** and Lower: Seal Class C.
  - 10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than **2-Inch wg (500 Pa)**: Seal Class B.
  - 11. Conditioned Space, Exhaust Ducts: Seal Class B.
  - 12. Conditioned Space, Return-Air Ducts: Seal Class C.

### 3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
  - 1. Where practical, install concrete inserts before placing concrete.
  - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
  - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than **4 inches (100 mm)** thick.
  - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than **4 inches (100 mm)** thick.
  - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," **Table 5-1 (Table 5-1M)**, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within **24 inches (610 mm)** of each elbow and within **48 inches (1200 mm)** of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of **16 feet (5 m)**.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

### 3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 15820 "Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

### 3.6 DUCT CLEANING

- A. Clean **new** duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
  - 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 15820 "Duct Accessories" for access panels and doors.
  - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
  - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

### 3.7 START UP

- A. Air Balance: Comply with requirements in Section 15950 "Testing, Adjusting, and Balancing."

### 3.8 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

B. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
  - a. Pressure Class: Positive **1-inch wg (250 Pa)**.
  - b. Minimum SMACNA Seal Class: **A**.
  - c. SMACNA Leakage Class for Rectangular: **12**.



- d. SMACNA Leakage Class for Round and Flat Oval: **12**.
- C. Return Ducts:
  - 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
    - a. Pressure Class: Positive or negative **1-inch wg (250 Pa)**.
    - b. Minimum SMACNA Seal Class: **A**.
    - c. SMACNA Leakage Class for Rectangular: **12**.
    - d. SMACNA Leakage Class for Round and Flat Oval: **12**.
- D. Exhaust Ducts:
  - 1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
    - a. Pressure Class: Negative **1-inch wg (250 Pa)**.
    - b. Minimum SMACNA Seal Class: **A** if negative pressure, and **A** if positive pressure.
    - c. SMACNA Leakage Class for Rectangular: **12**.
- E. Elbow Configuration:
  - 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
    - a. Velocity **1000 fpm (5 m/s)** or Lower:
      - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
    - b. Velocity **1000 to 1500 fpm (5 to 7.6 m/s)**:
      - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
      - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
      - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
  - 2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
    - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
      - 1) Velocity **1000 fpm (5 m/s)** or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
      - 2) Velocity **1000 to 1500 fpm (5 to 7.6 m/s)**: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
      - 3) Velocity **1500 fpm (7.6 m/s)** or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
      - 4) Radius-to Diameter Ratio: 1.5.
    - b. Round Elbows, [**12 Inches (305 mm)**] <Insert dimension> and Smaller in Diameter: Stamped or pleated.
    - c. Round Elbows, [**14 Inches (356 mm)**] <Insert dimension> and Larger in Diameter: [Standing seam] [Welded].

F. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
  - a. Rectangular Main to Rectangular Branch: 45-degree entry.
  - b. Rectangular Main to Round Branch: Spin in.
2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
  - a. Velocity 1000 fpm (5 m/s) or Lower: 90-degree tap.
  - b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.
  - c. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

END OF SECTION

SECTION 15820  
DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Control dampers.
4. Fire dampers.
5. Smoke dampers.
6. Flange connectors.
7. Turning vanes.
8. Duct-mounted access doors.
9. Flexible connectors.
10. Flexible ducts.
11. Duct accessory hardware.

1.2 SUBMITTALS

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

B. LEED Submittal:

1. Product Data for Prerequisite EQ 1: Documentation indicating that units comply with ASHRAE 62.1-2004, Section 5 - "Systems and Equipment."

C. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
  - a. Special fittings.
  - b. Manual volume damper installations.
  - c. Control damper installations.
  - d. Fire-damper and smoke-damper installations, including sleeves; and duct-mounted access doors.
  - e. Wiring Diagrams: For power, signal, and control wiring.

D. Operation and maintenance data.

### 1.3 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: **G60 (Z180)**.
  - 2. Exposed-Surface Finish: Mill phosphatized.
- C. Aluminum Sheets: Comply with **ASTM B 209 (ASTM B 209M)**, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- D. Extruded Aluminum: Comply with **ASTM B 221 (ASTM B 221M)**, Alloy 6063, Temper T6.
- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- F. Tie Rods: Galvanized steel, **1/4-inch (6-mm)** minimum diameter for lengths **36 inches (900 mm)** or less; **3/8-inch (10-mm)** minimum diameter for lengths longer than **36 inches (900 mm)**.

### 2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
  - 1. American Warming and Ventilating; a division of Mestek, Inc.
  - 2. Duro Dyne Inc.
  - 3. Greenheck Fan Corporation.
  - 4. Nailor Industries Inc.
  - 5. Pottorff; a division of PCI Industries, Inc.
  - 6. Ruskin Company.
  - 7. SEMCO Incorporated.
  - 8. Vent Products Company, Inc.
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: **2000 fpm (10 m/s)**.
- D. Maximum System Pressure: **1-inch wg (0.25 kPa)**.

- E. Frame: **0.052-inch- (1.3-mm-) thick, galvanized sheet steel**, with welded corners and **mounting flange**.
- F. Blades: Multiple single-piece blades, **center-pivoted**, maximum **6-inch (150-mm)** width, **0.025-inch- (0.6-mm-) thick, roll-formed aluminum** with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: **Neoprene, mechanically locked**.
- I. Blade Axles:
  - 1. Material: **Stainless steel**.
  - 2. Diameter: **0.20 inch (5 mm)**.
- J. Tie Bars and Brackets: **Galvanized steel**.
- K. Return Spring: Adjustable tension.
- L. Bearings: **Steel ball**.
- M. Accessories:
  - 1. Adjustment device to permit setting for varying differential static pressure.
  - 2. Counterweights and spring-assist kits for vertical airflow installations.
  - 3. Electric actuators.
  - 4. Chain pulls.
  - 5. Screen Mounting: Front mounted in sleeve.
    - a. Sleeve Thickness: **20-gage (1.0-mm)** minimum.
    - b. Sleeve Length: **6 inches (152 mm)** minimum.
  - 6. Screen Mounting: Rear mounted.
  - 7. Screen Material: **Aluminum**.
  - 8. Screen Type: **Bird**.
  - 9. 90-degree stops.

## 2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
  - 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:
    - a. Air Balance Inc.; a division of Mestek, Inc.
    - b. American Warming and Ventilating; a division of Mestek, Inc.
    - c. McGill AirFlow LLC.
    - d. Pottorff; a division of PCI Industries, Inc.
    - e. Ruskin Company.
    - f. Vent Products Company, Inc.
  - 2. Standard leakage rating, **with linkage outside airstream**.
  - 3. Suitable for horizontal or vertical applications.
  - 4. Frames:

- a. Hat-shaped, **galvanized**-steel channels, 0.064-inch (1.62-mm) minimum thickness.
  - b. Mitered and welded corners.
  - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
- 5. Blades:
  - a. Multiple or single blade.
  - b. Parallel- or opposed-blade design.
  - c. Stiffen damper blades for stability.
  - d. **Galvanized**-steel, 0.064 inch (1.62 mm) thick.
- 6. Blade Axles: **Stainless steel**.
- 7. Bearings:
  - a. **Oil-impregnated bronze**.
  - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
- 8. Tie Bars and Brackets: Galvanized steel.
- B. Jackshaft:
  - 1. Size: 1-inch (25-mm) diameter.
  - 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
  - 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.
- C. Damper Hardware:
  - 1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut.
  - 2. Include center hole to suit damper operating-rod size.
  - 3. Include elevated platform for insulated duct mounting.

## 2.4 CONTROL DAMPERS

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:
  - 1. American Warming and Ventilating; a division of Mestek, Inc.
  - 2. Arrow United Industries; a division of Mestek, Inc.
  - 3. Duro Dyne Inc.
  - 4. Greenheck Fan Corporation.
  - 5. Ruskin Company.
  - 6. Vent Products Company, Inc.
  - 7. Young Regulator Company.
- B. Frames:
  - 1. **Hat** shaped.
  - 2. **Galvanized**-steel channels, 0.064 inch (1.62 mm) thick.
  - 3. Mitered and welded corners.

- C. Blades:
  - 1. Multiple blade with maximum blade width of 8 inches (200 mm).
  - 2. **Opposed**-blade design.
  - 3. **[Galvanized] [Stainless]** steel.
  - 4. 0.064 inch (1.62 mm) thick.
  - 5. Blade Edging: Closed-cell neoprene edging.
  - 6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.
- D. Blade Axles: 1/2-inch- (13-mm-) diameter; **[galvanized steel] [stainless steel] [nonferrous metal]**; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
  - 1. Operating Temperature Range: From minus 40 to plus 200 deg F (minus 40 to plus 93 deg C).
- E. Bearings:
  - 1. **Oil-impregnated bronze.**
  - 2. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  - 3. Thrust bearings at each end of every blade.

## 2.5 FIRE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
  - 1. Air Balance Inc.; a division of Mestek, Inc.
  - 2. Arrow United Industries; a division of Mestek, Inc.
  - 3. Pottorff; a division of PCI Industries, Inc.
  - 4. Prefco; Perfect Air Control, Inc.
  - 5. Ruskin Company.
  - 6. Vent Products Company, Inc.
- B. Type: **Static**; rated and labeled according to UL 555 by an NRTL.
- C. Closing rating in ducts up to 4-inch wg (1-kPa) static pressure class and minimum 4000-fpm (20-m/s) velocity.
- D. Fire Rating: 1-1/2 hours.
- E. Frame: **Curtain type with blades outside airstream**; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.
- F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
  - 1. Minimum Thickness: 0.052 or 0.138 inch (1.3 or 3.5 mm) thick, as indicated, and of length to suit application.
  - 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- G. Mounting Orientation: Vertical or horizontal as indicated.
- H. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.

- I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- J. Heat-Responsive Device: Replaceable, **165 deg F (74 deg C)** rated, fusible links.

## 2.6 FLANGE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
  - 1. Ductmate Industries, Inc.
  - 2. Nexus PDQ; Division of Shilco Holdings Inc.
  - 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Description: **Add-on**, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- C. Material: Galvanized steel.
- D. Gage and Shape: Match connecting ductwork.

## 2.7 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
  - 1. Ductmate Industries, Inc.
  - 2. Duro Dyne Inc.
  - 3. METALAIRE, Inc.
  - 4. SEMCO Incorporated.
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
  - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."
- E. Vane Construction: **Single** wall.
- F. Vane Construction: Single wall for ducts up to **48 inches (1200 mm)** wide and double wall for larger dimensions.

## 2.8 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
  - 1. American Warming and Ventilating; a division of Mestek, Inc.
  - 2. Ductmate Industries, Inc.
  - 3. Greenheck Fan Corporation.



4. McGill AirFlow LLC.
5. Pottorff; a division of PCI Industries, Inc.
6. Ventfabrics, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:
  - a. Double wall, rectangular.
  - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
  - c. Vision panel.
  - d. Hinges and Latches: 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.
  - e. Fabricate doors airtight and suitable for duct pressure class.
2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:
  - a. Access Doors Less Than 12 Inches (300 mm) Square: No hinges and two sash locks.
  - b. Access Doors up to 18 Inches (460 mm) Square: Two hinges and two sash locks.
  - c. Access Doors up to 24 by 48 Inches (600 by 1200 mm): Three hinges and two compression latches[ with outside and inside handles].
  - d. Access Doors Larger Than 24 by 48 Inches (600 by 1200 mm): Four hinges and two compression latches with outside and inside handles.

## 2.9 DUCT ACCESS PANEL ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
1. Ductmate Industries, Inc.
  2. Flame Gard, Inc.
  3. 3M.
- B. Labeled according to UL 1978 by an NRTL.
- C. Panel and Frame: Minimum thickness **0.0528-inch (1.3-mm) carbon** steel.
- D. Fasteners: **Stainless** steel. Panel fasteners shall not penetrate duct wall.
- E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum **2000 deg F (1093 deg C)**.
- F. Minimum Pressure Rating: **10-inch wg (2500 Pa)**, positive or negative.

## 2.10 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
1. Ductmate Industries, Inc.
  2. Duro Dyne Inc.
  3. Ventfabrics, Inc.

- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip **3-1/2 inches (89 mm)** wide attached to 2 strips of **2-3/4-inch- (70-mm-)** wide, **0.028-inch- (0.7-mm-)** thick, galvanized sheet steel or **0.032-inch- (0.8-mm-)** thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
  - 1. Minimum Weight: **26 oz./sq. yd. (880 g/sq. m).**
  - 2. Tensile Strength: **480 lbf/inch (84 N/mm)** in the warp and **360 lbf/inch (63 N/mm)** in the filling.
  - 3. Service Temperature: **Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).**
- F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
  - 1. Minimum Weight: **24 oz./sq. yd. (810 g/sq. m).**
  - 2. Minimum Tensile Strength: **500 lbf/inch (88 N/mm)** in the warp and **440 lbf/inch (77 N/mm)** in the filling.
  - 3. Service Temperature: **Minus 50 to plus 250 deg F (Minus 45 to plus 121 deg C).**
- G. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
  - 1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
  - 2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
  - 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  - 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
  - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
  - 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
  - 7. Coil Spring: Factory set and field adjustable for a maximum of **1/4-inch (6-mm)** movement at start and stop.

## 2.11 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**
  - 1. Flexmaster U.S.A., Inc.
  - 2. McGill AirFlow LLC.
- B. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; **aluminized** vapor-barrier film.
  - 1. Pressure Rating: **10-inch wg (2500 Pa)** positive and **1.0-inch wg (250 Pa)** negative.
  - 2. Maximum Air Velocity: **4000 fpm (20 m/s).**
  - 3. Temperature Range: **Minus 10 to plus 160 deg F (Minus 23 to plus 71 deg C).**
  - 4. Insulation R-value: **Comply with ASHRAE/IESNA 90.1-2004.**
- C. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; **aluminized** vapor-barrier film.

1. Pressure Rating: **4-inch wg (1000 Pa)** positive and **0.5-inch wg (125 Pa)** negative.
2. Maximum Air Velocity: **4000 fpm (20 m/s)**.
3. Temperature Range: **Minus 20 to plus 175 deg F (Minus 29 to plus 79 deg C)**.
4. Insulation R-Value: **Comply with ASHRAE/IESNA 90.1-2004.**

D. Flexible Duct Connectors:

1. Clamps: **Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action** in sizes **3 through 18 inches (75 through 460 mm)**, to suit duct size.

## 2.12 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install **backdraft** dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
  1. Install steel volume dampers in steel ducts.
  2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire dampers according to UL listing.
- H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
  1. On both sides of duct coils.
  2. Upstream from duct filters.

3. At outdoor-air intakes and mixed-air plenums.
  4. At drain pans and seals.
  5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
  6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors; and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
  7. At each change in direction and at maximum **50-foot (15-m)** spacing.
  8. Upstream[**and downstream**] from turning vanes.
  9. Control devices requiring inspection.
  10. Elsewhere as indicated.
- I. Install access doors with swing against duct static pressure.
- J. Access Door Sizes:
1. One-Hand or Inspection Access: **8 by 5 inches (200 by 125 mm)**.
  2. Two-Hand Access: **12 by 6 inches (300 by 150 mm)**.
  3. Head and Hand Access: **18 by 10 inches (460 by 250 mm)**.
  4. Head and Shoulders Access: **21 by 14 inches (530 by 355 mm)**.
  5. Body Access: **25 by 14 inches (635 by 355 mm)**.
  6. Body plus Ladder Access: **25 by 17 inches (635 by 430 mm)**.
- K. Label access doors according to Division 15 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- L. Install flexible connectors to connect ducts to equipment.
- M. For fans developing static pressures of **5-inch wg (1250 Pa)** and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- N. Connect terminal units to supply ducts with maximum **12-inch (300-mm)** lengths of flexible duct. Do not use flexible ducts to change directions.
- O. Connect diffusers to ducts with maximum **60-inch (1500-mm)** lengths of flexible duct clamped or strapped in place.
- P. Connect flexible ducts to metal ducts with **draw bands**.
- Q. Install duct test holes where required for testing and balancing purposes.
- R. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of **1/4-inch (6-mm)** movement during start and stop of fans.
- 3.2 FIELD QUALITY CONTROL
- A. Tests and Inspections:
1. Operate dampers to verify full range of movement.
  2. Inspect locations of access doors and verify that purpose of access door can be performed.
  3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
  4. Inspect turning vanes for proper and secure installation

END OF SECTION

## SECTION 15838

### POWER VENTILATORS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following:

1. Centrifugal roof ventilators.

##### 1.2 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

##### 1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- C. UL Standard: Power ventilators shall comply with UL 705.

#### PART 2 - PRODUCTS

##### 2.1 CENTRIFUGAL ROOF VENTILATORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide **the product indicated on Drawings** or a comparable product by one of the following:
1. Acme Engineering & Mfg. Corp.
  2. Loren Cook Company.

