

# PROJECT MANUAL

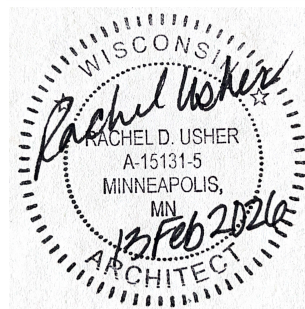
## Appleton International Airport (ATW) Outbound Baggage and Ticketing

VOLUME 1 OF 2



WBOA No.: ATW 1012, AIP No.: SOP-97

M&H Project No.: R2309902-191756.08



**Appleton, Wisconsin**

Prepared for:  
Appleton International Airport

**Mead&Hunt**  
www.meadhunt.com



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**END OF SECTION 000110**

## SECTION 014150 - SPECIAL INSPECTION AND STRUCTURAL TESTING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Special inspections and structural testing to be performed during the progress of this project.
2. Special Inspector, Testing Laboratory and other agents of the Special Inspector requirements and responsibilities.
3. Owner's Quality Assurance Program and extent of Contractor's responsibilities.

#### 1.2 RESPONSIBILITY

- A. The Owner will engage the services of the Special Inspections and Testing Agency. The Contractor shall be responsible for proper notification when inspection is required in the progress of the work, providing access and utility services to facilitate the inspection, and make corrections necessary when work is not in compliance with the Contract Documents.
- B. Contractor is responsible for the cost of any retesting or re-inspection of work which fails to comply with the requirements of the Contract Documents.

#### 1.3 REPORTS

- A. Submit copies of inspection reports, signed by person performing the inspection or test, to Owner's Representative, Engineer, and Contractor. Maintain a copy in the field office.

#### 1.4 GENERAL REQUIREMENTS

- A. Special Inspections and Structural Testing shall be in accordance with Chapter 1 and Chapter 17 of the International Building Code, Statement of Special Inspections, and Schedule of Special Inspections.
- B. The Statement of Special Inspections and Schedule of Special Inspections are included as attachments to this specification.
- C. Special Inspections and Structural Testing is a quality assurance program intended to ensure that the work is performed in accordance with the Contract Documents and applicable building codes. Special Inspections are to be performed by an independent, third-party agency. These services do not relieve the Contractor of responsibility for compliance with the requirements of the Contract Documents.

## 1.5 SPECIAL INSPECTIONS

- A. Required inspections and tests are described in the "Statement of Special Inspections" and "Schedule of Special Inspections" attached to the end of this specification.

## 1.6 SCHEDULE OF INSPECTION AND TESTS

- A. Required inspections and tests are described in the "Statement of Special Inspections" and "Schedule of Special Inspections" attached to the end of this specification.

## 1.7 QUALIFICATIONS

- A. The Testing Laboratory and individual technicians shall be approved by the Engineer.
- B. Testing Laboratory shall maintain a full-time licensed Professional Engineer (P.E.) on staff to certify the test reports. This Engineer shall be responsible for the training of the testing technicians and shall be in responsible charge of the field and laboratory testing operations.
- C. Submit qualifications for each special inspector according to the following certification requirements. The Engineer will consider alternative equivalent certifications upon request. Without written acceptance deviations to the following qualifications are not approved.

### 1. Concrete Construction Special Inspector:

- a. ICC Reinforced Concrete Special Inspector certificate with one year of related experience, or
- b. ACI Concrete Construction Special Inspector, or
- c. Registered Professional Engineer with 3 years of related experience

### 2. Verification of Site Soil Condition, Fill Placement, and Load-Bearing Requirements Special Inspector:

- a. ICC Soils Special Inspector certificate with one year of related experience, or
- b. National Institute for Certification in Engineering Technologies (NICET) Soils Technician Level II Certificate in Construction Material Testing, or
- c. Geologist-in-Training with 3 years of related experience, or
- d. Registered Professional Engineer with 3 years of related experience

- 3. Technicians performing standard tests described by specific ASTM Standards shall have training in the performance of such tests and must be able to demonstrate, either by oral or written examination, competence for the test to be conducted. They shall be under the supervision of a licensed Professional Engineer and shall not be permitted to independently evaluate test results.

## 1.8 SUBMITTALS



- A. The Special Inspector and Testing Laboratory shall submit to the Owner and Engineer for review a copy of their qualifications, including the names and qualifications of each of the individual inspectors and technicians who will be performing inspections or tests.
- B. The Special Inspector and Testing Laboratory shall disclose any past or present business relationship or potential conflict of interest with the Contractor or any of their Subcontractors whose work will be inspected or tested.
- C. Provide Contractor's Statement of Responsibility in accordance with Section 1704.4 of the International Building Code.
- D. Special Inspection and Structural Testing Daily Reports.
- E. Comprehensive Final Report
- F. Certificates:
  - 1. Certificate of Compliance.

#### 1.9 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with the Special Inspector and their agents so that the Special Inspections and Testing may be performed without hindrance.
- B. Coordinate, schedule, and review inspections and tests. Notify the Special Inspector or Testing Laboratory at least 48 hours in advance of a required inspection or test. Work not inspected that required inspection may be rejected solely on that basis.
- C. Provide incidental labor and facilities to provide access to the work to be inspected or tested, to obtain and handle samples at the site or at the source of products to be tested, and to facilitate tests and inspection, storage and curing of test samples.
- D. Provide access at the project site, to the latest set of construction drawings, field sketches, approved and field use shop and erection drawings, and specifications, for use by the Inspectors and Testing technicians.
- E. The Special Inspections program shall in no way relieve the Contractor of obligations to perform work in accordance with the requirements of the Contract Documents or from implementing an effective Quality Control Program. All work subjected to Special Inspections shall first be reviewed by the Contractor's Quality Control personnel.

#### 1.10 LIMITS ON AUTHORITY

- A. The Special Inspector or Testing Laboratory may not release, revoke, alter or enlarge on the requirements of the Contract Documents.
- B. The Special Inspector or Testing Laboratory will not have control over the Contractor's means and methods of construction.
- C. The Special Inspector or Testing Laboratory shall not be responsible for construction site safety.

- D. The Special Inspector or Testing Laboratory has no authority to stop the work.

#### 1.11 RECORDS AND REPORTS

- A. Detailed daily reports shall be prepared of each inspection and test by the Special Inspector and Testing Laboratory. Reports shall include:
  - 1. Project title and number.
  - 2. Firm name and address.
  - 3. Date and time of test, inspection, or sampling.
  - 4. Name of Inspector or Technician.
  - 5. Identification of product and specification section.
  - 6. Location of specific areas tested or inspected.
  - 7. Description of test or inspection and results.
  - 8. Applicable ASTM standard.
  - 9. Weather conditions.
  - 10. Observations regarding compliance with Contract Documents or deviations there from.
  - 11. Name and signature of tester or inspector.
- B. The Special Inspector shall submit interim reports to the Owner and Authorities Having Jurisdiction at the end of each week which includes all inspections and test reports received that week. Copies shall be sent to the Engineer and Contractor.
- C. Discrepancies from the Contract Documents found during a Special Inspection shall be immediately reported to the Contractor and Owner. If the discrepancies are not corrected, the Special Inspector shall notify the Owner and Authorities Having Jurisdiction. Reports shall document all discrepancies identified and the corrective action taken.
- D. The Testing Laboratory shall immediately notify the Owner and Authorities Having Jurisdiction by telephone, fax or email of any test results which fail to comply with the requirements of the Contract Documents.

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

#### PART 3 - EXECUTION

##### 3.1 RESPONSIBILITIES

- A. Project Superintendent
  - 1. Supervise all Special Inspectors required by the Contract Documents and the International Building Code.
  - 2. Verify the qualifications of all the Special Inspectors.
  - 3. Verify the qualifications of all fabricators.
  - 4. Maintain copies of the Special Inspector's special inspection daily reports and special inspection biweekly reports. These copies must be located in a conspicuous place in the project trailer/office to allow for review by the Engineer.

5. Maintain a rework items list that includes discrepancies noted on the Special Inspector's daily report.

B. Special Inspectors

1. Inspect all elements of the project which the special inspector is qualified to inspect and which are identified in the Schedule of Special Inspections.
2. Attend preparatory phase meetings related to the Definable Feature of Work (DFOW) which the Special Inspector is qualified to inspect.

3.2 DEFECTIVE WORK

- A. Check work as it progresses, but failure to detect any defective work or materials must in no way prevent later rejection if defective work or materials are discovered, nor obligate the Engineer to accept the defective work or materials.

END OF SECTION 014150

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## **STATEMENT OF SPECIAL INSPECTIONS**

|                                    |            |
|------------------------------------|------------|
| Seismic Design Category:           | <b>A</b>   |
| Risk Category:                     | <b>III</b> |
| Design Wind Speed (mph):           | <b>113</b> |
| Number of Stories:                 | <b>2</b>   |
| Structure Height Above Grade (ft): | <b>43</b>  |
| Hazard Occupancy                   | <b>N/A</b> |

This statement has been prepared in accordance with the special inspection and testing requirements of IBC 2021 Section 1704. The following materials, systems, components, and work are required to have special inspections and tests in accordance with IBC 2021 Section 1705. Refer to the SCHEDULE OF SPECIAL INSPECTIONS for the type, extent and frequency of each special inspection and test.