- D. Description: Direct- or belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.
- E. Housing: Removable, **spun-aluminum, dome top and outlet baffle**; square, one-piece, aluminum base with venturi inlet cone.
  - 1. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.
- F. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
- G. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:
  - 1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
  - 2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
  - 3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
  - 4. Fan and motor isolated from exhaust airstream.
- H. Accessories:
  - 1. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted **inside** fan housing, factory wired through an internal aluminum conduit.
  - 2. Bird Screens: Removable, **1/2-inch (13-mm)** mesh, aluminum or brass wire.
  - 3. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
  - 4. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.
- I. Roof Curbs: Galvanized steel; mitered and welded corners; **1-1/2-inch- (40-mm-)** thick, rigid, fiberglass insulation adhered to inside walls; and **1-1/2-inch (40-mm)** wood nailer. Size as required to suit roof opening and fan base.
  - 1. Configuration: **Built-in cant and mounting flange.**
  - 2. Overall Height: **12 inches (300 mm).**
  - 3. Sound Curb: Curb with sound-absorbing insulation matrix.
  - 4. Pitch Mounting: Manufacture curb for roof slope.
  - 5. Metal Liner: Galvanized steel.

## 2.2 MOTORS

- A. Comply with requirements in Division 15 Section "Motors."
- B. Enclosure Type: Totally enclosed, fan cooled.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 7 Section "Roof Accessories" for installation of roof curbs.

- C. Install units with clearances for service and maintenance.
- D. Label units according to requirements specified in Division 15 Section "Mechanical Identification."
- E. Duct installation and connection requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 15 Section "Duct Accessories."
- F. Install ducts adjacent to power ventilators to allow service and maintenance.
- G. Ground equipment according to Division 16 Section "Grounding and Bonding."
- H. Connect wiring according to Division 16 Section "Conductors and Cables."

### 3.2 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
  - 1. Verify that shipping, blocking, and bracing are removed.
  - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
  - 3. Verify that cleaning and adjusting are complete.
  - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
  - 5. Adjust belt tension.
  - 6. Adjust damper linkages for proper damper operation.
  - 7. Verify lubrication for bearings and other moving parts.
  - 8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
  - 9. Remove and replace malfunctioning units and retest as specified above.
- B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION

## SECTION 15855

### DIFFUSERS, REGISTERS, AND GRILLES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

##### 1.2 SUBMITTALS

- A. Product Data: For each product indicated, include the following:
  - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
  - 2. Diffuser, Register, and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

##### 2.2 CEILING DIFFUSER OUTLETS

- A. Louver Face Diffuser:
  - 1. Products:
    - a. METALAIRE, Inc., Metal Industries Inc..
    - b. Price Industries.
    - c. Kruger.
  - 2. Material: **Steel.**
  - 3. Finish: **Baked enamel, white**
  - 4. Face Size: 24 x 24.
  - 5. Mounting: **T-bar.**
  - 6. Pattern: **Four-way.**
  - 7. Dampers: **Radial opposed blade.**
  - 8. Accessories:
    - a. Square to round neck adaptor.



## 2.3 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

### 3.2 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

## SECTION 15950

### TESTING, ADJUSTING, AND BALANCING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Balancing Air Systems:
    - a. Constant-volume air systems.

##### 1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An entity engaged to perform TAB Work.

##### 1.3 SUBMITTALS

- A. Strategies and Procedures Plan: Within **30** days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- B. Certified TAB reports.

##### 1.4 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by **AABC or NEBB**.
  - 1. TAB Field Supervisor: Employee of the TAB contractor and certified by **AABC or NEBB**.
  - 2. TAB Technician: Employee of the TAB contractor and who is certified by **AABC or NEBB** as a TAB technician.
- B. Certify TAB field data reports and perform the following:
  - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
  - 2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- C. TAB Report Forms: Use standard TAB contractor's forms approved by **Architect**.

- D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

## PART 2 - PRODUCTS (Not Applicable)

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, flow-control devices, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine equipment performance data including fan curves.
  - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
  - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- G. Examine test reports specified in individual system and equipment Sections.
- H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- I. Examine operating safety interlocks and controls on HVAC equipment.
- J. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

### 3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system-readiness checks and prepare reports. Verify the following:
  - 1. Permanent electrical-power wiring is complete.

2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance dampers are open.
5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
6. Windows and doors can be closed so indicated conditions for system operations can be met.

### 3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "**National Standards for Total System Balance**" or NEBB's "**Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems**" and in this Section.
  1. Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."
- B. Cut insulation, ducts, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
  1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
  2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 15 Section "HVAC Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in **inch-pound (IP)** units.

### 3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.
- I. Check condensate drains for proper connections and functioning.
- J. Check for proper sealing of air-handling-unit components.

- K. Verify that air duct system is sealed as specified in Division 15 Section "Metal Ducts."

### 3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
  - 1. Measure total airflow.
    - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.
  - 2. Measure fan static pressures as follows to determine actual static pressure:
    - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    - b. Measure static pressure directly at the fan outlet or through the flexible connection.
    - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
    - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
  - 3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
    - a. Report the cleanliness status of filters and the time static pressures are measured.
  - 4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
  - 5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
  - 6. Obtain approval from **Architect** for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 15 Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
  - 7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
  - 1. Measure airflow of submain and branch ducts.
    - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
  - 2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
  - 3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

- C. Measure air outlets and inlets without making adjustments.
  - 1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
  - 1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
  - 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

### 3.6 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
  - 1. Manufacturer's name, model number, and serial number.
  - 2. Motor horsepower rating.
  - 3. Motor rpm.
  - 4. Efficiency rating.
  - 5. Nameplate and measured voltage, each phase.
  - 6. Nameplate and measured amperage, each phase.
  - 7. Starter thermal-protection-element rating.

### 3.7 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record compressor data.

### 3.8 PROCEDURES FOR HEAT-TRANSFER COILS

- A. Measure, adjust, and record the following data for each refrigerant coil:
  - 1. Dry-bulb temperature of entering and leaving air.
  - 2. Wet-bulb temperature of entering and leaving air.
  - 3. Airflow.
  - 4. Air pressure drop.
  - 5. Refrigerant suction pressure and temperature.

### 3.9 TOLERANCES

- A. Set HVAC system's air flow rates within the following tolerances:
  - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: **Plus or minus 10 percent.**
  - 2. Air Outlets and Inlets: **Plus or minus 10 percent.**

### 3.10 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: Prepare **biweekly** progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

### 3.11 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
  - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
  - 2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
  - 1. Fan curves.
  - 2. Manufacturers' test data.
- C. General Report Data: In addition to form titles and entries, include the following data:
  - 1. Title page.
  - 2. Name and address of the TAB contractor.
  - 3. Project name.
  - 4. Project location.
  - 5. Architect's name and address.
  - 6. Engineer's name and address.
  - 7. Contractor's name and address.
  - 8. Report date.
  - 9. Signature of TAB supervisor who certifies the report.
  - 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
  - 11. Summary of contents including the following:
    - a. Indicated versus final performance.
    - b. Notable characteristics of systems.
    - c. Description of system operation sequence if it varies from the Contract Documents.
  - 12. Nomenclature sheets for each item of equipment.
  - 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
  - 14. Notes to explain why certain final data in the body of reports vary from indicated values.
  - 15. Test conditions for fan performance forms including the following:
    - a. Settings for outdoor-, return-, and exhaust-air dampers.
    - b. Conditions of filters.

- c. Cooling coil, wet- and dry-bulb conditions.
  - d. Fan drive settings including settings and percentage of maximum pitch diameter.
  - e. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:
  - 1. Quantities of outdoor, supply, return, and exhaust airflows.
  - 2. Duct, outlet, and inlet sizes.
  - 3. Balancing stations.
  - 4. Position of balancing devices.

### 3.12 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION



## SECTION 16010

### BASIC ELECTRICAL REQUIREMENTS

August 9, 2022

#### 1. PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Basic Electrical Requirements specifically applicable to Division 15 and 16 Sections, in addition to Division 1 - General Requirements.

##### 1.2 SCOPE OF WORK

- A. Provide conductors, panels, lighting, wiring devices, fusible safety switches and other required materials and labor to produce complete and operating electrical system as shown on drawing for the new Transylvania County Emergency Services Base, Transylvania County, North Carolina.

Provide conduit controls for all equipment in project (review HVAC sheets for HVAC control locations). Coordinate conduit installation with HVAC contractor prior to installation.

Provide power wiring and conduit for all equipment in project.

- B. Obtain all permits, pay all fees and request inspection from authority having jurisdiction.
- C. All work and materials shall be guaranteed for one year from date of substantial completion.
- D. Questions - Please email ([derek@simseengineers.com](mailto:derek@simseengineers.com)) questions to Engineer in lieu of telephone calls. This allows us to better understand the questions and respond when not present to receive telephone calls.

##### 1.3 WORK SEQUENCE

- A. Visit site before submitting bid to confirm existing conditions. Notify Engineer of discrepancies in the Contract Documents and existing conditions.

##### 1.4 SUBMITTALS

- A. Submit under provisions of Contract Documents.
- B. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal. Identify items with marks to match those shown on drawings.
- C. Mark dimensions and values in units to match those specified.
- D. Architect shall approve all colors.
- E. All submittals shall have the Contractor's stamp, with approval signature.
- F. Highlight deviations from specified materials.
- G. Shop Drawings: 6 sets, including 3 for maintenance manuals. See H below for materials included.
- H. Product Data: 6 sets, including 3 sets for maintenance manuals. Data shall include the following, but not limited to:
  - Lighting Fixtures
  - Wiring Devices
  - Panelboards
  - Disconnect Switches
  - UL Designs for Sealing Penetrations thru all rated construction
- I. Certifications: 3 copies
- J. Test Reports: 3 copies
- K. Warranties (Guarantees): 6 copies, including 3 for maintenance manuals.

- L. Maintenance Manuals: 3 complete sets with individual sets each of this data bound in 10 1/2 x 11 1/2 loose-leaf 3-ring binders, 1 1/2", 2", or 3" ring size, with rigid permanent vinyl covered back and front. Separators with index tabs and loose-leaf sheet protectors shall be provided. One set shall have all sheets individually encased in clear, plastic document protectors.

#### 1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable State and Local Building Codes.
- B. Fire Protection: Conform to NFPA 72.
- C. Electrical: National Electric Code, NFPA 70.
- D. Life Safety Code, NFPA 101.
- E. All Codes shall be the latest edition.
- F. The Contractor shall install all materials in accordance with the State and Local Building Code. Any work that does not comply shall be made to comply at the contractor's expense.
- G. All equipment shall be UL or ETL-approved for purpose specified.
- H. Install all materials in accordance with manufacturer's instructions.
- I. Telephone installation and materials shall be in accordance with and coordinated with utility.

#### 1.6 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- B. Prepare record drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding. Submit all changes on Record Documents as a requirement of Project Closeout.
- C. Refer to Architectural Drawings for dimensions, Locations, cabinets, etc. Do not scale Electrical Drawings.
- D. Conceal all materials except where the Architect grants specific permission to do otherwise.
- E. Arrange electrical work in a neat, well organized manner with conduit running parallel with primary lines of the building construction.
- F. Locate operating and control equipment properly to provide easy access, and arrange electrical work with adequate access for operation and maintenance.
- G. Give right-of-way to piping which must slope for drainage.
- H. Advise other trades of openings required in their work for the subsequent move-in of large units of electrical work (equipment).
- I. Coordination Drawings: For locations where several elements of electrical (or combined mechanical and electrical) work must be sequenced and positioned with precision in order to fit into the available space, prepare coordination drawings (shop drawings) showing the actual dimensions (at accurate scale) required for the installation. Prepare and submit coordination drawings prior to purchase-fabrication-installation of any of the elements involved in the coordination.

#### 1.7 SUBSTITUTIONS:

All products listed are to establish design and quality standards, not to limit submittals. Substitutions may be accepted if approved as equivalent. Contact engineer prior to bid with any questions. If substitutes are not submitted within 14 days after the bid is accepted, then the equipment shall be provided as specified. Contractor submitting substitutions shall be responsible for any additional cost resulting from the substitution.

- 1.8 CONTROL DATA: Provide control diagrams and wiring diagrams where applicable; include description of control systems, catalog data, maintenance, and calibration instruction for all components.  
Provide name and address of Control manufacturer.
- 1.9 MAINTENANCE INSTRUCTION: Typewritten instructions for maintenance of the systems and with time schedule, shall be furnished. The instructions shall list each item of electrical equipment requiring inspection, lubrication or service and describe the performance of such maintenance. The operating personnel shall be instructed in the care of the system in accordance with the typewritten instructions.

## 1.10 EXCAVATING FOR ELECTRICAL WORK

- A. General: The work of this article is defined to include whatever excavating and backfilling (but excluding insulating backfill) is necessary to install the electrical work. Coordinate the work with other excavating and backfilling in the same area, including dewatering, floor protection provisions, and other temporary facilities. Coordinate the work with other work in the same area, including other underground services, landscape development, paving, and floor slabs on grade. Coordinate with weather conditions and provide temporary facilities needed for protection and proper performance of excavating and backfilling.
- B. General Standards: Except as otherwise indicated, comply with the applicable provisions of the Division 2 sections, for plumbing work excavating and backfilling. Refer instances of uncertain applicability to the Engineer for resolution before proceeding.
- C. Rock Excavation shall be defined as the removal of a formation that cannot be excavated without systematic drilling and blasting or without the use of pneumatic tools. All rock excavation/removal shall be performed by the General Contractor. The Plumbing, Mechanical, and Electrical subcontractors shall lay out their work and perform all normal or earth excavation. Should these subcontractors encounter rock (bulk or trench), it shall be removed by the General Contractor using allowable funds. The General Contractor shall be responsible for providing fill material for backfill of rock excavations.
- D. Sequencing: Delay backfill and encasement of conduit until testing of conductors has been completed.

## 2. PART 2 GENERAL DESCRIPTION OF WORK

### 2.1 Coordinate work with other Trades.

### 2.2 General:

- A. Provide all new lighting fixtures, wiring devices, conductors, switches, receptacles, disconnects, fuses, and other required materials. Coordinate electrical requirements for equipment supplied by other trades prior to ordering electrical materials.
- B. Identify major equipment with Lamicor labels.
- C. Provide typed panelboard directories.
- D. Gang mount switches. Provide continuous face plate.
- E. Electrical Contractor shall provide all penetrations and patching required to install electrical work.
- F. Coordinate receptacle locations and floor box locations with Architect.

### 2.3 Conductors:

- A. Single conductors shall be copper with THHN (unless otherwise noted) insulation. Single conductors underground or under slab shall be type XHHW.
- B. Type MC cable may be used for interior, concealed feeders and concealed branch circuits. Where cable would otherwise be exposed (e.g., panelboard get-aways), it shall be installed in conduit. If type MC is used underground or under slab, it shall have a PVC jacket and shall be installed in conduit.

### 2.4 Conduit:

- A. Above grade: EMT.  
Below grade: Schedule 40 PVC for horizontal runs with IMC risers. Protect below grade runs in accordance with the NEC. Provide a warning tape 6" below grade.
- B. Independently support conduit with threaded rods and hangers, trapeze hangers, channel and clamps or other approved method from building structure.
- C. Conduit fittings and couplings: Shall be steel compression type.

2.5 Support lighting fixtures from building structure.

### 3. PART 3 ELECTRICAL WORK CLOSEOUT

- 3.1 General: Refer to the Division 1 sections for general closeout requirements. Maintain a daily log of operational data on electrical equipment and systems through the closeout period; record hours of operation, assigned personnel, fuel consumption and similar information; submit copy to Owner.
- 3.2 Record Drawings: For electrical work, give special attention to the complete and accurate recording of underground conduit, circuits, and other concealed and non-accessible work, service entry, panels, lighting fixtures, disconnects, other major pieces of equipment, and work of change orders where not shown accurately by contract documents. Submit to Engineer at end of project one set of reproducible sepia's that show all recorded changes in the electrical work.
- 3.3 Closeout Equipment/Systems Operations: Sequence operations properly so that work of project will not be damaged or endangered. Coordinate with seasonal requirements. Operation each item of equipment and each system in a test run of appropriate duration (with the Engineer present, and with the Owner's operating personnel present), to demonstrate sustained, satisfactory performance. Adjust and correct operations as required for proper performance. Clean equipment and lighting fixtures.
- 3.4 Operating Instructions: Conduct a day walk-through instruction seminar for the Owner's personnel to be involved in the continued operation and maintenance of electrical equipment and systems. Explain the identification system, operation diagrams, emergency and alarm provisions, sequencing requirements, seasonal provisions, security, safety, efficiency, and similar features of the systems.
- 3.5 Training: Contractor to provide training on all major equipment, controls, etc., as part of the contract.
- 3.6 Turn-Over of Operations: At the time of substantial completion, turn over the prime responsibility for operation of the electrical equipment and systems to the Owner's operating personnel. However, until the time of final acceptance, provide one full-time employee, who is completely familiar with the work, to consult with and continue training the Owner's personnel.