|     |                                               |             | Inspection Required |    |     |
|-----|-----------------------------------------------|-------------|---------------------|----|-----|
|     | Type of Construction                          | IBC Section | Yes                 | No | N/A |
| 1.  | Special Cases                                 | 1705.1.1    | -                   | -  | X   |
| 2.  | Steel Construction                            | 1705.2      | X                   | -  | -   |
|     | A. Structural Steel                           | 1705.2.1    | X                   | -  | -   |
|     | B. Cold-Formed Steel Deck                     | 1705.2.2    | X                   | -  | -   |
|     | C. Open-Web Steel Joist and Joists Girders    | 1705.2.3    | X                   | -  | -   |
|     | D. Cold-Formed Steel Trusses Span ≥ 60 Feet   | 1705.2.4    | -                   | -  | X   |
| 3.  | Concrete Construction                         | 1705.3      | X                   | -  | -   |
| 4.  | Masonry Construction                          | 1705.4      | X                   | -  | -   |
| 5.  | Wood Construction                             | 1705.5      | -                   | -  | X   |
| 6.  | Soils                                         | 1705.6      | X                   | -  | -   |
| 7.  | Driven Deep Foundations                       | 1705.7      | -                   | -  | X   |
| 8.  | Cast-in-Place Deep Foundations                | 1705.8      | -                   | -  | X   |
| 9.  | Helical Pile Foundations                      | 1705.9      | -                   | -  | X   |
| 10. | Structural Integrity of Deep Foundations      | 1705.10     | -                   | -  | X   |
| 11. | Fabricated Items                              | 1705.11     | X                   | -  | -   |
| 12. | Special Inspections for Wind Resistance       | 1705.12     | -                   | X  | -   |
| 13. | Special Inspections for Seismic Resistance    | 1705.13     | -                   | X  | -   |
| 14. | Testing for Seismic Resistance                | 1705.14     | -                   | X  | -   |
| 15. | Sprayed Fire-Resistant Materials              | 1705.15     | -                   | -  | X   |
| 16. | Mastic & Intumescent Fire-Resistant Coatings  | 1705.16     | -                   | -  | X   |
| 17. | Exterior Insulation and Finish Systems (EIFS) | 1705.17     | -                   | -  | X   |
| 18. | Fire-Resistant Penetrations and Joints        | 1705.18     | X                   | -  | -   |
| 19. | Testing for Smoke Control                     | 1705.19     | -                   | -  | X   |

|                                            |               |                            |
|--------------------------------------------|---------------|----------------------------|
| Special Inspections for Wind Resistance    | <b>IS NOT</b> | required for this project. |
| Special Inspections for Seismic Resistance | <b>IS NOT</b> | required for this project. |
| Testing for Seismic Resistance             | <b>IS NOT</b> | required for this project. |

### Lateral Force Resisting System (LFRS)

When special inspections for wind or seismic resistance, or testing for seismic resistance are required, the following list of main wind force-resisting systems and wind-resisting components, or seismic force-resisting systems shall be subject to special inspections or tests in accordance with IBC 2021 Section 1704.3.2 and 1704.3.3. Each LFRS element shall be carefully inspected as indicated in the SCHEDULE OF SPECIAL INSPECTIONS.

| Vertical LFRS Elements   | Location Notes |
|--------------------------|----------------|
| Not Applicable           |                |
| Horizontal LFRS Elements | Location Notes |
| Not Applicable           |                |

### Designated Seismic Systems (DSS)

When special inspections or tests for seismic resistance are required, the following list of Designated Seismic Systems (DSS) for nonstructural components shall be certified by the manufacturer to remain operational and/or contain hazardous substances in accordance with IBC 2021 Section 1704.14.3 and ASCE 7 Section 13.2.2. Certificates of Compliance for each DSS shall be reviewed and accepted by the Contracting Officer and Registered Design Professional in Responsible Charge. Each DSS shall be carefully inspected as indicated in the SCHEDULE OF SPECIAL INSPECTIONS.

#### ELECTRICAL Designated Seismic Systems (DSS) Requiring a Certificate of Compliance

1. Not Applicable
- 2.
- 3.

#### MECHANICAL/PLUMBING Designated Seismic Systems (DSS) Requiring a Certificate of Compliance

1. Not Applicable
- 2.
- 3.

#### OTHER Designated Seismic Systems (DSS) Requiring a Certificate of Compliance

1. Not Applicable
- 2.
- 3.

## **SCHEDULE OF SPECIAL INSPECTIONS**

Reference Specification 014150 for all requirements not noted as part of this schedule.

Definitions for Sections located at end of Schedule.

The Seismic Design Category for this project is: ☒ A, ☐ B, ☐ C, ☐ D, ☐ E, ☐ F (check appropriate box)

**A. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - WELDING SECTION****THIS SECTION APPLICABLE IF BOX IS CHECKED: ☒**STEEL CONSTRUCTION - STRUCTURAL STEEL - WELDING - INSPECTION TASKS PRIOR TO WELDING - VERIFY THE FOLLOWING ARE IN COMPLIANCE

IBC 2021 SECTION 1705.2.1, AISC 360-16: CHAPTER N, SECTION N5.4, TABLE N5.4-1

| INSPECTION TASKS PRIOR TO WELDING                                                                                                                                                                                                                                                                                                            | QC      | QA      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|
| 1. Welder qualification records and continuity records                                                                                                                                                                                                                                                                                       | Perform | Observe |
| 2. WPS available                                                                                                                                                                                                                                                                                                                             | Perform | Perform |
| 3. Manufacturer certifications for welding consumables available                                                                                                                                                                                                                                                                             | Perform | Perform |
| 4. Material identification (type/grade)                                                                                                                                                                                                                                                                                                      | Observe | Observe |
| 5. Welder identification system <sup>a</sup>                                                                                                                                                                                                                                                                                                 | Observe | Observe |
| 6. Fit-up of groove welds (including joint geometry) <ul style="list-style-type: none"> <li>Joint preparation</li> <li>Dimensions (alignment, root opening, root face, bevel)</li> <li>Cleanliness (condition of steel surfaces)</li> <li>Tacking (tack weld quality and location)</li> <li>Backing type and fit (if applicable)</li> </ul>  | Observe | Observe |
| 7. Fit-up of CJP groove welds of HSS T-, Y- and K-joints without backing (including joint geometry) <ul style="list-style-type: none"> <li>Joint preparation</li> <li>Dimensions (alignment, root opening, root face, bevel)</li> <li>Cleanliness (condition of steel surfaces)</li> <li>Tacking (tack weld quality and location)</li> </ul> | Perform | Observe |
| 8. Configuration and finish of access holes                                                                                                                                                                                                                                                                                                  | Observe | Observe |
| 9. Fit-up of fillet welds <ul style="list-style-type: none"> <li>Dimensions (alignment, gaps at root)</li> <li>Cleanliness (condition of steel surfaces)</li> <li>Tacking (tack weld quality and location)</li> </ul>                                                                                                                        | Observe | Observe |
| 10. Check welding equipment                                                                                                                                                                                                                                                                                                                  | Observe | Observe |
| a. The fabricator or erector, as applicable, shall maintain a system by which a welder who has welded a joint or member can be identified. Stamps, if used, shall be the low-stress type.                                                                                                                                                    |         |         |



**A. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - WELDING SECTION (CONTINUED)**

| STEEL CONSTRUCTION - STRUCTURAL STEEL - WELDING - INSPECTION TASKS <u>DURING</u> WELDING - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.2.1, AISC 360-16: CHAPTER N, SECTION N5.4, TABLE N5.4-2                                                                                                                                             |         |         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|
| INSPECTION TASKS DURING WELDING                                                                                                                                                                                                                                                                                                                                | QC      | QA      |
| 1. Control and handling of welding consumables <ul style="list-style-type: none"><li>• Packaging</li><li>• Exposure Control</li></ul>                                                                                                                                                                                                                          | Observe | Observe |
| 2. No welding over cracked tack welds                                                                                                                                                                                                                                                                                                                          | Observe | Observe |
| 3. Environmental conditions <ul style="list-style-type: none"><li>• Wind speed within limits</li><li>• Precipitation and temperature</li></ul>                                                                                                                                                                                                                 | Observe | Observe |
| 4. Welding Procedures Specification (WPS) followed <ul style="list-style-type: none"><li>• Settings on welding equipment</li><li>• Travel speed</li><li>• Selected welding materials</li><li>• Shielding gas type/flow rate</li><li>• Preheat applied</li><li>• Interpass temperature maintained (min./max.)</li><li>• Proper position (F, V, H, OH)</li></ul> | Observe | Observe |
| 5. Welding techniques <ul style="list-style-type: none"><li>• Interpass and final cleaning</li><li>• Each pass within profile limitations</li><li>• Each pass meets quality requirements</li></ul>                                                                                                                                                             | Observe | Observe |
| 6. Placement and installation of steel headed stud anchors                                                                                                                                                                                                                                                                                                     | Perform | Perform |

**A. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - WELDING SECTION (CONTINUED)**

STEEL CONSTRUCTION - STRUCTURAL STEEL - WELDING - INSPECTION TASKS AFTER WELDING - VERIFY THE FOLLOWING ARE IN COMPLIANCE

IBC 2021 SECTION 1705.2.1, AISC 360-16: CHAPTER N, SECTION N5.4, TABLE N5.4-3

| INSPECTION TASKS AFTER WELDING                                                                                                                                                                                                                                                                           | QC      | QA      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|
| 1. Welds cleaned                                                                                                                                                                                                                                                                                         | Observe | Observe |
| 2. Size, length, and location of welds                                                                                                                                                                                                                                                                   | Perform | Perform |
| 3. Welds meet visual acceptance criteria <ul style="list-style-type: none"><li>• Crack prohibition</li><li>• Weld/base-metal fusion</li><li>• Crater cross section</li><li>• Weld profiles</li><li>• Weld size</li><li>• Undercut</li><li>• Porosity</li></ul>                                           | Perform | Perform |
| 4. Arc strikes                                                                                                                                                                                                                                                                                           | Perform | Perform |
| 5. k-area <sup>a</sup>                                                                                                                                                                                                                                                                                   | Perform | Perform |
| 6. Weld access holes in rolled heavy shapes and built-up shapes <sup>b</sup>                                                                                                                                                                                                                             | Perform | Perform |
| 7. Backing removed and weld tabs removed (if required)                                                                                                                                                                                                                                                   | Perform | Perform |
| 8. Repair activities                                                                                                                                                                                                                                                                                     | Perform | Perform |
| 9. Document acceptance or rejection of welded joint or member                                                                                                                                                                                                                                            | Perform | Perform |
| 10. No prohibited welds have been added without the approval of the EOR                                                                                                                                                                                                                                  | Observe | Observe |
| a. When welding of doubler plates, continuity plates or stiffeners has been performed in the k-area, visually inspect the web k-area for cracks within 3 in. (75mm) of the weld.<br>b. After rolled heavy shapes and built-up heavy shapes are welded, visually inspect the weld access hole for cracks. |         |         |