END OF SECTION

## SECTION 16050

### BASIC ELECTRICAL MATERIALS AND METHODS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Electrical equipment coordination and installation.
  - 2. Sleeves for raceways and cables.
  - 3. Sleeve seals.
  - 4. Common electrical installation requirements.

##### 1.2 SUBMITTALS

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

##### 1.3 QUALITY ASSURANCE

- A. Test Equipment Suitability and Calibration: Comply with NETA ATS, "Suitability of Test Equipment" and "Test Instrument Calibration."

##### 1.4 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
  - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. To allow right of way for piping and conduit installed at required slope.
  - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 8 Section "Access Doors and Frames."
- D. Coordinate electrical testing of electrical, mechanical, and architectural items, so equipment and systems that are functionally interdependent are tested to demonstrate successful interoperability.

## PART 2 - PRODUCTS

### 2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

## PART 3 - EXECUTION

### 3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to raceways and piping systems installed at a required slope.

### 3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, or fire-rated floor and wall assemblies.
- B. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."
- C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- D. Cut sleeves to length for mounting flush with both surfaces of walls.
- E. Seal space outside of sleeves with grout for penetrations of concrete and masonry **and with approved joint compound for gypsum board assemblies.**
- F. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with Division 7 Section "Through-Penetration Firestop Systems."
- G. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

### 3.3 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Through-Penetration Firestop Systems."

END OF SECTION

## SECTION 16060

### GROUNDING AND BONDING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment.

##### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

##### 1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

#### PART 2 - PRODUCTS

##### 2.1 CONDUCTORS

- A. Insulated Conductors: **Copper** wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Stranded Conductors: ASTM B 8.
  - 3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
  - 4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

##### 2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.



1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

## PART 3 - EXECUTION

### 3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. **10** AWG and smaller, and stranded conductors for No. **8** AWG and larger, unless otherwise indicated.
- B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

### 3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
  1. Feeders and branch circuits.
  2. Lighting circuits.
  3. Receptacle circuits.
  4. Single-phase motor and appliance branch circuits.
  5. Three-phase motor and appliance branch circuits.
  6. Flexible raceway runs.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

### 3.3 INSTALLATION

- A. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

END OF SECTION

## SECTION 16075

### ELECTRICAL IDENTIFICATION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Identification for conductors and communication and control cable.
  - 2. Warning labels and signs.
  - 3. Equipment identification labels.

##### 1.2 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

##### 1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.

##### 1.4 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

#### PART 2 - PRODUCTS

##### 2.1 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

- A. Marker Tape: Vinyl or vinyl -cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

##### 2.2 EQUIPMENT IDENTIFICATION LABELS

- A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-blue background. Minimum letter height shall be **3/8 inch (10 mm)**.

## PART 3 - EXECUTION

### 3.1 APPLICATION

- A. Auxiliary Electrical Systems Conductor and Cable Identification: Use marker tape to identify field-installed alarm, control, signal, sound, intercommunications, voice, and data wiring connections.
  - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and cable pull points. Identify by system and circuit designation.
  - 2. Use system of designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
- B. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
  - 1. Labeling Instructions:
    - a. Indoor Equipment: **Self-adhesive, engraved, laminated acrylic or melamine label.** Unless otherwise indicated, provide a single line of text with **1/2-inch- (13-mm-)** high letters on **1-1/2-inch- (38-mm-)** high label; where 2 lines of text are required, use labels **2 inches (50 mm)** high.
    - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label, drilled for screw attachment.
    - c. Elevated Components: Increase sizes of labels and legend to those appropriate for viewing from the floor.
  - 2. Equipment to Be Labeled:
    - a. Panelboards, electrical cabinets, and enclosures.
    - b. Disconnect switches.
    - c. Enclosed circuit breakers.

### 3.2 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
- F. Color-Coding for Phase **and Voltage Level** Identification, 600 V and Less: Use the colors listed below for ungrounded **feeder and branch-circuit** conductors.

1. Color shall be factory applied.
2. Colors for 208/120-V Circuits:
  - a. Phase A: Black.
  - b. Phase B: Red.
  - c. Phase C: Blue.

END OF SECTION

## SECTION 16120

### CONDUCTORS AND CABLES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Building wires and cables rated 600 V and less.
  - 2. Connectors, splices, and terminations rated 600 V and less.
  - 3. Sleeves and sleeve seals for cables.

##### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

##### 1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

#### PART 2 - PRODUCTS

##### 2.1 CONDUCTORS AND CABLES

- A. **Copper** Conductors: Comply with NEMA WC 70.
- B. Conductor Insulation: Comply with NEMA WC 70 for Types **THHN-THWN**.

##### 2.2 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AFC Cable Systems, Inc.
  - 2. Hubbell Power Systems, Inc.
  - 3. O-Z/Gedney; EGS Electrical Group LLC.
  - 4. 3M; Electrical Products Division.

5. Tyco Electronics Corp.

- C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

## 2.3 SLEEVES FOR CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

## 2.4 SLEEVE SEALS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide **the product indicated on Drawings** or a comparable product by one of the following:
1. Advance Products & Systems, Inc.
  2. Calpico, Inc.
  3. Metraflex Co.
  4. Pipeline Seal and Insulator, Inc.
- D. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
1. Sealing Elements: **EPDM** interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
  2. Pressure Plates: **Plastic**. Include two for each sealing element.
  3. Connecting Bolts and Nuts: **Stainless steel** of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## PART 3 - EXECUTION

### 3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: **Copper**. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: **Copper**. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: **Type THHN-THWN, single conductors in raceway.**
- B. Exposed Feeders: **Type THHN-THWN, single conductors in raceway.**
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: **Type THHN-THWN, single conductors in raceway.**
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: **Type THHN-THWN, single conductors in raceway.**
- E. Exposed Branch Circuits, Including in Crawlspace: **Type THHN-THWN, single conductors in raceway.**
- F. Branch Circuits Concealed in Walls, and Partitions: **Type THHN-THWN, single conductors in raceway.**
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: **Type THHN-THWN, single conductors in raceway.**
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- I. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- J. Class 2 Control Circuits: **Type THHN-THWN, in raceway.**

3.3 INSTALLATION OF CONDUCTORS

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 16 Section "Electrical Supports and Seismic Restraints."
- F. Identify and color-code conductors and cables according to Division 16 Section "Electrical Identification."
- G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

I. Wiring at Outlets: Install conductor at each outlet, with at least **12 inches (300 mm)** of slack.

### 3.4 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- D. Cut sleeves to length for mounting flush with both wall surfaces.
- E. Extend sleeves installed in floors **2 inches (50 mm)** above finished floor level.
- F. Size pipe sleeves to provide **1/4-inch (6.4-mm)** annular clear space between sleeve and cable unless sleeve seal is to be installed.
- G. Seal space outside of sleeves with grout for penetrations of concrete and masonry **and with approved joint compound for gypsum board assemblies.**
- H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 7 Section "Joint Sealants."
- I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 7 Section "Through-Penetration Firestop Systems."
- J. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.
- K. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for **1-inch (25-mm)** annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- L. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for **1-inch (25-mm)** annular clear space between cable and sleeve for installing mechanical sleeve seals.

### 3.5 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground exterior-wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.



### 3.6 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 7 Section "Through-Penetration Firestop Systems."

### 3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test **service entrance and feeder conductors, and conductors** for compliance with requirements.
  - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.
- C. Test Reports: Prepare a written report to record the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

## SECTION 16130

### RACEWAYS AND BOXES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

##### 1.2 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, details, and attachments to other work.

##### 1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

#### PART 2 - PRODUCTS

##### 2.1 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. IMC: ANSI C80.6.
- C. EMT: ANSI C80.3.
- D. LFMC: Flexible steel conduit with PVC jacket.
- E. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
  - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
  - 2. Fittings for EMT: **Steel compression** type.

##### 2.2 NONMETALLIC CONDUIT AND TUBING

- A. RNC: NEMA TC 2, **Type EPC-40-PVC**, unless otherwise indicated.

- B. Fittings for RNC: NEMA TC 3; match to conduit or tubing type and material.

## 2.3 METAL WIREWAYS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cooper B-Line, Inc.
  - 2. Hoffman.
  - 3. Square D; Schneider Electric.
- C. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type **1, 3R**, unless otherwise indicated.
- D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- E. Wireway Covers: **Hinged type, Flanged-and-gasketed type as indicated.**
- F. Finish: Manufacturer's standard enamel finish.

## 2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, **ferrous alloy**, Type FD, with gasketed cover.
- C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- D. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- E. Cabinets:
  - 1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
  - 2. Hinged door in front cover with flush latch and concealed hinge.
  - 3. Key latch to match panelboards.
  - 4. Metal barriers to separate wiring of different systems and voltage.
  - 5. Accessory feet where required for freestanding equipment.

## PART 3 - EXECUTION

### 3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: **Rigid steel conduit.**
2. Concealed Conduit, Aboveground: **Rigid steel conduit.**
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): **LFMC.**
5. Boxes and Enclosures, Aboveground: NEMA 250, Type **3R.**

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: **EMT.**
2. Exposed, Not Subject to Severe Physical Damage: **EMT.**
3. Exposed and Subject to Severe Physical Damage: **Rigid steel conduit.** Includes raceways in the following locations:
  - a. Loading dock.
  - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
  - c. Mechanical rooms.
4. Concealed in Ceilings and Interior Walls and Partitions: **EMT.**
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): **FMC**, except use **LFMC** in damp or wet locations.
6. Damp or Wet Locations: **Rigid steel conduit.**
7. Raceways for Optical Fiber or Communications Cable: **EMT.**
8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, **stainless steel** in damp or wet locations.

C. Minimum Raceway Size: **3/4-inch (21-mm)** trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. EMT: Steel Compression Type.

### 3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least **6 inches (150 mm)** away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 16 Section "Electrical Supports and Seismic Restraints."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- H. Raceways Embedded in Slabs:

1. Run conduit larger than **1-inch (27-mm)** trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
  2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
- I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than **200-lb (90-kg)** tensile strength. Leave at least **12 inches (300 mm)** of slack at each end of pull wire.
- K. Raceways for Optical Fiber and Communications Cable: Install as follows:
1. **3/4-Inch (19-mm)** Trade Size and Smaller: Install raceways in maximum lengths of **50 feet (15 m)**.
  2. **1-Inch (25-mm)** Trade Size and Larger: Install raceways in maximum lengths of **75 feet (23 m)**.
  3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.
- L. Flexible Conduit Connections: Use maximum of **72 inches (1830 mm)** of flexible conduit for **recessed and semirecessed lighting fixtures**, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
  2. Use LFMC in damp or wet locations not subject to severe physical damage.
- M. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

### 3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 2 Section "Earthwork" for pipe less than **6 inches (150 mm)** in nominal diameter.
  2. Install backfill as specified in Division 2 Section "Earthwork."
  3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within **12 inches (300 mm)** of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 2 Section "Earthwork."
  4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
  5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
    - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with **3 inches (75 mm)** of concrete.
    - b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of **60 inches (1500 mm)** from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

6. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of conduit.

#### 3.4 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Through-Penetration Firestop Systems."

END OF SECTION

## SECTION 16140

### WIRING DEVICES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
  - 2. Wall-box motion sensors.
  - 3. Snap switches and wall-box dimmers.
  - 4. Solid-state fan speed controls.
  - 5. Wall-switch and exterior occupancy sensors.
  - 6. Communications outlets.
- B. See Division 16 Section "Voice and Data Communication Cabling" for workstation outlets.

##### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.
- D. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

##### 1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
  - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
  - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
  - 3. Leviton Mfg. Company Inc. (Leviton).

4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

## 2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  2. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 5351 (single), 5362 (duplex).
    - b. Hubbell; HBL5351 (single), CR5362 (duplex).
    - c. Leviton; 5891 (single), 5362 (duplex).
    - d. Pass & Seymour; 5381 (single), 5362 (duplex).

## 2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, **non-feed**-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  2. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; GF20.
    - b. Pass & Seymour; 2084.
    - c. Hubbell GF5362.

## 2.4 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  2. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
    - b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
    - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
    - d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).
- C. Pilot Light Switches, 20 A:
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:



2. Products: Subject to compliance with requirements, provide one of the following:
  - a. Cooper; 2221PL for 120 V and 277 V.
  - b. Hubbell; HPL1221PL for 120 V and 277 V.
  - c. Leviton; 1221-PLR for 120 V, 1221-7PLR for 277 V.
  - d. Pass & Seymour; PS20AC1-PLR for 120 V.
3. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."

## 2.5 WALL-BOX DIMMERS

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- B. Control: Continuously adjustable **slider**; with single-pole or three-way switching. Comply with UL 1472.
- C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
  1. 600 W; dimmers shall require no derating when ganged with other devices.

## 2.6 OCCUPANCY SENSORS

- A. Wall-Switch Sensors:
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  2. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 6111 for 120 V, 6117 for 277 V.
    - b. Hubbell; WS1277.
    - c. Leviton; ODS 10-ID.
    - d. Pass & Seymour; WS3000.
    - e. Watt Stopper (The); WSP-200.
  3. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of **900 sq. ft. (84 sq. m)**.

## 2.7 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
  1. Plate-Securing Screws: Metal with head color to match plate finish.
  2. Material for Finished Spaces: **0.035-inch- (1-mm-) thick, satin-finished stainless steel.**
  3. Material for Unfinished Spaces: **Galvanized steel.**
  4. Material for Damp Locations: **Cast aluminum** with spring-loaded lift cover, and listed and labeled for use in "wet locations."
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant **thermoplastic** with lockable cover.

## 2.8 FLOOR SERVICE FITTINGS

- A. Type: Modular, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: **die-cast aluminum solid brass** with satin finish.
- D. Power Receptacle: NEMA WD 6 configuration 5-20R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: **Two modular, keyed, color-coded, RJ-45 Category 5e jacks for UTP cable.**

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
  - 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
  - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
  - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
  - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
  - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  - 4. Existing Conductors:
    - a. Cut back and pigtail, or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pigtailling existing conductors is permitted provided the outlet box is large enough.
- D. Device Installation:
  - 1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
  - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
  - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
  - 4. Connect devices to branch circuits using pigtails that are not less than **6 inches (152 mm)** in length.

5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles **down**, and on horizontally mounted receptacles to the **left**.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

### 3.2 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new, and retest as specified above.

END OF SECTION

SECTION 16511  
INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
  - 1. Interior lighting fixtures, lamps, and ballasts.
  - 2. Emergency lighting units.
  - 3. Exit signs.
  - 4. Lighting fixture supports.
  - 5. Retrofit kits for fluorescent lighting fixtures.
- B. See Division 16 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.

1.2 SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes.
- B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
- C. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, signed by product manufacturer.
- D. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In Interior Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

## 2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.
- C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
- D. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.
- E. Metal Parts: Free of burrs and sharp corners and edges.
- F. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- H. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
  1. White Surfaces: 85 percent.
  2. Specular Surfaces: 83 percent.
  3. Diffusing Specular Surfaces: 75 percent.
  4. Laminated Silver Metallized Film: 90 percent.
- I. Plastic Diffusers, Covers, and Globes:
  1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
    - a. Lens Thickness: At least **0.125 inch (3.175 mm)** minimum unless different thickness is indicated.
    - b. UV stabilized.
  2. Glass: Annealed crystal glass, unless otherwise indicated.

## 2.3 BALLASTS

- A. Electronic Ballasts for Linear Fluorescent Lamps: Comply with ANSI C82.11; **instant**-start type, unless otherwise indicated, and designed for type and quantity of lamps served. Ballasts shall be designed for full light output unless dimmer or bi-level control is indicated.
  1. Sound Rating: **A**.
  2. Total Harmonic Distortion Rating: Less than **20** percent.
  3. Transient Voltage Protection: IEEE C62.41, Category A or better.
  4. Operating Frequency: **20** kHz or higher.

5. Lamp Current Crest Factor: **1.7** or less.
  6. BF: 0.85 or higher.
  7. Power Factor: **0.98** or higher.
- B. Ballasts for Compact Fluorescent Lamps: Electronic programmed rapid-start type, complying with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
1. Lamp end-of-life detection and shutdown circuit.
  2. Automatic lamp starting after lamp replacement.
  3. Sound Rating: A.
  4. Total Harmonic Distortion Rating: Less than 20 percent.
  5. Transient Voltage Protection: IEEE C62.41, Category A or better.
  6. Operating Frequency: 20 kHz or higher.
  7. Lamp Current Crest Factor: 1.7 or less.
  8. BF: 0.95 or higher, unless otherwise indicated.
  9. Power Factor: **0.98** or higher.
  10. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
  11. Ballast Case Temperature: 75 deg C, maximum.
- C. Electromagnetic Ballast for Metal-Halide Lamps: Comply with ANSI C82.4 and UL 1029. Include the following features, unless otherwise indicated:
1. Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
  2. Minimum Starting Temperature: **Minus 22 deg F (Minus 30 deg C)** for single-lamp ballasts.
  3. Normal Ambient Operating Temperature: **104 deg F (40 deg C)**.
  4. Open-circuit operation that will not reduce average life.
  5. Low-Noise Ballasts: Manufacturers' standard epoxy-encapsulated models designed to minimize audible fixture noise.

## 2.4 EXIT SIGNS

- A. Internally Lighted Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
1. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.

## 2.5 LAMPS

- A. Low-Mercury Fluorescent Lamps: Comply with EPA's toxicity characteristic leaching procedure test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.
- B. T8 Rapid-Start **low-mercury** Fluorescent Lamps: Rated 32 W maximum, nominal length **48 inches (1220 mm)**, 2800 initial lumens (minimum), CRI 86 (minimum), color temperature **3500 K**, and average rated life 20,000 hours, unless otherwise indicated.
- C. T8 Rapid-Start **low-mercury** Fluorescent Lamps: Rated 17 W maximum, nominal length of **24 inches (610 mm)**, 1300 initial lumens (minimum), CRI 86 (minimum), color temperature **3500 K**, and average rated life of 20,000 hours, unless otherwise indicated.
- D. Compact Fluorescent Lamps: 4-Pin, **low mercury**, CRI 82 (minimum), color temperature **3500 K**, average rated life of 10,000 hours at 3 hours operation per start, unless otherwise indicated.

1. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
  2. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
  3. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
- E. Metal-Halide Lamps: ANSI C78.1372, with a minimum CRI **65**, and color temperature **4000 K**.

## 2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 16 Section "Electrical Supports and Seismic Restraints" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: **1/2-inch (13-mm)** steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, **1/2-inch (13-mm)** steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, **12 gage (2.68 mm)**.
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, **12 gage (2.68 mm)**.
- F. Rod Hangers: **3/16-inch (5-mm)** minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Comply with NFPA 70 for minimum fixture supports.
- C. Suspended Lighting Fixture Support:
  1. Pendants and Rods: Where longer than **48 inches (1200 mm)**, brace to limit swinging.
  2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
  3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
- D. Connect wiring according to Division 16 Section "Conductors and Cables."

### 3.2 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power and retransfer to normal.
- B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION



SECTION 16521  
EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Exterior luminaires with lamps and ballasts.
  - 2. Luminaire-mounted photoelectric relays.
  - 3. Poles and accessories.

1.2 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

- A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4-M.
- B. Live Load: Single load of **500 lbf (2224 N)**, distributed as stated in AASHTO LTS-4-M.
- C. Ice Load: Load of **3 lbf/sq. ft. (145 Pa)**, applied as stated in AASHTO LTS-4-M Ice Load Map.

1.3 SUBMITTALS

- A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, and finishes.
- B. Shop Drawings: Anchor-bolt templates keyed to specific poles and certified by manufacturer.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with IEEE C2, "National Electrical Safety Code."
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, **provide product indicated on Drawings.**

## 2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
  - 1. LER Tests Incandescent Fixtures: Where LER is specified, test according to NEMA LE 5A.
  - 2. LER Tests HID Fixtures: Where LER is specified, test according to NEMA LE 5B.
- B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.
- J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
  - 1. White Surfaces: 85 percent.
  - 2. Specular Surfaces: 83 percent.
  - 3. Diffusing Specular Surfaces: 75 percent.
- K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- M. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
  - 2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

- a. Color: As selected from manufacturer's standard catalog of colors.
  - b. Color: Match Architect's sample of **manufacturer's standard** color.
  - c. Color: As selected by Architect from manufacturer's full range.
  
- N. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - 1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
  - 2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
  - 3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
  - 4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
    - a. Color: **Black**.
  
- O. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
  - 1. Label shall include the following lamp and ballast characteristics:
    - a. "USES ONLY" and include specific lamp type.
    - b. Lamp tube configuration (twin, quad, triple), base type, and nominal wattage for compact fluorescent luminaires.
    - c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
    - d. Start type (preheat, rapid start, instant start) compact fluorescent luminaires.
    - e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
    - f. CCT and CRI for all luminaires.

## 2.3 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

- A. Comply with UL 773 or UL 773A.
  
- B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at **1.5 to 3 fc (16 to 32 lx)** and off at **4.5 to 10 fc (48 to 108 lx)** with 15-second minimum time delay. [ **Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.** ]
  - 1. Relay with locking-type receptacle shall comply with ANSI C136.10.
  - 2. Adjustable window slide for adjusting on-off set points.

## 2.4 FLUORESCENT BALLASTS AND LAMPS

- A. Ballasts for Low-Temperature Environments:

1. Temperatures **0 Deg F (Minus 17 Deg C)** and Higher: **Electronic** type rated for **0 deg F (minus 17 deg C)** starting and operating temperature with indicated lamp types.

B. Ballast Characteristics:

1. Power Factor: 90 percent, minimum.
2. Sound Rating: Class A.
3. Total Harmonic Distortion Rating: Less than **20** percent.
4. Electromagnetic Ballasts: Comply with ANSI C82.1, energy-saving, high power factor, Class P, automatic-reset thermal protection.
5. Case Temperature for Compact Lamp Ballasts: 65 deg C, maximum.
6. Transient-Voltage Protection: Comply with IEEE C62.41.1 and IEEE C62.41.2, Category A or better.

- C. Low-Temperature Lamp Capability: Rated for reliable starting and operation with ballast provided at temperatures **0 deg F (minus 18 deg C)** and higher.

## 2.5 BALLASTS FOR HID LAMPS

- A. Comply with ANSI C82.4 and UL 1029 and capable of open-circuit operation without reduction of average lamp life. Include the following features unless otherwise indicated:

1. Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
2. Minimum Starting Temperature: **Minus 22 deg F (Minus 30 deg C)**.
3. Normal Ambient Operating Temperature: **104 deg F (40 deg C)**.
4. Ballast Fuses: One in each ungrounded power supply conductor. Voltage and current ratings as recommended by ballast manufacturer.

- B. High-Pressure Sodium Ballasts: Electromagnetic type with solid-state igniter/starter and capable of open-circuit operation without reduction of average lamp life. Igniter/starter shall have an average life in pulsing mode of 10,000 hours at an igniter/starter-case temperature of 90 deg C.

## 2.6 HID LAMPS

- A. High-Pressure Sodium Lamps: ANSI C78.42, CRI 21 (minimum), CCT color temperature [**1900**] K, and average rated life of 24,000 hours, minimum.

1. Dual-Arc Tube Lamp: Arranged so only one of two arc tubes is lighted at one time and, when power is restored after an outage, the cooler arc tube, with lower internal pressure, lights instantly, providing an immediate 8 to 15 percent of normal light output.

- B. Metal-Halide Lamps: ANSI C78.43, with minimum CRI **65**, and CCT color temperature **4000** K.

- C. Pulse-Start, Metal-Halide Lamps: Minimum CRI 65, and CCT color temperature **4000** K.

- D. Ceramic, Pulse-Start, Metal-Halide Lamps: Minimum CRI **80**, and CCT color temperature **4000** K.

## 2.7 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

- A. Structural Characteristics: Comply with AASHTO LTS-4-M.

1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
  2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of **1.1** to obtain the equivalent projected area to be used in pole selection strength analysis.
- B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.
- C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
1. Materials: Shall not cause galvanic action at contact points.
  2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
  3. Anchor-Bolt Template: Plywood or steel.
- D. Handhole: Oval-shaped, with minimum clear opening of **2-1/2 by 5 inches (65 by 130 mm)**, with cover secured by stainless-steel captive screws.
- E. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123M; and with top-plate and mounting bolts to match pole base flange and strength required to support pole, luminaire, and accessories.
- F. Breakaway Supports: Frangible breakaway supports, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS-4-M.

## 2.8 STEEL POLES

- A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of **46,000 psig (317 MPa)**; one-piece construction up to **40 feet (12 m)** in height with access handhole in pole wall.
1. Shape: **Square, straight.**
  2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.
- B. Steel Mast Arms: **Single-arm** type, continuously welded to pole attachment plate. Material and finish same as pole.
- C. Brackets for Luminaires: Detachable, cantilever, without underbrace.
1. Adapter fitting welded to pole, allowing the bracket to be bolted to the pole mounted adapter, then bolted together with **stainless**-steel bolts.
  2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire.
  3. Match pole material and finish.
- D. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.
- E. Steps: Fixed steel, with nonslip treads, positioned for **15-inch (381-mm)** vertical spacing, alternating on opposite sides of pole; first step at elevation **10 feet (3 m)** above finished grade.

- F. Grounding and Bonding Lugs: Welded **1/2-inch (13-mm)** threaded lug, complying with requirements in Division 16 Section "Grounding and Bonding," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.
- G. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.
- H. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.
- I. Galvanized Finish: After fabrication, hot-dip galvanize complying with ASTM A 123/A 123M.
- J. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or with SSPC-SP 8, "Pickling."
  - 2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.
  - 3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
    - a. Color: **As selected by Architect from manufacturer's full range.**

## PART 3 - EXECUTION

### 3.1 LUMINAIRE INSTALLATION

- A. Install lamps in each luminaire.
- B. Fasten luminaire to indicated structural supports.
  - 1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Adjust luminaires that require field adjustment or aiming.

### 3.2 POLE INSTALLATION

- A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
- B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:
  - 1. Fire Hydrants and Storm Drainage Piping: **60 inches (1520 mm)**.
  - 2. Water, Gas, Electric, Communication, and Sewer Lines: **10 feet (3 m)**.
  - 3. Trees: **15 feet (5 m)** from tree trunk.

- C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Division 3 Section "Cast-in-Place Concrete."
- D. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
  - 1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
  - 2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
  - 3. Install base covers unless otherwise indicated.
  - 4. Use a short piece of ~~1/2-inch-~~ (13-mm-) diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.
- E. Raise and set poles using web fabric slings (not chain or cable).

### 3.3 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Division 16 Section "Raceways and Boxes." In concrete foundations, wrap conduit with ~~0.010-inch-~~ (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

### 3.4 GROUNDING

- A. Ground metal poles and support structures according to Division 16 Section "Grounding and Bonding."
  - 1. Install grounding electrode for each pole unless otherwise indicated.
  - 2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
- B. Ground nonmetallic poles and support structures according to Division 16 Section "Grounding and Bonding."
  - 1. Install grounding electrode for each pole.
  - 2. Install grounding conductor and conductor protector.
  - 3. Ground metallic components of pole accessories and foundations.

END OF SECTION

## SECTION 313116 - TERMITE CONTROL

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Soil treatment.

#### 1.2 PREINSTALLATION MEETINGS

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

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include the EPA-Registered Label for termiticide products.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product certificates.

- B. Soil Treatment Application Report: Include the following:

1. Date and time of application.
2. Moisture content of soil before application.
3. Termiticide brand name and manufacturer.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes used, and rates of application.
6. Areas of application.
7. Water source for application.

- C. Sample Warranties: For special warranties.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located and who employs workers trained and approved by manufacturer to install manufacturer's products.



## 1.6 WARRANTY

- A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied soil termiticide treatment will prevent infestation of subterranean termites, **including Formosan termites (*Coptotermes formosanus*)**. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

1. Warranty Period: **Five** years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 SOIL TREATMENT

- A. Termiticide: EPA-Registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. Bayer Environmental Science.
  - b. Ensysstex, Inc.
  - c. Master Builders Solutions.
  - d. Syngenta Crop Protection, LLC.
2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than **five** years against infestation of subterranean termites.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Remove extraneous sources of wood cellulose and other edible materials, such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.
- B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated.

### 3.2 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.

1. Slabs-on-Grade and Basement Slabs: Underground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
  2. Foundations: Soil adjacent to and along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing.
  3. Crawlspace: Soil under and adjacent to foundations. Treat adjacent areas, including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
  4. Masonry: Treat voids.
  5. Penetrations: At expansion joints, control joints, and areas where slabs and below-grade walls will be penetrated.
- B. Post warning signs in areas of application.
- C. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 313116

## SECTION 323113 - CHAIN LINK FENCES AND GATES

### 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. Chain-link fences.
- 2. Swing gates.

#### 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 for the following:
  - a. Fence and gate posts, rails, and fittings.
  - b. Chain-link fabric, reinforcements, and attachments.
  - c. Gates and hardware.

- B. Shop Drawings: For each type of fence and gate assembly.

- 1. Include plans, elevations, sections, details, and attachments to other work.
- 2. Include accessories, hardware and operational clearances.

- C. Samples for Initial Selection: For each type of factory-applied finish.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of chain-link fence and gate.
- B. Sample Warranty: For special warranty.

#### 1.5 FIELD CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

## 1.6 WARRANTY

- A. Special Warranty: **Manufacturer and Installer agrees** to repair and/or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Failure to comply with performance requirements.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    - c. Faulty operation of gate operators and controls.
  2. Warranty Period: **Five (5) years** from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:
1. Fabric Height: 72"
  2. Steel Wire for Fabric: Wire diameter of **0.164 inch (8 ga.)**.
    - a. Mesh Size: **2 inches (50 mm)**.
    - b. Polymer-Coated Fabric: ASTM F 668, **Class 2b** over **Zn-5-Al-MM-alloy-coated** steel wire.
      - 1) Color: **Dark green**, according to ASTM F 934.
    - c. Coat selvage ends of metallic-coated fabric before the weaving process with manufacturer's standard clear protective coating.
  3. Selvage: **Knuckled at top and twisted at bottom selvages**

### 2.2 FENCE FRAMEWORK

- A. Posts and Rails: ASTM F 1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to the following:
1. Fence Height: **72 inches (1830 mm)**.
  2. Light-Industrial-Strength Material: **Group IC-L, round steel pipe, electric-resistance-welded pipe**.
    - a. Line Post: **Sch. 40 - 2.0 inches diameter**.
    - b. End, Corner, and Pull Posts: **Sch. 40 2.0 inches diameter**.

3. Horizontal Framework Members: **top** rails according to ASTM F 1043.
  - a. Top Rail: **1.66 inches (42 mm) in diameter.**
4. Metallic Coating for Steel Framework:
  - a. External, Type B: Zinc with organic overcoat, consisting of a minimum of **0.9**  
Type C: Zn-5-Al-MM alloy, consisting of not less than **1.8-oz./sq. ft. (0.55-  
kg/sq. m)** coating.
5. Polymer coating over metallic coating.
  - a. Color: **Dark green** according to ASTM F 934.

## 2.3 TENSION WIRE

- A. Metallic-Coated Steel Wire: **0.177-inch- (4.5-mm-)** diameter, marcelled tension wire according to ASTM A 817 or ASTM A 824, with the following metallic coating:
  1. Type III: Zn-5-Al-MM alloy with the following minimum coating weight:
    - a. Class 60: Not less than **0.6 oz./sq. ft. (183 g/sq. m)** of uncoated wire surface.
    - b. Class 100: Not less than **1 oz./sq. ft. (305 g/sq. m)** of uncoated wire surface.
    - c. Matching chain-link fabric coating weight.
- B. Polymer-Coated Steel Wire: **0.177-inch- (4.5-mm-)** diameter, tension wire according to ASTM F 1664, **Class 2a** over **Zn-5-Al-MM-alloy-coated** steel wire.
  1. Color: **Dark green**, according to ASTM F 934.

## 2.4 SWING GATES

- A. General: One double (16'-0" total opening) gate framing to be reused. Install new hardware latch and vertical rod. Repaint existing framing and install new chain link fabric to existing frames.

Provide (1) one new passage gates.