**END SECTION**

**B. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - NON-DESTRUCTIVE TESTING (NDT) OF WELDED JOINTS SECTION**

**THIS SECTION APPLICABLE IF BOX IS CHECKED: ☒**

| STEEL CONSTRUCTION – STRUCTURAL STEEL - NON-DESTRUCTIVE TESTING (NDT) OF WELDED JOINTS - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.2.1, AISC 360-16: CHAPTER N, SECTION N5.5 |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TASK                                                                                                                                                                                               | INSPECTION TYPE | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 1. Procedures                                                                                                                                                                                      | Perform         | Ultrasonic testing (UT), magnetic particle testing (MT), penetrant testing (PT), and radiographic testing (RT), where required, shall be performed by QA in accordance with AWS D1.1/D1.1M.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 2. CJP Groove Weld NDT                                                                                                                                                                             | Perform         | For structures in Risk Category III or IV, UT shall be performed by QA on all complete-joint-penetration (CJP) groove welds subject to transversely applied tension loading in butt, T- and corner joints, in material 5/16 inch thick or greater. For structures in Risk Category II, UT shall be performed by QA on 10% of CJP groove welds in butt, T- and corner joints subject to transversely applied tension loading, in materials 5/16 inch thick or greater.                                                                                                                                                                                                                       |
| 3. Welded Joints Subjected to Fatigue                                                                                                                                                              | Perform         | When required by AISC 360 Appendix 3, Table A-3.1, welded joints requiring weld soundness to be established by radiographic or ultrasonic inspection shall be tested by QA as prescribed. Reduction in the rate of UT is prohibited.                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 4. Ultrasonic Testing Rejection Rate                                                                                                                                                               | Perform         | The ultrasonic testing rejection rate shall be determined as the number of welds containing defects divided by the number of welds completed. Welds that contain acceptable discontinuities shall not be considered as having defects when the rejection rate is determined. For evaluating the rejection rate of continuous welds over 3 feet in length where the effective throat is 1 inch or less, each 12-inch increment of fraction thereof shall be considered as one weld. For evaluating the rejection rate on continuous welds over 3 feet in length where the effective throat is greater than 1 inch, each 6-inch of length, or fraction thereof, shall be considered one weld. |
| 5. Reduction of Ultrasonic Testing Rate                                                                                                                                                            | Perform         | For projects that contain 40 or fewer welds, there shall be no reduction in the ultrasonic testing rate. The rate of UT is permitted to be reduced if approved by the EOR and the AHJ. Where the initial rate of UT is 100%, the NDT rate for an individual welder or welding operator is permitted to be reduced to 25%, provided the rejection rate, the number of welds containing unacceptable defects divided by the number of welds completed, is demonstrated to be 5% or less of the welds tested for the welder or welding operator. A sampling of at least 40 completed welds shall be made for such reduced evaluation on each project.                                          |

**B. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - NON-DESTRUCTIVE TESTING (NDT) OF WELDED JOINTS SECTION (CONTINUED)**

| STEEL CONSTRUCTION – STRUCTURAL STEEL - NON-DESTRUCTIVE TESTING (NDT) OF WELDED JOINTS - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.2.1, AISC 360-16: CHAPTER N, SECTION N5.5 |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TASK                                                                                                                                                                                               | INSPECTION TYPE | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 6. Increase in Ultrasonic Testing Rate                                                                                                                                                             | Perform         | For structures in Risk Category II and higher (where the initial rate for UT is 10%) the NDT rate for an individual welder or welding operator shall be increased to 100% should the rejection rate (the number of welds containing unacceptable defects divided by the number of welds completed) exceed 5% of the welds tested for the welder or welding operator. A sampling of at least 20 completed welds on each project shall be made prior to implementing such an increase. If the rejection rate for the welder or welding operator falls to 5% or less on the basis of at least 40 completed welds, the rate of UT may be decreased to 10%. |
| 7. Documentation                                                                                                                                                                                   | Document        | All NDT performed shall be documented. For shop fabrication, the NDT report shall identify the tested weld by piece mark and location in the piece. For field work, the NDT report shall identify the tested weld by location in the structure, piece mark, and location in the piece,<br>When a weld is rejected on the basis of NDT, the NDT record shall indicate the location of the defect and the basis of rejection.                                                                                                                                                                                                                            |

**END SECTION**

**C. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - BOLTING SECTION****THIS SECTION APPLICABLE IF BOX IS CHECKED: ☒**

| STEEL CONSTRUCTION - STRUCTURAL STEEL - BOLTING - INSPECTION TASKS <u>PRIOR TO</u> BOLTING - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.2.1, AISC 360-16: CHAPTER N, SECTION N5.6, TABLE N5.6-1 |         |         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|
| INSPECTION TASKS PRIOR TO BOLTING                                                                                                                                                                                    | QC      | QA      |
| 1. Manufacturer's certifications available for fastener materials                                                                                                                                                    | Observe | Perform |
| 2. Fasteners marked in accordance with ASTM requirements                                                                                                                                                             | Observe | Observe |
| 3. Correct fasteners selected for joint detail (grade, type, bolt length if threads are to be excluded from shear plane)                                                                                             | Observe | Observe |
| 4. Correct bolting procedure selected for joint detail                                                                                                                                                               | Observe | Observe |
| 5. Connecting elements, including the appropriate faying surface condition and hole preparation, if specified, meet applicable requirements                                                                          | Observe | Observe |
| 6. Pre-installation verification testing by installation personnel observed and documented for fastener assemblies and methods used.                                                                                 | Perform | Observe |
| 7. Protected storage provided for bolts, nuts, washers, and other fastener components                                                                                                                                | Observe | Observe |
| STEEL CONSTRUCTION - STRUCTURAL STEEL - BOLTING - INSPECTION TASKS <u>DURING</u> BOLTING - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.2.1, AISC 360-16: CHAPTER N, SECTION N5.6, TABLE N5.6-2   |         |         |
| INSPECTION TASKS DURING BOLTING                                                                                                                                                                                      | QC      | QA      |
| 1. Fastener assemblies placed in all holes and washers and nuts are positioned as required                                                                                                                           | Observe | Observe |
| 2. Joint brought to the snug-tight condition prior to pre-tensioning operation                                                                                                                                       | Observe | Observe |
| 3. Fastener component not turned by the wrench prevented from rotating                                                                                                                                               | Observe | Observe |
| 4. Fasteners are pretensioned in accordance with RCSC Specification, progressing systematically from the most rigid point toward the free edges                                                                      | Observe | Observe |
| STEEL CONSTRUCTION - STRUCTURAL STEEL - BOLTING INSPECTION TASKS <u>AFTER</u> BOLTING - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.2.1, AISC 360-16: CHAPTER N, SECTION N5.6, TABLE N5.6-3      |         |         |
| INSPECTION TASKS AFTER BOLTING                                                                                                                                                                                       | QC      | QA      |
| 1. Document acceptance or rejection of all bolted connections                                                                                                                                                        | Perform | Perform |

**END SECTION**

**D. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL – GALVANIZED STRUCTURAL STEEL MAIN MEMBERS & OTHER INSPECTION TASK SECTION**

**THIS SECTION APPLICABLE IF BOX IS CHECKED: ☐**

| STEEL CONSTRUCTION - STRUCTURAL STEEL – GALVANIZED STRUCTURAL STEEL MAIN MEMBERS & OTHER INSPECTION TASKS - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.2.1, AISC 360-16: CHAPTER N, SECTIONS N5.7 & N5.8                                                                                                                                                                                                                                                    |         |          |         |          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------|---------|----------|
| OTHER INSPECTION TASK                                                                                                                                                                                                                                                                                                                                                                                                                                                            | QC      |          | QA      |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | TASK    | DOC.     | TASK    | DOC.     |
| 1. Exposed cut surfaces of galvanized structural steel main members and exposed corners of rectangular HSS shall be visually inspected for cracks subsequent to galvanizing. Cracks shall be repaired or the member shall be rejected.                                                                                                                                                                                                                                           | Perform | Document |         |          |
| 2. The fabricator's QCI shall inspect the fabricated steel to verify compliance with the details shown on the shop drawings, including such items as the correct application of shop joint details at each connection.                                                                                                                                                                                                                                                           | Perform | Document |         |          |
| 3. The erector's QCI shall inspect the erected steel frame to verify compliance with the field installed details shown on the erection drawings, including such items as braces, stiffeners, member locations, and correct application of field joint details at each connection.                                                                                                                                                                                                | Perform | Document |         |          |
| 4. Placement of anchor rods and other embedments supporting structural steel – QAI shall be on the premises for inspection during the placement of anchor bolts and other embedments supporting structural steel for compliance with the construction documents. As a minimum, the diameter, grade, type and length of the anchor rod or embedded item, and the extent or depth of embedment into the concrete, shall be verified and documented prior to placement of concrete. |         |          | Perform | Document |
| 5. Fabricated steel or erected steel frame – QAI shall inspect the fabricated steel or erected steel frame, as applicable, to verify compliance with the details shown on the construction documents. This includes such items as braces, stiffeners, member locations and proper application of joint details at each connection. The acceptance or rejection of joint details and the correct application of joint details shall be documented.                                |         |          | Perform | Document |