1. Passage Gate Leaf Width: **36 inches (914 mm).**
2. Framework Member Sizes and Strength: Based on gate fabric height of **72 inches (1830 mm) or less as indicated.**
- B. Pipe and Tubing:
  1. Zinc-Coated Steel: ASTM F 1043 and ASTM F 1083; **protective coating and finish to match fence framework.**
  2. Gate Posts: **Round tubular steel.**
- C. Frame Corner Construction: **Welded or assembled with corner fittings.**

- D. Extended Gate Posts and Frame Members: Fabricate gate posts and frame end members to extend **12 inches (300 mm)** as indicated above top of chain-link fabric at both ends of gate frame assemblies.
- E. Hardware:
  - 1. Hinges: **360-degree inward and outward** swing.
  - 2. Latch: Permitting operation from both sides of gate **with provision for padlocking accessible from both sides of gate.**

## 2.5 FITTINGS

- A. Provide fittings according to ASTM F 626.
- B. Post Caps: Provide for each post.
  - 1. Provide line post caps with loop to receive tension wire or top rail.
- C. Rail and Brace Ends: For each gate, corner, pull, and end post.
- D. Rail Fittings: Provide the following:
  - 1. Top Rail Sleeves: **Pressed-steel or round-steel tubing** not less than **6 inches (152 mm)** long.
  - 2. Rail Clamps: Line and corner boulevard clamps for connecting **intermediate and bottom** rails to posts.
- E. Tension and Brace Bands: **Pressed steel.**
- F. Tension Bars: **Steel**, length not less than **2 inches (50 mm)** shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- G. Truss Rod Assemblies: **Steel, hot-dip galvanized after threading** rod and turnbuckle or other means of adjustment.
- H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
  - 1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:
    - a. Hot-Dip Galvanized Steel: **0.106-inch- (2.69-mm-)** diameter wire; **galvanized coating thickness matching coating thickness of chain-link fence fabric.**
- I. Finish:
  - 1. Metallic Coating for Pressed Steel or Cast Iron: Not less than **1.2 oz./sq. ft. (366 g/sq. m)** of zinc.
    - a. Polymer coating over metallic coating.

## 2.6 GROUT AND ANCHORING CEMENT

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout, recommended in writing by manufacturer, for exterior applications. Use grout where existing post are being replaced.
- B. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
  - 1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 CHAIN-LINK FENCE INSTALLATION

- A. Install chain-link fencing according to ASTM F 567 and more stringent requirements specified.
  - 1. Install fencing on established boundary lines inside property line.
- B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil. See drawings.
- C. Post Setting: Set posts **in concrete** at indicated spacing into firm, undisturbed soil.
  - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
  - 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
    - a. Exposed Concrete: Extend **2 inches (50 mm)** above grade; shape and smooth to shed water.
    - b. Concealed Concrete: Place top of concrete below slab elevation **as indicated on Drawings** to allow covering with surface material.
    - c. Posts Set into Holes in Concrete: Form or core drill holes not less than depth indicated on the drawings and **2 inch** larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with **anchoring cement**, mixed and placed according to anchoring material

manufacturer's written instructions. Finish anchorage joint to slope away from post to drain water.

- D. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of **30 degrees or more**. For runs exceeding **500 feet (152 m)**, space pull posts an equal distance between corner or end posts unless otherwise noted on the drawings.
- E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.
- F. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Pull wire taut, without sags. Fasten fabric to tension wire with **0.120-inch- (3.05-mm-)** diameter hog rings of same material and finish as fabric wire, spaced a maximum of **24 inches (610 mm)** o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:
  - 1. Extended along **bottom** of fence fabric. Install bottom tension wire within **3 inches** of bottom of fabric and tie to each post with not less than same diameter and type of wire.
- G. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
- H. Chain-Link Fabric: Apply fabric to **outside** of enclosing framework. Leave **1-inch (25-mm)]** bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- I. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than **15 inches (380 mm)** o.c.
- J. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
  - 1. Maximum Spacing: Tie fabric to line posts at **12 inches (300 mm)** o.c. and to braces at **24 inches (610 mm)** o.c.
- K. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side.

END OF SECTION 323113



# APPENDIX "A"



Geotechnical Exploration  
Emergency Services Facility  
Brevard, North Carolina  
S&ME Project No. 210173

PREPARED FOR:

**Transylvania County  
152 Public Safety Way  
Brevard, North Carolina 28712**

PREPARED BY:

**S&ME, Inc.  
44 Buck Shoals Road  
Arden, North Carolina 28704**

**January 28, 2021**



January 28, 2021

Transylvania County  
152 Public Safety Way  
Brevard, North Carolina 28712

Attention: Mr. David McNeill

Reference: **Geotechnical Exploration Report  
Emergency Services Facility**  
Brevard, North Carolina  
S&ME Project No. 210173  
NC PE Firm License No. F-0176

Dear Mr. McNeill:

S&ME, Inc. has completed the geotechnical exploration for the proposed Emergency Services facility in Brevard, North Carolina. This work was performed in general accordance with S&ME Proposal No. 210173 dated January 6, 2021 and the Agreement for Services (S&ME Form AS-071) authorized by Mr. David McNeill on January 11, 2021. The Optional Scope (two additional borings in the proposed parking lot) was approved and performed as part of the overall scope for this project. The purpose of the geotechnical exploration was to help determine site subsurface conditions and to evaluate these conditions relative to site preparation, foundation design, floor slab support, and pavement considerations for the proposed development. The following report presents a brief description of the proposed project, the exploration procedures, the results, and our geotechnical recommendations regarding the above considerations. The Phase I Environmental Site Assessment Report will be issued under separate cover.

We appreciate the opportunity to be of service on this project. If you have any questions concerning the information presented or if we can be of further assistance, please contact us.

Sincerely,

**S&ME, Inc.**

A handwritten signature in blue ink that reads 'Khiya Armstrong'.

Khiya Armstrong, E.I.  
Staff Professional  
karmstrong@smeinc.com

A handwritten signature in blue ink that reads 'Matthew H. McCurdy'.

Matthew H. McCurdy, P.E.  
Principal Engineer  
mmccurdy@smeinc.com





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## **Appendix**

Site Vicinity Map (Figure 1)  
USGS Topographic Map (Figure 2)  
Boring Location Plan (Figure 3)  
Legend to Soil Classification and Symbols  
Boring Logs (B-1 through B-5, P-1 and P-2)  
Field Testing Procedures  
Important Information about Your Geotechnical Report



## 1.0 Project Information

The information contained herein is based on the following:

- Email and phone correspondence between Mr. Larry Reece with Transylvania County, Mr. Richard Worley, AIA Architect, and Mr. Matt McCurdy P.E. with S&ME between December 23, 2020 and January 5, 2021;
- Our review of the *Preliminary Site Study* (Sheet C1) prepared by Mr. Richard Worley dated December 22, 2020, provided in an email on December 23, 2020;
- Our review of aerial imagery and property information for the site from the Transylvania County GIS website and Google Earth™;
- A site visit by Ms. Khiya Armstrong with S&ME on January 12, 2021;
- Our previous geotechnical explorations and construction experience on two adjacent properties including the Habitat for Humanity Thrift Store site (exploration performed in 2005) and the Ecusta Road/Sylvan Sports Warehouse site (exploration performed in 2016).

Based on the above information, we understand that Transylvania County is considering purchase of land to construct a new Emergency Services Facility in Brevard, North Carolina (see the Site Vicinity Map Figure 1 the USGS Topographic Map Figure 2 in the Appendix). The site is bordered by Morris Road to the south, the Brevard Community Church to the west, a residential property to the north, and commercial properties to the east. The subject property is a moderately wooded 2.25-acre vacant lot (PIN: 8597-31-1079-000). The proposed facility will be constructed in the southern portion of the site with a parking lot east of the structure.

Detailed structural information was not available at the time this report was prepared. Based on the provided *Preliminary Site Study*, the Emergency Services Facility will be approximately 9,600 square feet. The building will consist of a central portion serving as the administrative area with three-vehicle truck bays to the north and south. A 3,000-square foot future addition is planned adjacent to the north truck bay. We anticipate the Emergency Services Facility will be single story with high bay ceilings in the truck bay areas. Based on our experience with similar projects, we expect maximum column, wall, and floor live loads will likely be on the order of 50 to 100 kips, 2 to 4 kips per lineal foot, and 100 to 150 pounds per square foot, respectively.

For the purpose of this report, and based on our conversations with Mr. Worley, we have assumed the finished floor elevation of the structure will be about 2125 to 2127 feet above mean sea level (about 1 to 3 feet higher than Morris Road). We expect excavation depths up to 10 to 13 feet near the north end of the building and proposed future expansion area and fill depths up to 5 feet towards the southern portion of the building and in the parking lot. Excavations for new underground utility lines will likely be deeper.

## 2.0 Exploration and Testing

Our field exploration included a visual site reconnaissance by an S&ME professional and performance of 7 soil test borings (B-1 through B-5, P-1, and P-2). The borings were extended to depths ranging between 10 to 40 feet below the existing ground surface. Boring locations were established in the field by our personnel using a handheld GPS device and aerial imagery.



The borings were drilled with a track-mounted Deidrich D-50 drill rig, equipped with an automatic hammer, using hollow-stem augers to advance the boreholes. Split-spoon samples and Standard Penetration Resistance (N-values) were obtained at 2.5-foot intervals in the upper 10 feet, and at 5-foot intervals thereafter. Water levels were recorded at the termination of boring (TOB) and at the end of the day (EOD), then each borehole was backfilled with soil cuttings and a mechanical hole plug was installed to help reduce borehole settlement.

Following completion of the field work, the split-spoon samples were transported to our laboratory where a Geotechnical Professional visually and manually classified the soils in general accordance with the Unified Soil Classification System (USCS). Boring locations are depicted on the Boring Location Plan (Figure 3) in the Appendix. Because precise survey techniques were not used, the indicated locations should be considered approximate. The classifications and field testing results are presented on the individual Boring Logs in the Appendix, along with a Legend to Soil Classification and Symbols, and the Field Testing Procedures. Ground surface elevations are not shown on the boring logs because detailed topographic information was not available.

## **3.0 Site and Subsurface Conditions**

### **3.1 Surface Features**

As previously mentioned, the site is a moderately wooded undeveloped lot. Most of the lot is covered in low-lying brush and medium to large trees. During our site visit, standing water (a few inches deep) was evident near boring P-1. Based on topographical information from the Transylvania County GIS website and our site visit, the property exhibits approximately 20 feet of relief and slopes down from northwest to southeast. At the west side of the site, the ground surface slopes up relatively steeply to the adjacent church parking lot.

The site is in a broad valley, apparently the result of the historic geologic floodplain of the Davidson River and its tributaries. The river is currently approximately 1/2 a mile east of the site; however, the river (and its tributaries) has likely meandered through the valley over geologic time.

### **3.2 Area Geology**

The site is located within the Brevard Fault Zone at the contact of the Piedmont physiographic province of North Carolina and the Blue Ridge, an area underlain by ancient igneous and metamorphic rocks. The soils encountered in this area are the residual product of in-place physical and chemical weathering of the rock presently underlying the site. In areas not altered by erosion or disturbed by the activities of man, the typical residual soil profile typically consists of clayey soils near the surface, where soil weathering is more advanced, underlain by sandy silts and silty sands.

The boundary between soil and rock is not sharply defined. This transitional zone, termed "partially weathered rock," is normally found overlying parent bedrock. Partially weathered rock is defined, for engineering purposes, as residual material with standard penetration resistance values of at least 50 blows per 6 inches. Weathering is facilitated by fractures, joints, and the presence of less resistant rock types. Consequently, the profile of the partially weathered rock (as well as hard rock) is quite irregular and erratic, even over relatively short horizontal



distances. Also, it is not unusual to find lenses and boulders of hard rock and zones of partially weathered rock within the soil mantle, well above the general bedrock level.

The natural geological profile of portions of the site have been modified/disturbed by past grading activities that have resulted in disturbance of soils and the placement of fill. Disturbed and fill soils can vary in composition and consistency, and the engineering characteristics of these soils can be difficult to predict. Fill can be comprised of a variety of soil types and can also contain debris from building demolition, organics, topsoil, trash, etc. The engineering properties of fill depend primarily on its composition, density, and moisture content. Based on the samples obtained, it does not appear that the fill was monitored by an engineering firm and documented for compaction and moisture characteristics.

Typically, the upper soils along streams, creeks, rivers, drainage features, and in geologic floodplain areas are water-deposited materials (termed alluvium) that have been eroded and washed down from higher ground. These alluvial soils are usually wet, soft, and compressible, having never been consolidated by pressures in excess of their present overburden. Alluvial materials can vary from silts and clays to sand, gravel, cobbles, and boulders, and can contain organic debris.

### **3.3 Subsurface Conditions**

The following is a brief and general description of subsurface conditions encountered at the site. More detailed information is provided on the individual Boring Logs included in the Appendix.

#### *3.3.1 Surface Materials*

The borings initially encountered a thin layer of topsoil (about 2 to 3 inches). However, some of the topsoil could have been removed during the clearing efforts to access the boring locations. As such, topsoil thicknesses could vary from those encountered in the borings and could be thicker than shown on the boring logs.

#### *3.3.2 Existing Fill*

Beneath the topsoil borings B-2 and B-4 encountered existing fill soils extending to depths of approximately 5 ½ and 4 feet below the ground surface, respectively. The fill materials consisted of clayey sand, sandy silt, and sandy lean clay (USCS group symbols of SC, ML, and CL). Varying amounts of rock pieces and roots were observed in the fill and one sample from boring B-2 was mixed with topsoil. Based on visual observation of the split-spoon samples, the moisture content observed in the sampled fill was noted to be moist, or wetter than the estimated standard Proctor optimum moisture contents. Standard penetration resistance values (N-values) in the existing fill ranged between 4 and 7 blows per foot (bpf), indicating a moderately low degree of compaction was achieved. Based on the wetness of the fill, the lower N-values, and the topsoil and roots encountered, it appears the fill was probably not placed with regard for compaction and future structural support and is considered undocumented.

#### *3.3.3 Alluvium*

Alluvial soils (deposited by water) were encountered beneath the topsoil in borings B-1, B-3, P-1, and P-2 and extended to depths between 5 ½ and 12 feet below the ground surface. The sampled alluvium was generally described as moist to very moist (with a couple samples classified as wet – containing free water in the sample)



and consisted of low plasticity and high plasticity silty clay (CL and CH, respectively), sandy lean clay (CL), low and high plasticity clayey silt (ML and MH, respectively), and clayey sand (SC). Varying amounts of roots, sand, clay, and trace rounded rock pieces were observed in the samples. N-values obtained in the alluvium ranged from weight-of-hammer (WOH on the logs; meaning just the weight of the drilling tools pushed the sampler through the soil) to 8 bpf, indicating a very loose to loose relative density for the sands and a very soft to firm consistency for the silts and clays.

#### *3.3.4 Residuum*

Residual soils were encountered beneath the topsoil in boring B-5, beneath the existing fill in borings B-2 and B-4, and beneath the alluvium in borings B-1, B-3, P-1, and P-2. The sampled residuum consisted of very loose to very dense silty sands (SM) and soft to very hard sandy silts or silts (ML). The residual soils contained varying amounts of mica and rock pieces, and many samples were described as moist to very moist. The residuum exhibited standard penetration resistance values (N-values) ranging from 2 to 70 bpf.

Borings B-1, B-2, B-3, B-5, P-1, and P-2 were terminated at their planned termination depths (between 10 and 40 feet below the ground surface) in residual soils.

#### *3.3.5 Partially Weathered Rock*

Partially weathered rock (PWR) is typically defined as a transitional material between very hard soil and rock which has an N-value of at least 50 blows per 6 inches. PWR was encountered as a layer within the residuum in boring B-2, between depths of about 17 to 27 feet below the existing ground surface before transitioning back into residual soil. PWR was also encountered in boring B-4 from about 17 feet to the planned termination depth of 25 feet. The sampled PWR consisted of very hard sandy silt and silt (ML). The N-values recorded in the PWR were between 50/6" (equivalent to 50 blows for 6 inches of spoon advancement) and 50/2".

#### *3.3.6 Subsurface Water*

Subsurface water was measured at termination of boring (TOB) and at the end of the day (EOD) and was encountered in all of the borings at depths ranging between 1 and 11 feet below the ground surface (EOD readings). Some of the water levels may have stabilized at even higher levels if the borings were allowed to stay open for a day or two. Please note, subsurface water levels will fluctuate during the year and from year to year due to such things as seasonal variations, precipitation, nearby creek levels, and construction activity in the area, and could be encountered at different depths in the future.

## **4.0 Conclusions**

The following conclusions and recommendations presented herein are based on information and assumptions concerning structural loads, existing grades and final site grades, our understanding of the proposed project, findings of the subsurface exploration, geotechnical engineering evaluations of encountered subsurface conditions, and experience with similar projects. When reviewing this information, please keep in mind subsurface conditions vary erratically in this geologic area. This is particularly true with previously placed fill, alluvial soils, and groundwater levels. The development and construction team must understand our recommendations are based





on the premise that our personnel will be on-site to observe and document site work, including site preparation, proofrolling, undercutting, excavation, fill placement, and to perform density testing of fills. Proper site preparation and maintenance is very important in helping to providing time- and cost-efficient construction. Our field observations and tests are a vital component in improving the performance and efficiency of the site work.