**END SECTION**

**E. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - VISUAL WELDING INSPECTION SECTION**

**THIS SECTION APPLICABLE IF BOX IS CHECKED: ☐**

| STEEL CONSTRUCTION - STRUCTURAL STEEL – AISC 341 SEISMIC PROVISIONS - WELDING - VISUAL INSPECTION TASKS PRIOR TO WELDING - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.13.1, AISC 341-16: CHAPTER J, SECTION J6, TABLE J6.1                                                                                                                                                                                                                                                                                                                                               |                           |      |         |      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------|---------|------|
| VISUAL INSPECTION TASKS PRIOR TO WELDING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | QC                        |      | QA      |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | TASK                      | DOC. | TASK    | DOC. |
| 1. Material identification (type/grade)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Observe                   | ---- | Observe | ---- |
| 2. Welder identification system <sup>a</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Observe                   | ---- | Observe | ---- |
| 3. Fit-up of groove welds (including joint geometry) <ul style="list-style-type: none"> <li>Joint preparation</li> <li>Dimensions (alignment, root opening, root face, bevel)</li> <li>Cleanliness (condition of steel surfaces)</li> <li>Tacking (tack weld quality and location)</li> <li>Backing type and fit (if applicable)</li> </ul>                                                                                                                                                                                                                                                   | Perform/<br>Observe<br>** | ---- | Observe | ---- |
| 4. Configuration and finish of access holes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Observe                   | ---- | Observe | ---- |
| 5. Fit-up of fillet welds <ul style="list-style-type: none"> <li>Dimensions (alignment, gaps at root)</li> <li>Cleanliness (condition of steel surfaces)</li> <li>Tacking (tack weld quality and location)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                         | Perform/<br>Observe<br>** | ---- | Observe | ---- |
| ** Following performance of this inspection task for ten welds to be made by a given welder, with the welder demonstrating understanding of requirements and possession of skills and tools to verify these items, the Perform designation of this task shall be reduced to Observe, and the welder shall perform this task. Should the inspector determine that the welder has discontinued performance of this task, the task shall be returned to Perform until such time as the Inspector has re-established adequate assurance that the welder will perform the inspection tasks listed. |                           |      |         |      |

**E. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - VISUAL WELDING INSPECTION SECTION (CONTINUED)**

| STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - WELDING - VISUAL INSPECTION TASKS DURING WELDING - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.13.1, AISC 341-16: CHAPTER J, SECTION J6, TABLE J6.2                                                                                                                                    |         |      |         |      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------|---------|------|
| VISUAL INSPECTION TASKS DURING WELDING                                                                                                                                                                                                                                                                                                                                           | QC      |      | QA      |      |
|                                                                                                                                                                                                                                                                                                                                                                                  | TASK    | DOC. | TASK    | DOC. |
| 1. WPS followed <ul style="list-style-type: none"> <li>Settings on welding equipment</li> <li>Travel Speed</li> <li>Selected welding materials</li> <li>Shielding gas type/flow rate</li> <li>Preheat applied</li> <li>Interpass temperature maintained (min./max.)</li> <li>Proper position (F, V, H, OH)</li> <li>Intermix of filler metals avoided unless approved</li> </ul> | Observe | ---- | Observe | ---- |
| 2. Use of qualified welders                                                                                                                                                                                                                                                                                                                                                      | Observe | ---- | Observe | ---- |
| 3. Control and handling of welding consumables <ul style="list-style-type: none"> <li>Packaging</li> <li>Exposure Control</li> </ul>                                                                                                                                                                                                                                             | Observe | ---- | Observe | ---- |
| 4. Environmental conditions <ul style="list-style-type: none"> <li>Wind speed within limits</li> <li>Precipitation and temperature</li> </ul>                                                                                                                                                                                                                                    | Observe | ---- | Observe | ---- |
| 5. Welding techniques <ul style="list-style-type: none"> <li>Interpass and final cleaning</li> <li>Each pass within profile limitations</li> <li>Each pass meets quality requirements</li> </ul>                                                                                                                                                                                 | Observe | ---- | Observe | ---- |
| 6. No welding over cracked tacks                                                                                                                                                                                                                                                                                                                                                 | Observe | ---- | Observe | ---- |



**E. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - VISUAL WELDING INSPECTION SECTION (CONTINUED)**

| STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - WELDING - VISUAL INSPECTION TASKS AFTER WELDING - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.13.1, AISC 341-16: CHAPTER J, SECTION J6, TABLE J6.3                                           |         |          |         |          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------|---------|----------|
| VISUAL INSPECTION TASKS AFTER WELDING                                                                                                                                                                                                                                                  | QC      |          | QA      |          |
|                                                                                                                                                                                                                                                                                        | TASK    | DOC.     | TASK    | DOC.     |
| 1. Welds cleaned                                                                                                                                                                                                                                                                       | Observe | ----     | Observe | ----     |
| 2. Size, length, and location of welds                                                                                                                                                                                                                                                 | Perform | ----     | Perform | ----     |
| 3. Welds meet visual acceptance criteria <ul style="list-style-type: none"> <li>• Crack prohibition</li> <li>• Weld/base-metal fusion</li> <li>• Crater cross section</li> <li>• Weld profiles and size</li> <li>• Undercut</li> <li>• Porosity</li> </ul>                             | Perform | Document | Perform | Document |
| 4. k-area <sup>1</sup>                                                                                                                                                                                                                                                                 | Perform | Document | Perform | Document |
| 5. Placement of reinforcing or contouring fillet welds (if required)                                                                                                                                                                                                                   | Perform | Document | Perform | Document |
| 6. Backing removed, weld tabs removed and finished, and fillet welds added (if required)                                                                                                                                                                                               | Perform | Document | Perform | Document |
| 7. Repair activities                                                                                                                                                                                                                                                                   | Perform | ----     | Perform | Document |
| 1. When welding of doubler plates, continuity plates or stiffeners has been performed in the k-area, visually inspect the web k-area for cracks within 3 in. (75mm) of the weld. The visual inspection shall be performed no sooner than 48 hours following completion of the welding. |         |          |         |          |

**END SECTION**

**F. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - WELDING INSPECTION AND NONDESTRUCTIVE TESTING OF WELDED JOINTS SECTION**

**THIS SECTION APPLICABLE IF BOX IS CHECKED:** ☐

| STEEL CONSTRUCTIONJ - STRUCTUAL STEEL - AISC 341 SEISMIC PROVISIONS - WELDING INSPECTION AND NONDESTRUCTIVE TESTING OF WELDED JOINTS - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.13.1, AISC 341-16: CHAPTER J, SECTION J6 |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TASK                                                                                                                                                                                                                                            | INSPECTION TYPE | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 1. Welding Inspection and Nondestructive Testing                                                                                                                                                                                                | Perform         | Welding inspection and nondestructive testing shall satisfy the requirements of the <i>Specification</i> (AISC 360), AISC 341 Section J6, and AWS D1.8/D1.8M.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 2. Visual Welding Inspection                                                                                                                                                                                                                    | Perform         | All requirements of the <i>Specification</i> (AISC 360) shall apply, except as specifically modified by AWS D1.8/D1.8M.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 3. NDT of Welded Joints                                                                                                                                                                                                                         | Perform         | In addition to the requirements of <i>Specification</i> (AISC 360) Section N5.5, nondestructive testing of welded joints shall be as required by AISC 341 Section J6.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 4. CJP Groove Weld NDT                                                                                                                                                                                                                          | Perform         | Ultrasonic testing (UT) shall be performed on 100% of complete-joint-penetration (CJP) groove welds in materials 5/16 inch or greater. UT in material less than 5/16 inch thick is not required. Weld discontinuities shall be accepted or rejected on the basis of AWS D1.1/D1.1M Table 6.2. Magnetic particle testing (MT) shall be performed on 25% of all beam-to-column CJP groove welds. The rate of UT and MT is permitted to be reduced in accordance with Sections J6.2g and J6.2h, respectively. Exception: for ordinary moment frames in structures in Risk Categories I or II, UT and MT of CJP groove welds are required only for demand critical welds.                                                    |
| 5. Column Splice and Column to Base Plate PJP Groove Weld NDT                                                                                                                                                                                   | Perform         | UT shall be performed by QA on 100% of partial-joint-penetration (PJP) groove welds in column splices and column to base plate welds. The rate of UT is permitted to be reduced in accordance with AISC 341 Section J6.2g.<br>UT shall be performed using written procedures and UT technicians qualified in accordance with AWS D1.8/D1.8M.<br>UT examination of welds using alternative techniques in compliance with AWS D1.1/D1.1M Annex Q is permitted.<br>Weld discontinuities located within the groove weld throat shall be accepted or rejected on the basis of criteria of AWS D1.1/D1.1M Table 6.2, except when alternative techniques are used, the criteria shall be as provided in AWS D1.1/D1.1M Annex Q. |
| 6. Base Metal NDT for Lamellar Tearing and Laminations                                                                                                                                                                                          | Perform         | After joint completion, base metal thicker than 1 ½ inches loaded in tension in the through-thickness direction in T- and corner-joints, where the connected material is greater than ¾ inch and contains CJP groove welds, shall be ultrasonically tested for discontinuities behind and adjacent to the fusion line of such welds. An base metal discontinuities found within t/4 of the steel surface shall be accepted or rejected on the basis of criteria of AWS D1.1/D1.1M Table 6.2, where t is the thickness of the part subjected to the through-thickness strain.                                                                                                                                             |

**F. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS -  
WELDING INSPECTION AND NONDESTRUCTIVE TESTING OF WELDED JOINTS SECTION (CONTINUED)**

| STEEL CONSTRUCTION - STRUCTUAL STEEL - AISC 341 SEISMIC PROVISIONS - WELDING INSPECTION AND NONDESTRUCTIVE TESTING OF WELDED JOINTS - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.13.1, AISC 341-16: CHAPTER J, SECTION J6 |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TASK                                                                                                                                                                                                                                           | INSPECTION TYPE | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 7. Beam Cope and Access Hole NDT.                                                                                                                                                                                                              | Perform         | At welded splices and connections, thermally cut surfaces of beam copes and access holes shall be tested using magnetic particle testing or penetrant testing, when the flange thickness exceeds 1 1/2 inches for rolled shapes, or when the web thickness exceeds 1 1/2 inches for built-up shapes.                                                                                                                                                                                                                                                                                                                     |
| 8. Reduced Beam Section Repair NDT                                                                                                                                                                                                             | Perform         | MT shall be performed on any weld and adjacent area of the reduced beam section (RBS) cut surface that has been repaired by welding, or on the base metal of the RBS cut surface if a sharp notch has been removed by grinding.                                                                                                                                                                                                                                                                                                                                                                                          |
| 9. Weld Tab Removal Sites                                                                                                                                                                                                                      | Perform         | At the end of welds where tabs have been removed, MT shall be performed on the same beam-to-column joints receiving UT as required under AISC 341 Section J6.2a. The rate of MT is permitted to be reduced in accordance with Section J6.2h. MT of continuity plate weld tab removal sites is not required.                                                                                                                                                                                                                                                                                                              |
| 10. Reduction of Percentage of Ultrasonic Testing                                                                                                                                                                                              | Perform         | The reduction of percentage of UT is permitted to be reduced in accordance with <i>Specification</i> (AISC 360) Section N5.5e, except no reduction is permitted for demand critical welds.                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 11. Reduction of Percentage of Magnetic Particle Testing                                                                                                                                                                                       | Perform         | The amount of MT on CJP groove welds is permitted to be reduced if approved by the engineer of record and the authority having jurisdiction. The MT rate for an individual welder or welding operator is permitted to be reduced to 10%, provided the reject rate is demonstrated to be 5% or less of the welds tested for the welder or welding operator. A sampling of at least 20 completed welds for a job shall be made for such reduction evaluation. Reject rate is the number of welds completed. This reduction is prohibited on welds in the k-area, at repair sites, backing removal sites, and access holes. |

**END SECTION**

**G. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - BOLTING SECTION**

**THIS SECTION APPLICABLE IF BOX IS CHECKED: ☐**

| STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - BOLTING - INSPECTION TASKS <u>PRIOR</u> TO BOLTING - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.13.1, AISC 341-16: CHAPTER J, SECTION J7, TABLE J7.1 |         |          |         |          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------|---------|----------|
| INSPECTION TASKS PRIOR TO BOLTING                                                                                                                                                                                                               | QC      |          | QA      |          |
|                                                                                                                                                                                                                                                 | TASK    | DOC.     | TASK    | DOC.     |
| 1. Proper fasteners selected for the joint detail                                                                                                                                                                                               | Observe | ----     | Observe | ----     |
| 2. Proper bolting procedure selected for joint detail                                                                                                                                                                                           | Observe | ----     | Observe | ----     |
| 3. Connecting elements, including the appropriate faying surface condition and hole preparation, if specified, meet applicable requirements                                                                                                     | Observe | ----     | Observe | ----     |
| 4. Pre-installation verification testing by installation personnel observed for fastener assemblies and methods used                                                                                                                            | Perform | Document | Observe | Document |
| 5. Protected storage provided for bolts, nuts, washers, and other fastener components                                                                                                                                                           | Observe | ----     | Observe | ----     |
| STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - BOLTING - INSPECTION TASKS <u>DURING</u> BOLTING - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.13.1, AISC 341-16: CHAPTER J, SECTION J7, TABLE J7.2   |         |          |         |          |
| INSPECTION TASKS DURING BOLTING                                                                                                                                                                                                                 | QC      |          | QA      |          |
|                                                                                                                                                                                                                                                 | TASK    | DOC.     | TASK    | DOC.     |
| 1. Fastener assemblies placed in all holes and washers (if required) are positioned as required                                                                                                                                                 | Observe | ----     | Observe | ----     |
| 2. Joint brought to the snug-tight condition prior to the pre-tensioning operation                                                                                                                                                              | Observe | ----     | Observe | ----     |
| 3. Fastener component not turned by the wrench prevented from rotating                                                                                                                                                                          | Observe | ----     | Observe | ----     |
| 4. Bolts are pretensioned progressing systematically from the most rigid point toward the free edges                                                                                                                                            | Observe | ----     | Observe | ----     |
| STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - BOLTING - INSPECTION TASKS <u>AFTER</u> BOLTING - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.13.1, AISC 341-16: CHAPTER J, SECTION J7, TABLE J7.3    |         |          |         |          |
| INSPECTION TASKS AFTER BOLTING                                                                                                                                                                                                                  | QC      |          | QA      |          |
|                                                                                                                                                                                                                                                 | TASK    | DOC.     | TASK    | DOC.     |
| 1. Document accepted and rejected connections                                                                                                                                                                                                   | Perform | Document | Perform | Document |

**END SECTION**

## H. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - OTHER INSPECTION TASKS SECTION

THIS SECTION APPLICABLE IF BOX IS CHECKED: ☐

STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - OTHER INSPECTION TASKS - VERIFY THE FOLLOWING ARE IN COMPLIANCE  
IBC 2021 SECTION 1705.13.1, AISC 341-16: CHAPTER J, SECTION J8, TABLE J8.1

| OTHER INSPECTION TASKS                                                                                                                     | QC      |          | QA      |          |
|--------------------------------------------------------------------------------------------------------------------------------------------|---------|----------|---------|----------|
|                                                                                                                                            | TASK    | DOC.     | TASK    | DOC.     |
| 1. RBS requirements, if applicable <ul style="list-style-type: none"> <li>Contour and finishing</li> <li>Dimensional tolerances</li> </ul> | Perform | Document | Perform | Document |
| 2. Protected zone – no holes and unapproved attachments made by fabricator or erector, as applicable                                       | Perform | Document | Perform | Document |

**END SECTION**

**I. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - COMPOSITE STRUCTURES SECTION**

**THIS SECTION APPLICABLE IF BOX IS CHECKED:** ☐

| STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - INSPECTION OF COMPOSITE STRUCTURES <u>PRIOR TO</u> CONCRETE PLACEMENT - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.13.1, AISC 341-16: CHAPTER J, SECTION J9, TABLE J9.1 |         |          |         |          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------|---------|----------|
| INSPECTION OF COMPOSITE STRUCTURES PRIOR TO CONCRETE PLACEMENT                                                                                                                                                                                                     | QC      |          | QA      |          |
|                                                                                                                                                                                                                                                                    | TASK    | DOC.     | TASK    | DOC.     |
| 1. Material identification of reinforcing steel (Type/Grade)                                                                                                                                                                                                       | Observe | ----     | Observe | ----     |
| 2. Determination of carbon equivalent for reinforcing steel other than ASTM A706/A706M                                                                                                                                                                             | Observe | ----     | Observe | ----     |
| 3. Proper reinforcing steel size, spacing and orientation                                                                                                                                                                                                          | Observe | ----     | Observe | ----     |
| 4. Reinforcing steel has not been rebent in the field                                                                                                                                                                                                              | Observe | ----     | Observe | ----     |
| 5. Reinforcing steel has been tied and supported as required                                                                                                                                                                                                       | Observe | ----     | Observe | ----     |
| 6. Required reinforcing steel clearances have been provided                                                                                                                                                                                                        | Observe | ----     | Observe | ----     |
| 7. Composite member has required size                                                                                                                                                                                                                              | Observe | ----     | Observe | ----     |
| STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - INSPECTION OF COMPOSITE STRUCTURES <u>DURING</u> CONCRETE PLACEMENT - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.13.1, AISC 341-16: CHAPTER J, SECTION J9, TABLE J9.2   |         |          |         |          |
| INSPECTION OF COMPOSITE STRUCTURES DURING CONCRETE PLACEMENT                                                                                                                                                                                                       | QC      |          | QA      |          |
|                                                                                                                                                                                                                                                                    | TASK    | DOC.     | TASK    | DOC.     |
| 1. Concrete: Material identification (mix design, compressive strength, maximum large aggregate size, maximum slump)                                                                                                                                               | Observe | Document | Observe | Document |
| 2. Limits on water added at the truck or pump                                                                                                                                                                                                                      | Observe | Document | Observe | Document |
| 3. Proper placement techniques to limit segregation                                                                                                                                                                                                                | Observe | ----     | Observe | ----     |
| STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - INSPECTION OF COMPOSITE STRUCTURES <u>AFTER</u> CONCRETE PLACEMENT - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.13.1, AISC 341-16: CHAPTER J, SECTION J9, TABLE J9.3    |         |          |         |          |
| INSPECTION OF COMPOSITE STRUCTURES AFTER CONCRETE PLACEMENT                                                                                                                                                                                                        | QC      |          | QA      |          |
|                                                                                                                                                                                                                                                                    | TASK    | DOC.     | TASK    | DOC.     |
| 1. Achievement of minimum specified concrete compressive strength at specified age                                                                                                                                                                                 | ----    | Document | ----    | Document |

**END SECTION**

**J. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - H-PILES SECTION**

**THIS SECTION APPLICABLE IF BOX IS CHECKED:** ☐

| STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - INSPECTION OF H-PILES - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.13.1, AISC 341-16: CHAPTER J, SECTION J10, TABLE J10.1 |         |          |         |          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------|---------|----------|
| INSPECTION OF PILING                                                                                                                                                                                                 | QC      |          | QA      |          |
|                                                                                                                                                                                                                      | TASK    | DOC.     | TASK    | DOC.     |
| 1. Protected zone – no holes and unapproved attachments made by the responsible contractor, as applicable                                                                                                            | Perform | Document | Perform | Document |

**END SECTION**

**K. STRUCTURAL – STEEL CONSTRUCTION - COLD-FORMED STEEL DECK - PLACEMENT SECTION****THIS SECTION APPLICABLE IF BOX IS CHECKED: ☒**

| STEEL CONSTRUCTION - COLD-FORMED STEEL DECK - INSPECTION OR EXECUTION TASK <u>PRIOR</u> TO DECK PLACEMENT - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.2.2, SDI QA/QC-2017, APPENDIX 1: TABLE 1.1 |         |         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|
| INSPECTION OR EXECUTION TASKS PRIOR TO DECK PLACEMENT                                                                                                                                                                  | QC      | QA      |
| 1. Verify compliance of materials (deck and all deck accessories) with construction documents, including profiles, material properties, and base metal thickness                                                       | Perform | Perform |
| 2. Document acceptance or rejection of deck and deck accessories                                                                                                                                                       | Perform | Perform |
| STEEL CONSTRUCTION - COLD-FORMED STEEL DECK - INSPECTION OR EXECUTION TASK <u>AFTER</u> DECK PLACEMENT - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.2.2, SDI QA/QC-2017, APPENDIX 1: TABLE 1.2    |         |         |
| INSPECTION OR EXECUTION TASKS AFTER DECK PLACEMENT                                                                                                                                                                     | QC      | QA      |
| 1. Verify compliance of deck and all deck accessories installation with construction documents                                                                                                                         | Perform | Perform |
| 2. Verify deck materials are represented by the mill certifications that comply with the construction documents                                                                                                        | NA      | Perform |
| 3. Document acceptance or rejection of installation of deck and deck accessories                                                                                                                                       | Perform | Perform |
| STEEL CONSTRUCTION - COLDED-FORMED STEEL DECK - INSPECTION OR EXECUTION TASK PRIOR TO WELDING - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.2.2, SDI QA/QC-2017, APPENDIX 1: TABLE 1.3             |         |         |
| INSPECTION OR EXECUTION TASKS PRIOR TO WELDING                                                                                                                                                                         | QC      | QA      |
| 1. Welding procedure specification (WPS) available                                                                                                                                                                     | Observe | Observe |
| 2. Manufactures certifications for welding consumables available                                                                                                                                                       | Observe | Observe |
| 3. Material identification (type/grade)                                                                                                                                                                                | Observe | Observe |
| 4. Check welding equipment                                                                                                                                                                                             | Observe | Observe |