## **4.1 General Discussion**

The boring data indicates that near-surface soils generally consist of undocumented existing fill along the western property boundary (near borings B-2 and B-4), low consistency alluvial soils towards the southern and eastern property boundary (near borings B-1, B-3, P-1, and P-2), and residual soils towards the north end of the property (near boring B-5). The existing fill extended to depths ranging between 4 and 5½ feet below the ground surface and the alluvium extended to depths between 5½ to 12 feet. Subsurface water was relatively shallow, with depths ranging between 1 foot (in the parking lot area near P-1) to 11 feet below the ground surface (towards the northern side of the proposed building near B-4). We note some of the subsurface water levels could actually be higher than indicated by the borings when allowed to stabilize in open excavations. The shallow subsurface water will impact site preparation and excavation, and dewatering will likely be required.

It is our opinion that the site can be developed for support of the proposed building and pavements; however, special measures will be required. The undocumented existing fill within the building area should be undercut to residual soils. This is because it does not appear it was placed for structural support and contained topsoil and organics that could decay over time. The alluvial soils are typically under-consolidated and will tend to settle excessively and non-uniformly under new loads, and we would expect settlement-related issues for structures and pavements built without remedial site work or special foundations. The most positive approach would be to undercut all of the alluvial soil; however, this does not appear practical due to the depth of the alluvium and the shallow subsurface water. One possible remedial approach is to undercut the alluvial soils encountered in the building areas (and raise grades) so that at least 5 feet of new structural fill can be placed to support the building. This approach was performed for the adjacent Habitat for Humanity ReStore buildings the building appears to be performing satisfactorily. In our experience, this approach has also been successful on other similar sites in western North Carolina, although a small risk of excessive settlement must be accepted by the owner due to the remaining alluvial soils which will not be undercut. If this remedial approach is selected for building support and performed as outlined in this report, shallow spread footings could be used to support the proposed building and a design bearing pressure of up to 2,000 psf could be used in design to size column and wall footings. Based on the borings, approximate ground surface elevations for the County GIS (no survey has been performed), and assumed finished floor elevation, it appears most of the fill and alluvium could be removed by excavating to final grade and/or undercutting about 5 feet deep or less, except at boring B-1 where 12 feet of alluvium was encountered.

An alternative to undercutting in the building area would be to utilize ground improvement with aggregate piers. The aggregate piers generally have a 24- to 36-inch diameter and can be constructed to the required depth below the fill and alluvium to support the building footings and possibly the slab. If this approach is selected for the building area, higher bearing pressures could be available for design (usually 4,000 to 6,000 psf). Aggregate piers were used to support the adjacent Ecusta Road/Sylvan Sports Warehouse.



Pavement areas will likely need to be stabilized with geotextiles and/or crushed stone before structural fill is placed to achieve design grades. Some undercutting of the alluvial soil could also be required. If more than about 5 feet of fill will be placed, an initial thickened soil bridging lift could be considered to stabilize the soft subgrade. The following sections of this report discuss the site preparation and foundation options in more detail.

## **4.2 Site Preparation**

### *4.2.1 Stripping*

Site preparation and fill placement recommendations are for the proposed building and pavement areas. These recommendations should extend at least 10 feet outside the building limits and 5 feet outside pavement areas, where practical. Site preparation should begin with stripping of all unsuitable surface materials. This would include surface vegetation, organic-laden topsoil, trees, bushes and shrubs, roots, remnants of previous construction, and any unstable near-surface soils.

Utility lines may be present throughout the site. For lines that lie within the footprint of the proposed building, we suggest they be relocated 10 feet beyond building lines and their trenches cleaned and properly backfilled. Our experience indicates that the backfill soils for existing utility lines could be poorly compacted. If any utility lines will remain below "green" areas or proposed pavement areas, we suggest that the trench backfill material be carefully evaluated to ensure suitability.

### *4.2.2 Remedial Site Work – Undercutting and Stabilization*

Recommendations for remedial site work within the building and pavement areas are discussed in the following two sections. Any undercutting should extend to at least 10 feet beyond building lines and 5 feet beyond the pavement areas, where applicable. All undercutting should be closely observed by the Geotechnical Engineer or their representative to help confirm the extent and removal of unsuitable materials. We recommend this evaluation also include several backhoe-excavated test pits made by the contractor at the beginning of earthwork (or sooner during the planning phase) in the presence of our representative to observe the character and composition of the fill and alluvial material and subsurface water levels. Additional recommendations can be made in the field if needed.

#### 4.2.2.1 Building and Floor Slab

As previously mentioned, existing fill and low consistency alluvial soils were encountered in the building area to depths ranging between 4 and 12 feet below the existing ground surface. Based on a possible proposed grade of 2,126 feet for the building and the very approximate elevation data available, it appears the existing fill near boring B-4 will likely be excavated to achieve design grades. However, the organic-laden fill near boring B-2 will need to be undercut to residual soils to reduce the risk of settlement-related issues. Unless aggregate piers are used for foundation support, the alluvial soils within the building area (near borings B-1 and B-3) should be partially undercut so that at least 5 feet of new fill can be placed beneath the floor slab. After undercutting, the subgrade in most areas will likely be too soft to begin earthwork without placing a stabilization layer. The stabilization layer could consist of about 1 to 2 feet of crushed stone a possibly a geotextile fabric and/or geogrid for separation or additional support. The actual stabilization layer should be determined in the field based on



conditions encountered during the remedial work and jointly selected by the geotechnical engineer and the contractor. Also, the contractor should be prepared to control groundwater during the remedial work if it is higher than the undercut excavations.

#### **4.2.2.2**      Pavement Areas

The need and extent of stabilization/undercutting in pavement areas will be based on evaluation in the field at the time of construction. We expect the soils in the pavement areas will be unstable after stripping and/or undercutting and during proofrolling, and will need to be stabilized with crushed stone (approximately 1 to 2 feet), and possibly geotextile fabric and/or geogrid, prior to initiating fill placement or construction of the pavements. The crushed stone layer could consist of small surge stone, railroad ballast or No. 57 stone. The fabric could consist of Mirafi HP570 or equivalent, and the geogrid could consist of Tensar TX-160 or equivalent. In favorable weather (hot and dry) the remedial measures may be reduced, but during wet weather the remedial measures will likely be increased.

If more than about 5 feet of fill will be placed in the pavement areas, consideration could be given to placing an initial thickened soil bridging lift for stabilization instead of crushed stone. The bridge lift would consist of a single lift of structural fill soil at a relatively low moisture content, placed about 2 to 3 feet thick and tracked in with a light bulldozer. Subsequent lifts of fill would be compacted in normal thin lifts compacted with sheepsfoot equipment, but heavy rubber-tired equipment should be kept off the area until it is sufficiently stable. The primary consideration for pavement areas is that a stable subgrade be achieved.

The use of a bridge lift should be discussed with the owner and contractor further before being implemented. Because the thick lift is not well compacted, future buildings should not be placed over the bridge lift unless remedial work or special foundations are used.

#### **4.2.3**      *Proofrolling*

At multiple stages during grading (following site preparation, excavation to the design subgrade levels, and after any necessary undercutting), the exposed subgrade should be thoroughly proofrolled with a heavily-loaded, tandem-axle dump truck or similar rubber-tired equipment under the observation of a Geotechnical Engineer or his/her representative. Proofrolling will help reveal the presence of unstable or otherwise unsuitable surface materials and will help densify the exposed subgrade for subsequent structural fill placement and building and pavement support. Areas that are unstable should be undercut or stabilized in place as recommended by the Geotechnical Professional. Because of the existing fill and alluvial soils on site, proofrolling is very important at this site. However, some areas will likely be too soft and wet to proofroll and will need to be evaluated by observation of test pits, hand auger borings, and probing with a small-diameter steel rod.

#### **4.2.4**      *Site Drainage*

Grading activities for demolition and development typically result in areas of soil subgrade being exposed for extended periods with little to no topographic relief to drain surface water runoff. It is important the grading contractor protect the exposed soils from becoming wet or saturated during inclement weather. Positive site drainage should be maintained during all operations, including the initial stripping of the site, undercutting and backfilling, and after excavation to subgrade levels. This may include surface ditches around the perimeter,



internal ditching and in some cases French drains. Failure to provide positive site drainage can result in extensive and costly repairs to the exposed subgrade, as well as construction delays.

### **4.3 Excavation Considerations**

The boring data indicate probable excavations during mass grading and installation of utilities will likely extend through poorly-compacted existing fill near the western side of the building, low consistency alluvium along the eastern side of the building and in the pavement areas, and low to moderate consistency residual soils under the existing fill and near the future expansion area on the north side of the building. We expect the soil materials can be excavated with conventional excavation equipment. That is, mass excavation can be accomplished by front-end loaders, large tracked excavators, and bulldozers. Excavation for shallow foundations and utility trenches can typically be accomplished with a rubber-tired or tracked excavator.

Partially weathered rock was encountered in two of the borings (as shallow as about 17 feet below existing grades and 10 feet below assumed final grades) but this is not within anticipated excavation depths. However, there is always a possibility that rock, boulders, partially weathered rock and very dense soils will be encountered in areas intermediate of the borings or in unexplored areas, and difficult excavation, including blasting, can be required. This is because rock in a weathered, boulder, and massive form varies very erratically in depth and location in this geologic region.

All excavations should be sloped or shored in accordance with local, state, and federal regulations, including OSHA (29 CFR Part 1926) excavation safety standards. We note the Contractor is solely responsible for site safety. This information is provided only as a service and under no circumstances should we be assumed to be responsible for construction site safety.

#### **4.3.1 Subsurface Water**

Subsurface water was encountered as shallow as 1 foot in the pavement areas and between 5 and 11 feet within the building area (or about 5 feet below assumed final grades). Depending on actual final grades, the depth of utility trenches, and undercutting depths, subsurface water will likely be encountered. In utility trenches that encounter subsurface water, about 6 to 12 inches of No. 57 crushed stone bedding is normally required, and the trenches may also need to be backfilled up to the water line with No. 57 stone. If water is encountered during undercutting, it can typically be controlled by pumping from sump pits until initial crushed stone backfill is in place. It is also possible that gravity-flowing French drains could be needed to permanently lower the water levels if they impact the final grades.

### **4.4 Fill Placement and Compaction**

After excavation and undercutting, areas requiring fill placement should be raised to their design subgrade configuration with soil free of deleterious materials. The new fill should have a maximum particle size of 4 inches or less, plasticity index less than 25, and standard Proctor maximum dry density of at least 90 pounds per cubic foot (pcf). The fill should be uniformly spread in 6- to 8-inch thick loose lifts and be compacted to at least 95 percent of the soil's maximum dry density, as determined by a laboratory standard Proctor compaction test (ASTM D698). Since pavement and floor slab support characteristics generally improve with an increase in density, we recommend the upper 1 foot of fill in slab and pavement areas be compacted to a slightly higher degree (98



percent). The moisture content should be controlled at plus to minus 3 percent of optimum; however, a slight increase in optimum moisture could be allowable if the minimum compacted density is achieved and subgrade is stable.

Fill placement should be monitored by a qualified Materials Technician working under the direction of the Geotechnical Engineer. In addition to this evaluation, the Technician should perform a sufficient amount of in-place field density tests to confirm the required degree of compaction is being attained. We recommend that field density tests, including one-point Proctor verification tests, be performed on the fill as it is being placed at a frequency of 1 test per 2,500 square feet per lift in the building and pavement areas and 1 test per lift per 100 linear feet in utility trenches.

#### *4.4.1 Use of Excavated Soils as Fill*

The majority of the soils sampled during this exploration appear challenging or not suitable for reuse in a well-compacted fill to support buildings and pavements. The majority of the sampled soils were wet of their optimum moisture contents and some have a high plasticity (especially the alluvial and fill soils). Drying will be difficult or not reasonably possible. Also, the plasticity index of high plasticity ("fat") clays (USCS Group Symbols CH) is usually too high to be reused as structural fill. For these reasons, most excavated materials will require being wasted in non-structural areas or hauled off-site.

Some of the residual soils could be adaptable for use as well-compacted structural fill with proper moisture adjustment (typically drying, if this can be accomplished). However, most of the residual soils were silts, which are usually lightweight and difficult to keep stable unless very close to optimum moisture content.

#### *4.4.2 Use of Off-Site Borrow Materials as Fill*

We expect the contractor will need to import the majority of the fill and trench backfill soils. Any soils proposed as fill should be evaluated by the Geotechnical Engineer prior to hauling to the site. Imported fill should consist of a clean, sandy material (free of organics and debris), have a maximum particle size no greater than 4 inches, and be of low to moderately low plasticity soil (Liquid Limit less than 50, Plasticity Index less than 25), with a standard Proctor maximum dry density of at least 90 pounds per cubic foot. A Geotechnical Professional should evaluate these soils to determine their suitability prior to grading.

### **4.5 Excavated Slopes and Fill Embankments**

We anticipate new slopes of up to about 5 to 10 feet in height may be required for development of this site. These relatively low height cut slopes in the existing residual soils and well-compacted fill embankments should generally be stable at inclinations no steeper than 2H:1V (horizontal to vertical). Excavated slopes in alluvial soils should be no steeper than 3H:1V. To help reduce erosion, maintenance, and repair, and allow more convenient access for landscaping equipment, we advise all cut and fill slope inclinations be no steeper than 2.5H:1V to 3H:1V, if practical. All fill placed in embankments should be compacted to at least 95 percent of the standard Proctor maximum dry density.

Because of the type soils expected to be encountered in the excavated slopes and used for the fill embankments, erosion of the near surface soils tends to be a maintenance issue over time. Therefore, we advise the face of



slopes and embankments be protected by establishing vegetation with the use of permanent erosion control mats as soon as practical after grading. North American Green has several products (such as EroNet Turf Reinforcement Mat P300 or P550) that can help reduce the amount of erosion.

We recommend the building be setback at least the height of the slope with a minimum of 10 feet from the crests of all slopes. If practical, we recommend new or existing utility lines be located away from the slopes or near their crests. Leaking utility lines and poorly-compacted trench backfills can lead to slope issues including failure.

#### **4.6 Subgrade Repair and Improvement Methods**

The exposed subgrade soil of both excavation and fill areas can deteriorate when exposed to construction activity and environmental changes such as freezing, erosion, softening from ponded rainwater, and rutting from construction equipment. We recommend the exposed subgrade surfaces that have deteriorated be properly repaired by scarifying and recompacting immediately prior to further construction. If this must be performed during wet weather conditions, it would be worthwhile to consider undercutting the deteriorated soil and replacing it with compacted crushed stone.

#### **4.7 Foundation and Floor Slab Recommendations**

##### *4.7.1 Conventional Shallow Spread Footings*

Conventional spread footings can be used for support of the building if a sufficient thickness of new, well-compacted material or residual soils will underlie the foundations and the owner is willing to accept some risk of future settlement. As previously stated, based on our experience with similar conditions, the risks will be somewhat low in our opinion for the anticipated lightly loaded building columns if grading can be performed so that at least 5 feet of new, well-compacted structural fill can be placed under the building. This could be accomplished by undercutting some of the alluvial soils within the building footprint and replacing with new well-compacted structural fill or raising the entire site. If site grades can be raised sufficiently, this could reduce the amount of undercutting required.

If this remedial approach is selected for building support, a design bearing pressure of up to 2,000 psf could be used in design to size column and wall footings. Continuous wall footings should be at least 24 inches wide and column footings should be at least 30 inches wide. This recommendation is to help prevent localized or "punching" shear failure which can occur with very narrow footings. Foundations should bear at least 24 inches below finished exterior grades to provide adequate embedment against frost penetration.

Exposure to the environment will cause the bearing soils to rapidly deteriorate. If surface water runoff collects in any excavation, it should be removed promptly by pumping to help prevent softening of foundation supporting soils. To further reduce the potential for deterioration of bearing soils, we recommend that foundation excavation, evaluation, and placement of concrete be conducted on the same day, if practical. If an excavation is to remain open overnight, if rain is imminent, or if a mat foundation is used, the subgrade should be lowered and a 3- to 4-inch thick mud mat of lean (2,000 psi) concrete placed in the bottom of the excavation to protect the bearing soils. This will help limit the potential for additional excavation of wet, softened soils which often results in footings exposed to inclement weather.



All foundation excavation bottoms should be carefully evaluated by a representative of the Geotechnical Engineer prior to rebar and concrete placement. This evaluation should include the performance of shallow hand auger borings with dynamic cone penetrometer testing in each excavation. These evaluations will help assess whether the individual footings are directly underlain by suitable bearing material. Undercutting some of the footings could be required to penetrate lower-consistency soils. Any undercut areas should be backfilled with NCDOT Size No. 57 crushed stone in up to 1-foot thick lifts consolidated with a vibratory plate tamp or tamped with an excavator bucket.