**END SECTION**

**L. STRUCTURAL – STEEL CONSTRUCTION - COLD-FORMED STEEL DECK - WELDING SECTION****THIS SECTION APPLICABLE IF BOX IS CHECKED: ☒**STEEL CONSTRUCTION - COLD-FORMED STEEL DECK - INSPECTION OR EXECUTION TASK DURING WELDING - VERIFY THE FOLLOWING ARE IN COMPLIANCE

IBC 2021 SECTION 1705.2.2, SDI QA/QC-2017, APPENDIX 1: TABLE 1.4

| INSPECTION OR EXECUTION TASKS DURING WELDING                    | QC      | QA      |
|-----------------------------------------------------------------|---------|---------|
| 1. Use of qualified welders                                     | Observe | Observe |
| 2. Control and handling of welding consumables                  | Observe | Observe |
| 3. Environmental conditions (wind speed, moisture, temperature) | Observe | Observe |
| 4. WPS followed                                                 | Observe | Observe |

STEEL CONSTRUCTION - COLD-FORMED STEEL DECK - INSPECTION OR EXECUTION TASK AFTER WELDING - VERIFY THE FOLLOWING ARE IN COMPLIANCE

IBC 2021 SECTION 1705.2.2, SDI QA/QC-2017, APPENDIX 1: TABLE 1.5

| INSPECTION OR EXECUTION TASKS AFTER WELDING                                            | QC      | QA      |
|----------------------------------------------------------------------------------------|---------|---------|
| 1. Verify size and location of welds, including support, sidelap, and perimeter welds. | Perform | Perform |
| 2. Welds meet visual acceptance criteria                                               | Perform | Perform |
| 3. Verify repair activities                                                            | Perform | Perform |
| 4. Document acceptance or rejection of welds                                           | Perform | Perform |

**END SECTION****M. STRUCTURAL – STEEL CONSTRUCTION - COLD-FORMED STEEL DECK - MECHANICAL FASTENING SECTION****THIS SECTION APPLICABLE IF BOX IS CHECKED: ☒**STEEL CONSTRUCTION - COLD-FORMED STEEL DECK - INSPECTION OR EXECUTION TASK PRIOR TO MECHANICAL FASTENING - VERIFY THE FOLLOWING ARE IN COMPLIANCE

IBC 2021 SECTION 1705.2.2, SDI QA/QC-2017, APPENDIX 1: TABLE 1.6

| INSPECTION OR EXECUTION TASKS PRIOR TO MECHANICAL FASTENING                  | QC      | QA      |
|------------------------------------------------------------------------------|---------|---------|
| 1. Manufacturer installation instructions available for mechanical fasteners | Observe | Observe |
| 2. Proper tools available for fastener installation                          | Observe | Observe |
| 3. Proper storage for mechanical fasteners                                   | Observe | Observe |

STEEL CONSTRUCTION - COLD-FORMED STEEL DECK - INSPECTION OR EXECUTION TASKS DURING MECHANICAL FASTENING - VERIFY THE FOLLOWING ARE IN COMPLIANCE

IBC 2021 SECTION 1705.2.2, SDI QA/QC-2017, APPENDIX 1: TABLE 1.7

| INSPECTION OR EXECUTION TASKS DURING MECHANICAL FASTENING                 | QC      | QA      |
|---------------------------------------------------------------------------|---------|---------|
| 1. Fasteners are positioned as required                                   | Observe | Observe |
| 2. Fasteners are installed in accordance with manufacturer's instructions | Observe | Observe |

STEEL CONSTRUCTION - COLD-FORMED STEEL DECK - INSPECTION OR EXECUTION TASK AFTER MECHANICAL FASTENING - VERIFY THE FOLLOWING ARE IN COMPLIANCE

IBC 2021 SECTION 1705.2.2, SDI QA/QC-2017, APPENDIX 1:

TABLE 1.8

| INSPECTION OR EXECUTION TASKS AFTER MECHANICAL FASTENING        | QC      | QA      |
|-----------------------------------------------------------------|---------|---------|
| 1. Check spacing, type, and installation of support fasteners   | Perform | Perform |
| 2. Check spacing, type, and installation of sidelap fasteners   | Perform | Perform |
| 3. Check spacing, type, and installation of perimeter fasteners | Perform | Perform |
| 4. Verify repair activities                                     | Perform | Perform |
| 5. Document acceptance or rejection of mechanical fasteners     | Perform | Perform |

**END SECTION****N. STRUCTURAL – STEEL CONSTRUCTION - OPEN-WEB STEEL JOISTS AND JOIST GIRDERS SECTION****THIS SECTION APPLICABLE IF BOX IS CHECKED: ☒**

STEEL CONSTRUCTION - OPEN-WEB STEEL JOISTS AND JOIST GIRDERS - VERIFY THE FOLLOWING ARE IN COMPLIANCE



IBC 2021 SECTION 1705.2.3: TABLE 1705.2.3

| TYPE                                                                                           | CONTINUOUS<br>SPECIAL<br>INSPECTION | PERIODIC<br>SPECIAL<br>INSPECTION | REFERENCED STANDARD <sup>a</sup>                     |
|------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------------------|------------------------------------------------------|
| 1. Installation of open-web steel joists and joist girders.                                    |                                     |                                   |                                                      |
| a. End connections – welded or bolted.                                                         | ----                                | X                                 | SJI specifications listed in IBC 2021 Section 2207.1 |
| b. Bridging – horizontal or diagonal                                                           | ----                                | ----                              |                                                      |
| 1. Standard bridging                                                                           | ----                                | X                                 | SJI specifications listed in IBC 2021 Section 2207.1 |
| 2. Bridging that differs from the SJI specifications listed in IBC 2021 Section 2207.1         | ----                                | X                                 |                                                      |
| a. Where applicable, see IBC 2021 Section 1705.13, Special inspections for seismic resistance. |                                     |                                   |                                                      |

**END SECTION**

**O. STRUCTURAL – STEEL CONSTRUCTION - COLD-FORMED STEEL TRUSSES SPANNING 60 FEET OR GREATER SECTION**

**THIS SECTION APPLICABLE IF BOX IS CHECKED: ☐**

STEEL CONSTRUCTION - COLD-FORMED STEEL TRUSSES SPANNING 60 FEET OR GREATER - VERIFY THE FOLLOWING ARE IN COMPLIANCE  
IBC 2021 SECTION 1705.2.4

| TASK                                                                    | CONTINUOUS<br>SPECIAL<br>INSPECTION | PERIODIC<br>SPECIAL<br>INSPECTION | DESCRIPTION                                                                                                                                                                             |
|-------------------------------------------------------------------------|-------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Cold-form steel trusses spanning 60-feet or greater where/if applies | X                                   | ----                              | Verify that temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package. |

**END SECTION**

**P. STRUCTURAL - COLD-FORMED STEEL LIGHT-FRAME CONSTRUCTION - SPECIAL INSPECTIONS FOR WIND RESISTANCE SECTION**

**THIS SECTION APPLICABLE IF BOX IS CHECKED:** ☐

COLD-FORMED STEEL LIGHT-FRAME CONSTRUCTION – SPECIAL INSPECTIONS FOR WIND RESISTANCE - VERIFY THE FOLLOWING ARE IN COMPLIANCE  
IBC 2021 SECTION 1705.12.2

| TASK                                                                      | CONTINUOUS SPECIAL INSPECTION | PERIODIC SPECIAL INSPECTION | DESCRIPTION                                                                                                                                                                                                        |
|---------------------------------------------------------------------------|-------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Welding operations of elements of the main wind-force-resisting system | ----                          | X                           | Visually inspect all welds composing elements of the main wind force-resisting system, including shear walls, braces, diaphragms, collectors (drag struts), and hold-downs.                                        |
| 2. Connections for main wind-force resisting system                       | ----                          | X                           | Visually inspect all screw attachment, bolting, anchoring and other fastening of elements of main wind-force resisting system, including shear walls, braces, diaphragms, collectors (drag struts) and hold-downs. |

**NOTE:** This section required for buildings and structures constructed in the following areas: 1.) In wind Exposure Category B, where  $V_{asd}$  as determined in accordance with IBC 2021 Section 1609.3.1 is 117 mph (Vult = 150 mph) or greater. 2.) In wind Exposure Category C or D, where  $V_{asd}$  as determined in accordance with IBC 2021 Section 1609.3.1 is 109 mph (Vult = 140 mph) or greater.

**END SECTION**

**Q. STRUCTURAL - COLD-FORMED STEEL LIGHT-FRAME CONSTRUCTION - SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE SECTION**

**THIS SECTION APPLICABLE IF BOX IS CHECKED:** ☐

COLD-FORMED STEEL LIGHT-FRAME CONSTRUCTION – SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE - VERIFY THE FOLLOWING ARE IN COMPLIANCE  
IBC 2021 SECTION 1705.13.3

| TASK                                                                    | CONTINUOUS SPECIAL INSPECTION | PERIODIC SPECIAL INSPECTION | DESCRIPTION                                                                                                                                                                                                          |
|-------------------------------------------------------------------------|-------------------------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Welding operations of elements of the seismic force-resisting system | ----                          | X                           | Visually inspect all welds composing elements of the seismic force-resisting system, including shear walls, braces, diaphragms, collectors (drag struts), and hold-downs.                                            |
| 2. Connections for seismic force-resisting system                       | ----                          | X                           | Visually inspect all screw attachment, bolting, anchoring and other fastening of elements of the seismic force-resisting system, including shear walls, braces, diaphragms, collectors (drag struts) and hold-downs. |

**NOTE:** This section required for seismic force-resisting systems of structures assigned to Seismic Design Category C, D, E, or F.

**END SECTION**

**R. STRUCTURAL - CONCRETE CONSTRUCTION SECTION****THIS SECTION APPLICABLE IF BOX IS CHECKED: ☒**

| CONCRETE CONSTRUCTION - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.3: TABLE 1705.3                                                     |                                     |                                   |                                               |                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------------------|-----------------------------------------------|----------------|
| TYPE                                                                                                                                                        | CONTINUOUS<br>SPECIAL<br>INSPECTION | PERIODIC<br>SPECIAL<br>INSPECTION | REFERENCED<br>STANDARD <sup>a</sup>           | IBC REFERENCE  |
| 1. Inspect reinforcement, including prestressing tendons, and verify placement.                                                                             | ----                                | X                                 | ACI 318: Ch. 20, 25.2, 25.3, 26.6-1-26.6.3    |                |
| 2. Reinforcing bar welding                                                                                                                                  |                                     |                                   |                                               |                |
| a. Verify weldability of reinforcing bars other than ASTM A706;                                                                                             | ----                                | X                                 |                                               |                |
| b. Inspect single-pass fillet welds, maximum 5/16"; and                                                                                                     | ----                                | X                                 | AWS D1.4<br>ACI 318: 26.6.4                   |                |
| c. Inspect all other welds.                                                                                                                                 | X                                   | ----                              |                                               |                |
| 3. Inspect anchors cast in concrete.                                                                                                                        | ----                                | X                                 | ACI 318: 17.8.2                               |                |
| 4. Inspect anchors post-installed in hardened concrete members <sup>b</sup>                                                                                 |                                     |                                   |                                               |                |
| a. Adhesive anchors installed horizontally or upwardly inclined orientations to resist sustained tension loads.                                             | X                                   | ----                              | ACI 318:<br>17.8.2.4                          |                |
| b. Mechanical anchors and adhesive anchors not defined in 4.a.                                                                                              | ----                                | X                                 | ACI 318: 17.8.2                               |                |
| 5. Verify use of required design mix.                                                                                                                       | ----                                | X                                 | ACI 318: Ch. 19, 26.4.3, 26.4.4               | 1904.1, 1904.2 |
| 6. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete. | X                                   | ----                              | ASTM C172<br>ASTM C31<br>ACI 318: 26.5, 26.12 |                |
| 7. Inspect concrete and shotcrete placement for proper application techniques.                                                                              | X                                   | ----                              | ACI 318: 26.5                                 |                |
| 8. Verify maintenance of specified curing temperature and techniques.                                                                                       | ----                                | X                                 | ACI 318: 26.5.3-26.5.5                        |                |
| 9. Inspect prestressed concrete for:                                                                                                                        |                                     |                                   |                                               |                |
| a. Application of prestressing forces; and                                                                                                                  | X                                   | ----                              | ACI 318: 26.10                                |                |
| b. Grouting of bonded prestressing tendons.                                                                                                                 | X                                   | ----                              |                                               |                |
| 10. Inspect erection of precast concrete members                                                                                                            | ----                                | X                                 | ACI 318: 26.9                                 |                |

**R. STRUCTURAL - CONCRETE CONSTRUCTION SECTION (CONTINUED)**

CONCRETE CONSTRUCTION - VERIFY THE FOLLOWING ARE IN COMPLIANCE  
IBC 2021 SECTION 1705.3: TABLE 1705.3

| TYPE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | CONTINUOUS<br>SPECIAL<br>INSPECTION | PERIODIC<br>SPECIAL<br>INSPECTION        | REFERENCED<br>STANDARD <sup>a</sup>                        | IBC REFERENCE |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------------|------------------------------------------------------------|---------------|
| 11. For precast concrete diaphragm connections or reinforcement at joints classified as moderate or high deformability (MDE or HDE) in structures assigned to Seismic Design Category C, D, E or F, inspect such connection and reinforcing in the field for: <ul style="list-style-type: none"> <li>a. Installation of the embedded parts</li> <li>b. Completion of the continuity reinforcement across joints</li> <li>c. Completion of connection in the field</li> </ul>                                                                                                                                                                          | <br><br><br><br><br>X<br>X<br>X     | <br><br><br><br><br>----<br>----<br>---- | <br><br><br><br><br>ACI 318:<br>26.13.1.3<br><br>ACI 550.5 |               |
| 12. Inspect installation tolerances of precast concrete diaphragm connections for compliance with ACI 550.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ----                                | X                                        | ACI 318:<br>26.13.1.3                                      |               |
| 13. Verify in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ----                                | X                                        | ACI 318: 26.11.2                                           |               |
| 14. Inspect formwork for shape, location and dimensions of the concrete member being formed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ----                                | X                                        | ACI 318:<br>26.11.1.2(B)                                   |               |
| 15. Unbonded Post-Tension Concrete: Before concrete placement, inspect the following for compliance with post-tensioning installation drawings and the Contract Documents: <ul style="list-style-type: none"> <li>a. Location and number of tendons.</li> <li>b. Tendon profiles and cover.</li> <li>c. Installation of backup bars, hairpins, and other non-prestressed reinforcement shown on post-tensioning installation drawings.</li> <li>d. Installation of pocket formers and anchorage devices.</li> <li>e. Repair of damaged sheathing.</li> <li>f. Connection between sheathing and anchorage devices for encapsulated systems.</li> </ul> | X                                   | ----                                     |                                                            |               |
| 16. Unbonded Post-Tension Concrete: Record tendon elongations during stressing.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | X                                   | ----                                     |                                                            |               |
| 17. Unbonded Post-Tension Concrete: Report immediately deviations from the Contract Documents to the Engineer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                     |                                          |                                                            |               |
| a. Where applicable, see IBC 2021 Section 1705.13, Special inspections for seismic resistance.<br>b. Specific requirements for special inspection shall be included in the research report for the anchor issued by an approved source in accordance with 17.8.2 in ACI 318, or other qualification procedures. Where specific requirements are not provided, special inspection requirements shall be specified by the registered design professional and shall be approved by the building official prior to commencement of the work.                                                                                                              |                                     |                                          |                                                            |               |

## END SECTION

**S. STRUCTURAL - MASONRY CONSTRUCTION - MINIMUM VERIFICATION REQUIREMENTS SECTION****THIS SECTION APPLICABLE IF BOX IS CHECKED: ☒****REQUIRED QUALITY ASSURANCE LEVEL      ☐ LEVEL 1    ☒ LEVEL 2    ☐ LEVEL 3****MASONRY CONSTRUCTION - MINIMUM VERIFICATION REQUIREMENTS - VERIFY THE FOLLOWING ARE IN COMPLIANCE****IBC 2021 SECTION 1705.4, TMS 602-16: TABLE 3**

| MINIMUM VERIFICATION                                                                                                                                                                                                                                                      | REQUIRED FOR<br>QUALITY ASSURANCE <sup>a</sup> |         |         | REFERENCE<br>FOR CRITERIA |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---------|---------|---------------------------|
|                                                                                                                                                                                                                                                                           | LEVEL 1                                        | LEVEL 2 | LEVEL 3 | TMS 602                   |
| 1. Prior to construction, verification of compliance submittals                                                                                                                                                                                                           | R                                              | R       | R       | Art. 1.5                  |
| 2. Prior to construction, verification of $f'_m$ and $f'_{AAC}$ , except where specifically exempted by Code.                                                                                                                                                             | NR                                             | R       | R       | Art. 1.4 B                |
| 3. During construction, verification of Slump flow and Visual Stability Index (VSI) when self-consolidating grout is delivered to the project site.                                                                                                                       | NR                                             | R       | R       | Art. 1.5 & 1.6.3          |
| 4. During construction, verification of $f'_m$ and $f'_{AAC}$ for every 5,000 sq. ft. (465 sq. m)                                                                                                                                                                         | NR                                             | NR      | R       | Art. 1.4 B                |
| 5. During construction, verification of proportions of materials as delivered to the project site for premixed or preblended mortar, prestressing grout, and grout other than self-consolidating grout.                                                                   | NR                                             | NR      | R       | Art. 1.4 B                |
| a. R = Required, NR = Not Required.<br>Refer to TMS 402 Part 1, Chapter 3, Table 3.1 for the required "Minimum Quality Assurance Level" based on the "Design Method" (per TMS 402) and assigned "Risk Category" (as defined by the "Building Code") used for the project. |                                                |         |         |                           |
| <b>NOTE: For projects with masonry designed in accordance with TM 402 Part 3 (Engineered Design Method) the required quality assurance level is as follows: Risk Category I, II or III - Level 2, Risk Category IV - Level 3.</b>                                         |                                                |         |         |                           |