#### *4.7.2 Spread Footings with Ground Improvement (Compacted Aggregate Piers)*

Depending on the owner's tolerance of risk, another option could be ground improvement. This is typically considered a lower risk option. Also, the undercutting and stabilization described above would probably be reduced or possibly eliminated in the building area. The design and installation of the ground improvement system is typically handled by a design-build specialty contractor. We expect a series of compacted aggregate piers (CAPs) could be installed to support the building. Typically, these are installed beneath the footings only, but they can also be installed on a grid pattern to support the slab and the weight of new fill and reduce differential settlement across the entire structure. The CAPs would need to extend through the fill and alluvial layers and into the residual soils or partially weathered rock. The aggregate piers generally have a 24- to 36-inch diameter and the rigid inclusions are a smaller diameter. With this approach, because the foundations are supported on improved soils and compacted aggregate, higher bearing pressures are usually available for foundation design (typically about 4,000 to 6,000 psf). Although this is a lower risk option and installation would be much faster than undercutting and replacement, it may be more expensive than undercutting in the building area.

#### *4.7.3 Floor Slab Support*

The floor slab can be soil supported, provided the earthwork recommendations discussed in this report are followed and the subgrades are evaluated to be satisfactorily stable by the Geotechnical Engineer. Typically for projects similar to this, we recommend using a 4- to 6-inch thick layer of crushed stone (NCDOT Aggregate Base Course or No. 57 stone) to separate the floor slab from the subgrade soils. This layer will provide a good capillary break, and if placed soon after completion of grading, will help protect the subgrade during construction and exposure to weather. A modulus of subgrade reaction (k) of 125 pci is available for design of the floor slabs over the compacted stone.

Depending on final grades selected, a thicker underslab drainage layer may be required due to the shallow groundwater level. A vapor retarder should be considered beneath the grade slabs to help prevent slab dampness due to the upward migration of soil moisture. The need for a vapor retarder will also be dependent upon the floor covering design and local and state building codes.

#### *4.7.4 Seismic Conditions*

The proposed structure should be designed to resist possible earthquake effects as determined in accordance with Section 1613 of the North Carolina Building Code (NCBC) 2018 Edition (2015 International Building Code with North Carolina Amendments). The NCBC assigns a Seismic Site Class based on the type and thickness of overburden soil materials. Site Class values range from Class A for hard bedrock to Class F for deep deposits of





soft bearing strata. Based on the N-values obtained in the exploration and allowances in the North Carolina Building Code, a Seismic Site Class D should be used in design.

There are no active earthquake fault zones within close proximity to the general area and thus the site vicinity is not known to be subject to concerns of any major geologic hazards such as significant ground shaking, liquefaction, seismically induced slope failures, etc.

#### **4.8 Pre-Construction Meeting**

Because of the subsurface conditions and grading measures required at this site, we strongly recommend that a pre-construction meeting be conducted with the Owner, Civil Engineer, Contractor, Grading Contractor, and a representative of our firm. During this meeting, the recommendations of this report can be discussed, and the most cost-efficient and practical methods can be determined based on input from all parties.

### **5.0 Limitations of Report**

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other representation or warranty, either express or implied, is made.

We relied on project information given to us to develop our conclusions and recommendations. If project information described in this report is not accurate, or if it changes during project development, we should be notified of the changes so that we can modify our recommendations based on this additional information if necessary.

Our conclusions and recommendations are based on limited data from a field exploration program. Subsurface conditions can vary widely between explored areas. Some variations may not become evident until construction. If conditions are encountered which appear different than those described in our report, we should be notified. This report should not be construed to represent subsurface conditions for the entire site.

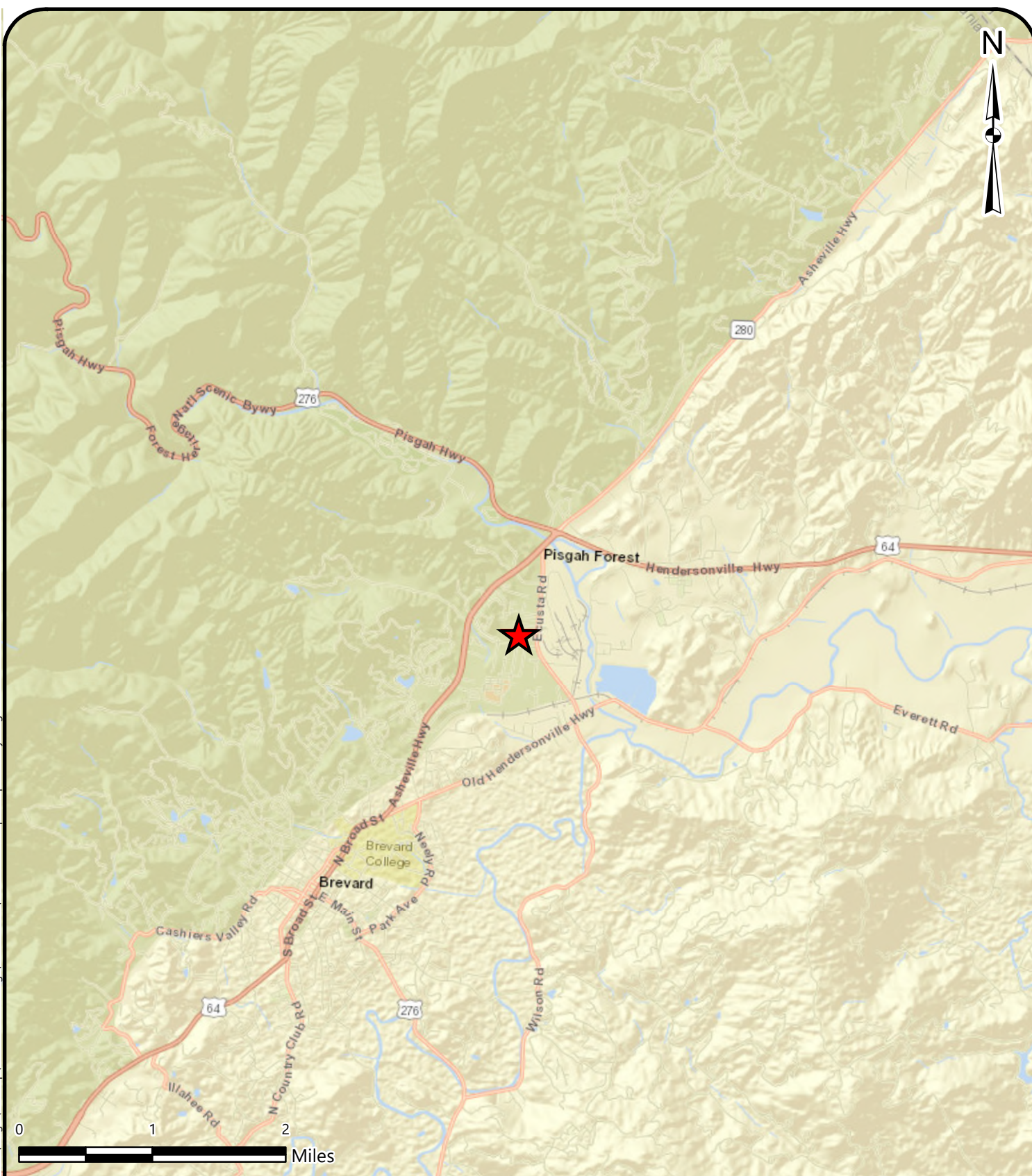
Unless specifically noted otherwise, our field exploration program did not include an assessment of regulatory compliance, environmental conditions or pollutants, or presence of any biological materials (mold, fungi, bacteria). If there is a concern about these items, other studies should be performed. S&ME can provide a proposal and perform these services if requested.

S&ME should be retained to review the final plans and specifications to confirm that earthwork, foundation, and other recommendations are properly interpreted and implemented. The recommendations in this report are contingent on S&ME's review of final plans and specifications followed by our observation and monitoring of earthwork and foundation construction activities.



## Appendix

Drawing Path: C:\Users\lslagle\Desktop\Brevard Phase 1 Figs\Morris Road\Morris Road Map.mxd plotted by lslagle 01-20-2021



**REFERENCE:**

GIS BASE LAYERS WERE OBTAINED FROM ARCGIS ONLINE ESRI STREET MAP. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.



**Project Location**



**VICINITY MAP**

EMERGENCY SERVICES FACILITY  
MORRIS ROAD  
BREVARD, TRANSYLVANIA COUNTY, NORTH CAROLINA

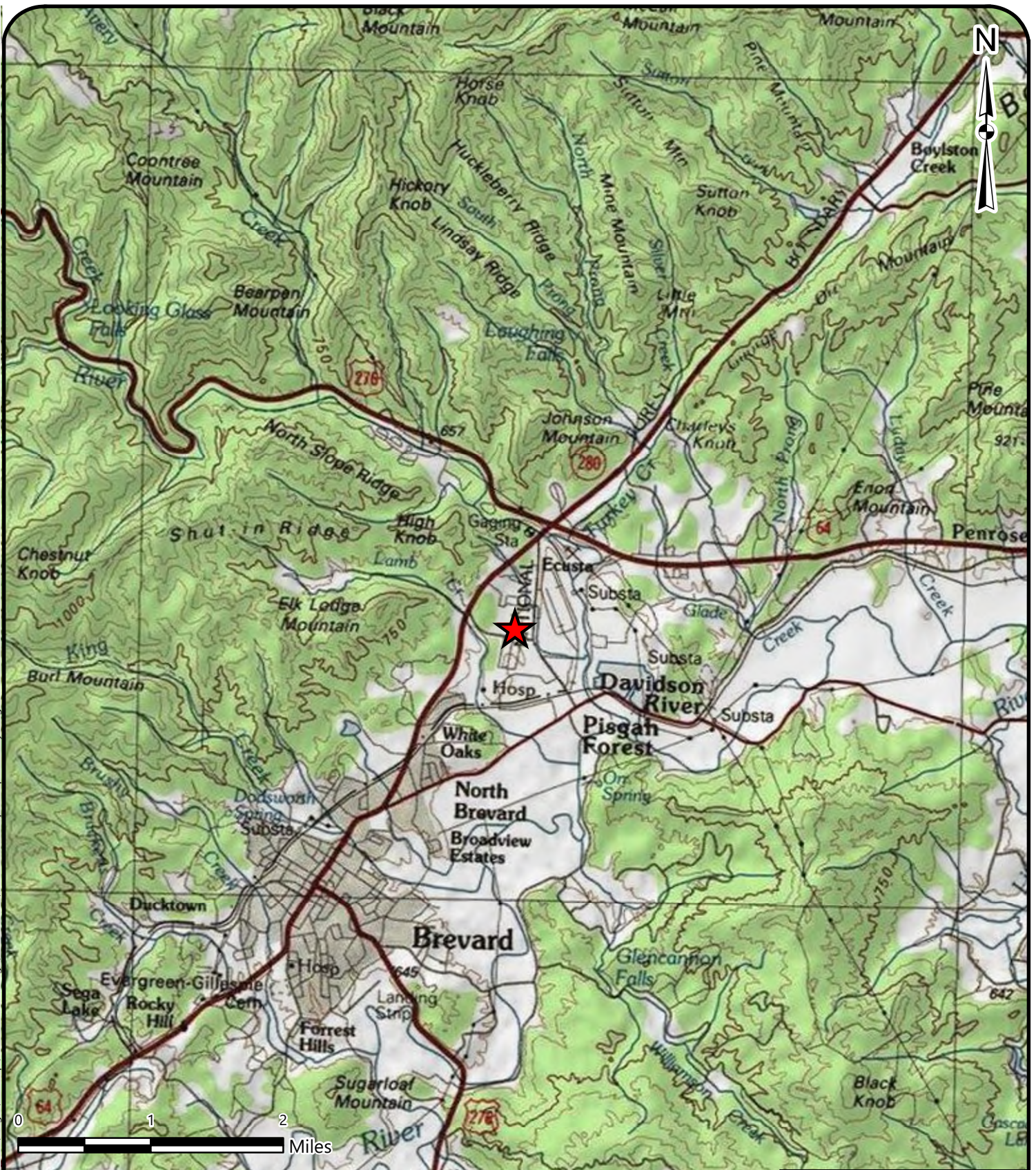
SCALE:  
1 in = 1 miles  
DATE:  
January 2021  
PROJECT NUMBER  
210173

FIGURE NO.

**1**



Drawing Path: C:\Users\Isaiah\Desktop\Brevard Phase 1 Figs\Morris Road\Morris Road Map.mxd plotted by Isaiah 01-20-2021



**REFERENCE:**

GIS BASE LAYERS WERE OBTAINED FROM ARCGIS ONLINE USA TOPO MAP. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.



**Project Location**



**USGS TOPOGRAPHIC MAP**

EMERGENCY SERVICES FACILITY  
MORRIS ROAD  
BREVARD, TRANSYLVANIA COUNTY, NORTH CAROLINA


SCALE:  
1 in = 1 miles  
DATE:  
January 2021  
PROJECT NUMBER  
210173

FIGURE NO.

**2**





	<b>BORING LOCATION PLAN</b>		SCALE: 1 in = 80 ft	FIGURE NO.  <b>3</b>
	EMERGENCY SERVICES FACILITY MORRIS ROAD BREVARD, TRANSYLVANIA COUNTY, NORTH CAROLINA		DATE: January 2021	
			PROJECT NUMBER 210173	

# LEGEND TO SOIL CLASSIFICATION AND SYMBOLS

## SOIL TYPES (USCS CLASSIFICATION)

(Shown in Graphic Log)



Fill



Asphalt



Concrete



Topsoil



Gravel (GW, GM, GP)



Sand (SW, SP)



Silt (ML)



Clay (CL, CH)



Organic (OL, OH)



Silty Sand (SM)



Clayey Sand (SC)



Sandy Silt (ML)



Clayey Silt (MH)



Sandy Clay (CL, CH)



Silty Clay (CL, CH)



Partially Weathered Rock



Cored Rock

## WATER LEVELS

(Shown in Water Level Column)

▽ = Water Level At Termination of Boring

▼ = Water Level Taken After 24 Hours

◀ = Loss of Drilling Water

HC = Hole Cave

## CONSISTENCY OF COHESIVE SOILS

### CONSISTENCY

Very Soft

Soft

Firm

Stiff

Very Stiff

Hard

Very Hard

### STD. PENETRATION RESISTANCE BLOWS/FOOT

0 to 2

3 to 4

5 to 8

9 to 15

16 to 30

31 to 50

Over 50

## RELATIVE DENSITY OF COHESIONLESS SOILS

### RELATIVE DENSITY

Very Loose

Loose

Medium Dense

Dense

Very Dense

### STD. PENETRATION RESISTANCE BLOWS/FOOT

0 to 4

5 to 10

11 to 30

31 to 50

Over 50

## SAMPLER TYPES

(Shown in Samples Column)



Shelby Tube



Split Spoon



Rock Core



No Recovery

## CONSTITUENT MODIFIERS

Trace: <5%

Few: 5 to <15%

Little: 15 to <30%

Some: 30 to <50%

Mostly: 50 to 100%

## TERMS

**Standard Penetration Resistance** - The Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in. I.D. Split Spoon Sampler 1 Foot. As Specified in ASTM D-1586.

**REC** - Total Length of Rock Recovered in the Core Barrel Divided by the Total Length of the Core Run Times 100%.

**RQD** - Total Length of Sound Rock Segments Recovered that are Longer Than or Equal to 4" (mechanical breaks excluded) Divided by the Total Length of the Core Run Times 100%.

**TOB** - Termination of Boring

**N.E.** - Not Encountered





PROJECT: <b>Emergency Services Facility Brevard, North Carolina S&amp;ME Project No. 210173</b>				<b>BORING LOG B-1</b>			
CLIENT: <b>Transylvania County</b>		ELEVATION:		NOTES:			
DATE DRILLED: <b>1/15/21</b>		BORING DEPTH: <b>20.0 ft</b>					
DRILL RIG: <b>Diedrich D-50</b>		WATER LEVEL: <b>8 ft at TOB, 5 ft at EOD</b>					
DRILLER: <b>Jordan Environmental</b>		CAVE-IN DEPTH: <b>16'</b>					
HAMMER TYPE: <b>Automatic</b>		LOGGED BY: <b>K. Armstrong</b>					
SAMPLING METHOD: <b>Split Spoon Samples</b>							
DRILLING METHOD: <b>2 1/4" H.S.A.</b>				STATION:		OFFSET:	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA			SPT N-Value (bpf) ● FINES % ▲					N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	PL	NM	LL			
		<b>TOPSOIL</b> - 3 inches													
		<b>ALLUVIUM: SILTY CLAY (CH)</b> - very soft, gray orange, some roots, trace mica, very moist			SS-1	⊗	1	1	1	●				2	
5		<b>ALLUVIUM: CLAYEY SILT (ML)</b> - firm, brown, some roots, with clay layers, very moist	▼		SS-2	⊗	1	2	3	●				5	
		<b>ALLUVIUM: SILTY CLAY (CH)</b> - soft to very soft, light gray tan dark gray, trace fine sand, trace mica, with sand layer, very moist	▽		SS-3	⊗	1	1	3	●				4	
10					SS-4	⊗	WOH	WOH	WOH	●				WOH	
		<b>RESIDUUM: SILTY SAND (SM)</b> - very loose, brown gray, fine to medium, micaceous, very moist			SS-5	⊗	2	1	1	●				2	
15				HC											
		<b>SILTY SAND (SM)</b> - medium dense, gray tan, fine, trace mica, moist			SS-6	⊗	9	8	11	●				19	
20		Boring terminated at 20 feet													

**NOTES:**

1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJECT: <b>Emergency Services Facility Brevard, North Carolina S&amp;ME Project No. 210173</b>				<b>BORING LOG    B-2</b>						
CLIENT: <b>Transylvania County</b>		ELEVATION:		NOTES:						
DATE DRILLED: <b>1/15/21</b>		BORING DEPTH: <b>40.0 ft</b>								
DRILL RIG: <b>Diedrich D-50</b>		WATER LEVEL: <b>9 ft at TOB, 9 ft at EOD</b>								
DRILLER: <b>Jordan Environmental</b>		CAVE-IN DEPTH: <b>28'</b>								
HAMMER TYPE: <b>Automatic</b>		LOGGED BY: <b>K. Armstrong</b>								
SAMPLING METHOD: <b>Split Spoon Samples</b>										
DRILLING METHOD: <b>2¼" H.S.A.</b>				STATION:		OFFSET:				
DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA	SPT N-Value (bpf) ●  FINES % ▲  PL                  NM                  LL 10   20   30   40   50   60   70   80   90		N VALUE
		<b>TOPSOIL</b> - 3 inches			SS-1	⊗	2       2       2	●		4
		<b>FILL: SANDY LEAN CLAY (CL)</b> - soft, brown, fine to medium, some roots, some rock pieces, moist			SS-2	⊗	3       3       3	●		6
5		<b>FILL: SANDY SILT (ML)</b> - firm, dark brown, fine to medium, some rock pieces, with topsoil and roots, with clay layer, with organic odor, moist			SS-3	⊗	2    12    18	●		30
10		<b>RESIDUUM: SANDY SILT (ML)</b> - very stiff, tan, fine, trace mica, trace rock pieces			SS-4	⊗	10   27   33	●		60
15		<b>SILTY SAND (SM)</b> - very dense to dense, brown gray, fine to medium, with partially weathered rock pieces - - - Sample 4 was moist			SS-5	⊗	12   27   16	●		43
20		<b>PARTIALLY WEATHERED ROCK: SANDY SILT (ML)</b> - very hard, brown gray, coarse, moist			SS-6	⊗	25   34   50/6"	●		>> 50/6"
25					SS-7	⊗	44   50/6"	●		>> 50/6"
30		<b>RESIDUUM: SANDY SILT (ML)</b> - very hard, brown gray, medium to coarse, very moist	HC		SS-8	⊗	6    19    35	●		54
35					SS-9	⊗	19   34   36	●		70
40		<b>SILT (ML)</b> - very stiff, white gray brown, trace fine sand, very moist			SS-10	⊗	7    8    12	●		20
		Boring terminated at 40 feet								

**NOTES:**

1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
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3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



<b>PROJECT:                      Emergency Services Facility</b> <b>                                     Brevard, North Carolina</b> <b>                                     S&amp;ME Project No. 210173</b>					<b>BORING LOG    B-3</b>										
<b>CLIENT: Transylvania County</b>			<b>ELEVATION:</b>		<b>NOTES:</b>										
<b>DATE DRILLED: 1/15/21</b>			<b>BORING DEPTH: 15.0 ft</b>												
<b>DRILL RIG: Diedrich D-50</b>			<b>WATER LEVEL: NE at TOB, 7 ft at EOD</b>												
<b>DRILLER: Jordan Environmental</b>			<b>CAVE-IN DEPTH: 13'</b>												
<b>HAMMER TYPE: Automatic</b>			<b>LOGGED BY: K. Armstrong</b>												
<b>SAMPLING METHOD: Split Spoon Samples</b>															
<b>DRILLING METHOD: 2 1/4" H.S.A.</b>					<b>STATION:</b>		<b>OFFSET:</b>								
DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA			SPT N-Value (bpf) ●  FINES % ▲  PL      NM      LL					N VALUE
		<b>TOPSOIL</b> - 3 inches					1st 6in / RUN #	2nd 6in / REC	3rd 6in / ROD						
		<b>ALLUVIUM: CLAYEY SAND (SC)</b> - loose, orange gray, fine to medium, trace mica, trace rounded rock pieces, very moist			SS-1	⊗	1	3	5	●					8
		<b>ALLUVIUM: SANDY LEAN CLAY (CL)</b> - firm, orange gray, fine, trace rounded rock pieces			SS-2	⊗	3	2	3	●					5
5		<b>RESIDUUM: SILT (ML)</b> - soft, gray, very moist	▼		SS-3	⊗	2	1	2	●					3
		<b>SILT (ML)</b> - firm to stiff, gray tan orange, trace fine sand, very moist to moist			SS-4	⊗	1	3	3	●					6
10				HC											
					SS-5	⊗	2	4	10	●					14
15		Boring terminated at 15 feet													

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3. **STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.**
4. **WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.**





<b>PROJECT:</b> <b>Emergency Services Facility</b> <b>Brevard, North Carolina</b> S&ME Project No. 210173					<b>BORING LOG    B-4</b>				
<b>CLIENT:</b> Transylvania County			<b>ELEVATION:</b>			<b>NOTES:</b>			
<b>DATE DRILLED:</b> 1/15/21			<b>BORING DEPTH:</b> 25.0 ft						
<b>DRILL RIG:</b> Diedrich D-50			<b>WATER LEVEL:</b> 15 ft at TOB, 11 ft at EOD						
<b>DRILLER:</b> Jordan Environmental			<b>CAVE-IN DEPTH:</b> 19'						
<b>HAMMER TYPE:</b> Automatic			<b>LOGGED BY:</b> K. Armstrong						
<b>SAMPLING METHOD:</b> Split Spoon Samples									
<b>DRILLING METHOD:</b> 2 1/4" H.S.A.						<b>STATION:</b>		<b>OFFSET:</b>	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA			SPT N-Value (bpf) ●  FINES % ▲					N VALUE				
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	10	20	30	40	50	60	70	80	90	
		<b>TOPSOIL</b> - 2 inches																	
		<b>FILL: CLAYEY SAND (SC)</b> - loose, tan red, fine to medium, trace rock pieces, trace roots, moist			SS-1		2	4	3										7
5		<b>RESIDUUM: SILT (ML)</b> - firm to stiff, gray red tan, trace fine sand, moist to very moist			SS-2		4	6	7										13
					SS-3		2	3	5										8
10					SS-4		3	3	7										10
			▼																
15		<b>SILT (ML)</b> - very stiff, tan, trace fine sand, moist		▽	SS-5		5	7	16										23
20		<b>PARTIALLY WEATHERED ROCK: SILT (ML)</b> - very hard, brown, trace fine sand, moist		HC	SS-6		4	50/4"											>> 50/4"
					SS-7		50/2"												>> 50/2"
25		- - - No recovery of Sample 7																	
		Boring terminated at 25 feet																	

S&amp;ME BORING LOG - VOGTLE 210173 EMERGENCY SERVICES FAC BORING LOGS.GPJ S&amp;ME 2009\_09\_24.GDT 1/28/21

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PROJECT: <b>Emergency Services Facility Brevard, North Carolina S&amp;ME Project No. 210173</b>					<b>BORING LOG B-5</b>				
CLIENT: <b>Transylvania County</b>			ELEVATION:			NOTES:			
DATE DRILLED: <b>1/15/21</b>			BORING DEPTH: <b>20.0 ft</b>						
DRILL RIG: <b>Diedrich D-50</b>			WATER LEVEL: <b>NE at TOB, 8 ft at EOD</b>						
DRILLER: <b>Jordan Environmental</b>			CAVE-IN DEPTH: <b>14'</b>						
HAMMER TYPE: <b>Automatic</b>			LOGGED BY: <b>K. Armstrong</b>						
SAMPLING METHOD: <b>Split Spoon Samples</b>									
DRILLING METHOD: <b>2 1/4" H.S.A.</b>						STATION:		OFFSET:	









DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA			SPT N-Value (bpf) ● FINES % ▲					N VALUE				
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	10	20	30	40	50	60	70	80	90	
		<b>TOPSOIL</b> - 2 inches																	
		<b>RESIDUUM: SILT (ML)</b> - firm to stiff, gray tan, trace fine sand, moist to very moist  - - - Samples 1 and 2 contained trace roots			SS-1	⊗	2	2	3										5
5					SS-2	⊗	3	3	4										7
					SS-3	⊗	1	3	3										6
10					SS-4	⊗	4	5	6										11
					SS-5	⊗	3	4	5										9
15		<b>SANDY SILT (ML)</b> - hard, gray tan, fine to medium, moist			SS-6	⊗	9	12	19										31
20		Boring terminated at 20 feet																	

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PROJECT: <b>Emergency Services Facility Brevard, North Carolina S&amp;ME Project No. 210173</b>					<b>BORING LOG P-1</b>				
CLIENT: <b>Transylvania County</b>			ELEVATION:			NOTES:			
DATE DRILLED: <b>1/15/21</b>			BORING DEPTH: <b>10.0 ft</b>						
DRILL RIG: <b>Diedrich D-50</b>			WATER LEVEL: <b>NE at TOB, 1 ft at EOD</b>						
DRILLER: <b>Jordan Environmental</b>			CAVE-IN DEPTH: <b>9'</b>						
HAMMER TYPE: <b>Automatic</b>			LOGGED BY: <b>K. Armstrong</b>						
SAMPLING METHOD: <b>Split Spoon Samples</b>									
DRILLING METHOD: <b>2 1/4" H.S.A.</b>						STATION:		OFFSET:	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA			SPT N-Value (bpf) ● FINES % ▲					N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / R&D	PL	NM	LL			
		<b>TOPSOIL</b> - 3 inches	▼												
		<b>ALLUVIUM: SILTY CLAY (CL)</b> - very soft, tan dark gray, some roots, moist			SS-1		WOH	WOH	WOH	●				WOH	
5		<b>ALLUVIUM: SILTY CLAY (CH)</b> - soft to very soft, gray, trace roots, moist to wet			SS-2		2	1	2	●				3	
		--- Sample 3 contained trace fine sand			SS-3		WOH	WOH	WOH	●				WOH	
10		<b>RESIDUUM: SILTY SAND (SM)</b> - very loose, tan, fine to medium, micaceous, very moist	HC		SS-4		1	1	3	●				4	
		Boring terminated at 10 feet													

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<b>PROJECT: Emergency Services Facility</b> <b>Brevard, North Carolina</b> <b>S&amp;ME Project No. 210173</b>					<b>BORING LOG P-2</b>				
<b>CLIENT: Transylvania County</b>			<b>ELEVATION:</b>		<b>NOTES:</b>				
<b>DATE DRILLED: 1/15/21</b>			<b>BORING DEPTH: 10.0 ft</b>						
<b>DRILL RIG: Diedrich D-50</b>			<b>WATER LEVEL: 6 ft at TOB, 3 ft at EOD</b>						
<b>DRILLER: Jordan Environmental</b>			<b>CAVE-IN DEPTH: 8'</b>						
<b>HAMMER TYPE: Automatic</b>			<b>LOGGED BY: K. Armstrong</b>						
<b>SAMPLING METHOD: Split Spoon Samples</b>									
<b>DRILLING METHOD: 2 1/4" H.S.A.</b>					<b>STATION:</b>		<b>OFFSET:</b>		

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA			SPT N-Value (bpf) ● FINES % ▲					N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / ROD	PL	NM	LL			
	TOPSOIL	<b>TOPSOIL</b> - 3 inches													
	ALLUVIUM	<b>ALLUVIUM: CLAYEY SILT (MH)</b> - very soft, dark gray brown, trace fine sand, trace roots, with organic odor, very moist	▼		SS-1	WOH	WOH	WOH						WOH	
5	ALLUVIUM	<b>ALLUVIUM: SANDY LEAN CLAY (CL)</b> - firm, gray, fine, trace roots, moist			SS-2		2	3	4					7	
	ALLUVIUM	<b>ALLUVIUM: CLAYEY SAND (SC)</b> - very loose, gray tan, fine to medium, some mica, very moist	▽		SS-3		2	2	2					4	
	RESIDUUM	<b>RESIDUUM: SILTY SAND (SM)</b> - loose, brown, fine to medium, micaceous, wet	HC		SS-4		2	2	3					5	
10		Boring terminated at 10 feet													

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## ◆ Field Testing Procedures

### Soil Test Borings

All borings and sampling were conducted in accordance with ASTM D-1586 test method. Initially, the borings were advanced by either mechanically augering or wash boring through the overburden soils. When necessary, a heavy drilling fluid is used below the water table to stabilize the sides and bottom of the borehole. At regular intervals, soil samples were obtained with a standard 1.4-inch I.D., 2-inch O.D., split-barrel or split-spoon sampler. The sampler was first seated 6 inches to penetrate any loose cuttings and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot is designated as the "Standard Penetration Resistance" or N-value. The penetration resistance, when properly evaluated, can be correlated to consistency, relative density, strength and compressibility of the sampled soils.

### Water Level Readings

Water level readings are normally taken in conjunction with borings and are recorded on the Boring Logs following termination of drilling (designated by  $\nabla$ ) and at a period of 24 hours following termination of drilling (designated by  $\nabla$ ). These readings indicate the approximate location of the hydrostatic water table at the time of our field exploration. The groundwater table may be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should also be expected with variations in surface run-off, evaporation, construction activity and other factors.

Occasionally the boreholes sides will cave, preventing the water level readings from being obtained or trapping drilling water above the cave-in zone. In these instances, the hole cave-in depth (designated by HC) is measured and recorded on the Boring Logs. Water level readings taken during the field operations do not provide information on the long-term fluctuations of the water table. When this information is required, piezometers are installed to prevent the boreholes from caving.



# Important Information About Your Geotechnical Engineering Report

*Variations in subsurface conditions can be a principal cause of construction delays, cost overruns and claims. The following information is provided to assist you in understanding and managing the risk of these variations.*

## **Geotechnical Findings Are Professional Opinions**

Geotechnical engineers cannot specify material properties as other design engineers do. Geotechnical material properties have a far broader range on a given site than any manufactured construction material, and some geotechnical material properties may change over time because of exposure to air and water, or human activity.

Site exploration identifies subsurface conditions at the time of exploration and only at the points where subsurface tests are performed or samples obtained. Geotechnical engineers review field and laboratory data and then apply their judgment to render professional opinions about site subsurface conditions. Their recommendations rely upon these professional opinions. Variations in the vertical and lateral extent of subsurface materials may be encountered during construction that significantly impact construction schedules, methods and material volumes. While higher levels of subsurface exploration can mitigate the risk of encountering unanticipated subsurface conditions, no level of subsurface exploration can eliminate this risk.

## **Scope of Geotechnical Services**

Professional geotechnical engineering judgment is required to develop a geotechnical exploration scope to obtain information necessary to support design and construction. A number of unique project factors are considered in developing the scope of geotechnical services, such as the exploration objective; the location, type, size and weight of the proposed structure; proposed site grades and improvements; the construction schedule and sequence; and the site geology.

Geotechnical engineers apply their experience with construction methods, subsurface conditions and exploration methods to develop the exploration scope. The scope of each exploration is unique based on available project and site information. Incomplete project information or constraints on the scope of exploration increases the risk of variations in subsurface conditions not being identified and addressed in the geotechnical report.

## **Services Are Performed for Specific Projects**

Because the scope of each geotechnical exploration is unique, each geotechnical report is unique. Subsurface conditions are explored and recommendations are made for a specific project. Subsurface information and recommendations may not be adequate for other uses. Changes in a proposed structure location, foundation loads, grades, schedule, etc. may require additional geotechnical exploration, analyses, and consultation. The geotechnical engineer should be consulted to determine if additional services are required in response to changes in proposed construction, location, loads, grades, schedule, etc.

## **Geo-Environmental Issues**

The equipment, techniques, and personnel used to perform a geo-environmental study differ significantly from those used for a geotechnical exploration. Indications of environmental contamination may be encountered incidental to performance of a geotechnical exploration but go unrecognized. Determination of the presence, type or extent of environmental contamination is beyond the scope of a geotechnical exploration.

## **Geotechnical Recommendations Are Not Final**

Recommendations are developed based on the geotechnical engineer's understanding of the proposed construction and professional opinion of site subsurface conditions. Observations and tests must be performed during construction to confirm subsurface conditions exposed by construction excavations are consistent with those assumed in development of recommendations. It is advisable to retain the geotechnical engineer that performed the exploration and developed the geotechnical recommendations to conduct tests and observations during construction. This may reduce the risk that variations in subsurface conditions will not be addressed as recommended in the geotechnical report.