**END SECTION**

**T. STRUCTURAL - MASONRY CONSTRUCTION - MINIMUM SPECIAL INSPECTION REQUIREMENTS SECTION**

**THIS SECTION APPLICABLE IF BOX IS CHECKED:** ☒ **LEVEL 1** ☒ **LEVEL 2** ☐ **LEVEL 3**

**FREQUENCY LEVEL**

☐ **LEVEL 1**

☒ **LEVEL 2**

☐ **LEVEL 3**

**MASONRY CONSTRUCTION – MINIMUM SPECIAL INSPECTION REQUIREMENTS - VERIFY THE FOLLOWING ARE IN COMPLIANCE**

IBC 2021 SECTION 1705.4, TMS 602-16: TABLE 4

| MINIMUM SPECIAL INSPECTIONS                                                                                                                 |                        |                                 |         |                                 |                          |
|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---------------------------------|---------|---------------------------------|--------------------------|
| INSPECTION TASKS                                                                                                                            | FREQUENCY <sup>a</sup> |                                 |         | REFERENCE FOR CRITERIA          |                          |
|                                                                                                                                             | LEVEL 1                | LEVEL 2                         | LEVEL 3 | TMS 402                         | TMS 602                  |
| 1. As masonry construction begins, verify that the following are in compliance:                                                             |                        |                                 |         |                                 |                          |
| a. Proportions of site-prepared mortar                                                                                                      | NR                     | P                               | P       |                                 | Art. 2.1, 2.6 A, & 2.6 C |
| b. Grade and size of prestressing tendons and anchorages                                                                                    | NR                     | P                               | P       |                                 | Art. 2.4 B & 2.4 H       |
| c. Grade, type and size of reinforcement, connectors, anchor bolts, and prestressing tendons and anchorages                                 | NR                     | P                               | P       |                                 | Art. 3.4 & 3.6 A         |
| d. Prestressing technique                                                                                                                   | NR                     | P                               | P       |                                 | Art. 3.6 B               |
| e. Properties of thin-bed mortar for AAC masonry                                                                                            | NR                     | C <sup>b</sup> / P <sup>c</sup> | C       |                                 | Art. 2.1 C.1             |
| f. Sample panel construction                                                                                                                | NR                     | P                               | C       |                                 | Art. 1.6 D               |
| 2. Prior to grouting, verify that the following are in compliance:                                                                          |                        |                                 |         |                                 |                          |
| a. Grout space                                                                                                                              | NR                     | P                               | C       |                                 | Art. 3.2 D & 3.2 F       |
| b. Placement of prestressing tendons and anchorages                                                                                         | NR                     | P                               | P       | Sec. 10.8 & 10.9                | Art. 2.4 & 3.6           |
| c. Placement of reinforcement, connectors, and anchor bolts                                                                                 | NR                     | P                               | C       | Sec. 6.1, 6.3.1, 6.3.6, & 6.3.7 | Art. 3.2 E & 3.4         |
| d. Proportions of site-prepared grout and prestressing grout for bonded tendons                                                             | NR                     | P                               | P       |                                 | Art. 2.6 B & 2.4 G.1.b   |
| 3. Verify compliance of the following during construction:                                                                                  |                        |                                 |         |                                 |                          |
| a. Material and procedures with the approved submittals                                                                                     | NR                     | P                               | P       |                                 | Art. 1.5                 |
| b. Placement of masonry units and mortar joint construction                                                                                 | NR                     | P                               | P       |                                 | Art. 3.3 B               |
| c. Size and location of structural members                                                                                                  | NR                     | P                               | P       |                                 | Art. 3.3 F               |
| d. Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction | NR                     | P                               | C       | Sec. 1.2.1(e), 6.2.1, & 6.3.1   |                          |
| e. Welding of reinforcement                                                                                                                 | NR                     | C                               | C       | Sec. 6.1.6.1.2                  |                          |

**T. STRUCTURAL - MASONRY CONSTRUCTION - MINIMUM SPECIAL INSPECTION REQUIREMENTS SECTION (CONTINUED)**

**MASONRY CONSTRUCTION - MINIMUM SPECIAL INSPECTION REQUIREMENTS - VERIFY THE FOLLOWING ARE IN COMPLIANCE**

IBC 2021 SECTION 1705.4, TMS 602-16: TABLE 4

| MINIMUM SPECIAL INSPECTIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |               |         |                        |                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---------------|---------|------------------------|----------------------------------------------------------------|
| INSPECTION TASKS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | FREQUENCY <sup>a</sup> |               |         | REFERENCE FOR CRITERIA |                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | LEVEL 1                | LEVEL 2       | LEVEL 3 | TMS 402                | TMS 602                                                        |
| f. Preparation, construction, and protection of masonry during cold weather (temperature below 40°F (4.4°C) or hot weather (temp above 90°F (32.2°C)))                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | NR                     | P             | P       |                        | Art. 1.8 C & 1.8 D                                             |
| g. Placement of AAC masonry units and construction of thin bed mortar joints                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | NR                     | C (b) / P (c) | C       |                        | Art. 3.3 B.9 & 3.3 F.1.b                                       |
| 4. Observe preparation of grout specimens, mortar specimens, and/or prisms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | NR                     | P             | C       |                        | Art. 1.4 B.2.a.3, 1.4 B.2.b.3, 1.4 B.2.c.3, 1.4 B.3, & 1.4 B.4 |
| <p>a. Frequency refers to the frequency of inspection, which may be continuous during the listed task or periodically during the listed task, as defined in the table. NR= Not Required, P = Periodic, C = Continuous. Refer to TMS 402 Part 1, Chapter 3, Table 3.1 for the required minimum "Quality Assurance Level" based on the "Design Method" (per TMS 402) and assigned "Risk Category" (as defined by the "Building Code") used for the project.</p> <p>b. Required for the first 5000 square feet (465 square meters) of AAC masonry.</p> <p>c. Required for the first 5000 square feet (465 square meters) of AAC masonry.</p> |                        |               |         |                        |                                                                |
| <p><b>NOTE: For projects with masonry designed in accordance with TM 402 Part 3 (Engineered Design Method) the required quality assurance frequency level is as follows: Risk Category I, II or III - Level 2, Risk Category IV - Level 3.</b></p>                                                                                                                                                                                                                                                                                                                                                                                        |                        |               |         |                        |                                                                |

**END SECTION**

## U. STRUCTURAL - WOOD CONSTRUCTION

THIS SECTION APPLICABLE IF BOX IS CHECKED: ☐

| WOOD CONSTRUCTION - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.5 |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TASK                                                                                  | INSPECTION TYPE | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 1. Prefabricated wood structural elements and assemblies                              | Perform         | Perform special inspections of prefabricated wood structural elements and assemblies in accordance with IBC 2021 Section 1704.2.5.                                                                                                                                                                                                                                                                                                                                 |
| 2. High-load diaphragms where applicable                                              | Perform         | High-load diaphragms designed in accordance with IBC 2021 Section 2306.2 shall be installed with special inspections as indicated in Section 1704.2. Verify grade and thickness of wood structural panel sheathing, nominal size of framing members at adjoining panel edges, nail or staple diameter and length, the number of fastener lines and that the spacing between fasteners in each line and at edge margins agree with the approved contract documents. |
| 3. Metal-plate connected wood trusses                                                 | Perform         | For wood trusses with a clear span of 60 feet or greater, verify during construction that the temporary installation restraint/bracing is installed in accordance with the approved truss submittal package.                                                                                                                                                                                                                                                       |

**END SECTION**

## V. STRUCTURAL – MASS TIMBER CONSTRUCTION & SEALING OF MASS TIMBER

THIS SECTION APPLICABLE IF BOX IS CHECKED: ☐



**MASS TIMBER CONSTRUCTION - REQUIRED SPECIAL INSPECTIONS OF MASS TIMBER CONSTRUCTION & SEALING OF MASS TIMBER - VERIFY THE FOLLOWING ARE IN COMPLIANCE**  
**IBC 2021 SECTION 1705.5.3: TABLE 1705.5.3; IBC 2021 SECTION 1705.20**

| TYPE                                                                                                                                                  |                                                                                               | CONTINUOUS SPECIAL INSPECTION | PERIODIC SPECIAL INSPECTION |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|-------------------------------|-----------------------------|
| 2. Inspection of anchorage and connection of mass timber construction to timber deep foundation systems.                                              |                                                                                               | ----                          | X                           |
| 3. Inspect erection of mass timber construction.                                                                                                      |                                                                                               | ----                          | X                           |
| 4. Inspection of connections where installation methods are required to meet design loads                                                             |                                                                                               |                               |                             |
| Threaded fasteners                                                                                                                                    | Verify use of proper installation equipment.                                                  | ----                          | X                           |
|                                                                                                                                                       | Verify use of pre-drilled holes where required.                                               | ----                          | X                           |
|                                                                                                                                                       | Inspect screws, including diameter, length, head type, spacing, installation angle and depth. | ----                          | X                           |
| Adhesive anchors installed in horizontal or upwardly inclined orientation to resist sustained tension loads                                           |                                                                                               | X                             | ----                        |
| Adhesive anchors not defined in preceding cell                                                                                                        |                                                                                               | ----                          | X                           |
| Bolted Connections                                                                                                                                    |                                                                                               | ----                          | X                           |
| Concealed Connections                                                                                                                                 |                                                                                               | ----                          | X                           |
| Where sealants or adhesive required by Section 703.7 is applied to mass timber building elements as designated in the approved construction documents |                                                                                               | ----                          | X                           |

**END SECTION**

**W. STRUCTURAL - STRUCTURAL WOOD - SPECIAL INSPECTIONS FOR WIND RESISTANCE SECTION**

**THIS SECTION APPLICABLE IF BOX IS CHECKED: ☐**

**STRUCTURAL WOOD – SPECIAL INSPECTIONS FOR WIND RESISTANCE - VERIFY THE FOLLOWING ARE IN COMPLIANCE**  
**IBC 2021 SECTION 1705.12.1**

| TASK                                                                              | INSPECTION TYPE | DESCRIPTION                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Field gluing operations of elements of the main windforce-resisting system     | Continuous      | Inspect field gluing operations of elements of the main windforce-resisting system.                                                                                                          |
| 2. Connections and attachments of elements of the main windforce-resisting system | Periodic        | Inspect nailing, bolting, anchoring and other fastening of elements of the main windforce-resisting system, including wood shear walls, wood diaphragms, drag struts, braces and hold downs. |

**NOTE: This section required for buildings and structures constructed in the following areas: 1.) In wind Exposure Category B, where Vasd as determined in accordance with IBC 2021 Section 1609.3.1 is 117 mph (Vult = 150 mph) or greater. 2.) In wind Exposure Category C or D, where Vasd as determined in accordance with IBC 2021 Section 1609.3.1 is 109 mph (Vult = 140 mph) or greater.**

**END SECTION**

**X. STRUCTURAL - STRUCTURAL WOOD - SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE SECTION****THIS SECTION APPLICABLE IF BOX IS CHECKED:** ☐

STRUCTURAL WOOD – SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE - VERIFY THE FOLLOWING ARE IN COMPLIANCE

IBC 2021 SECTION 1705.13.2

| TASK                                                                             | INSPECTION TYPE | DESCRIPTION                                                                                                                                                                                              |
|----------------------------------------------------------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Field gluing operations of elements of the seismic force-resisting system     | Continuous      | Inspect field gluing operations of elements of the seismic force-resisting system.                                                                                                                       |
| 2. Connections and attachments of elements of the seismic force-resisting system | Periodic        | Inspect nailing, bolting, anchoring and other fastening of elements of the seismic force-resisting system, including wood shear walls, wood diaphragms, drag struts, braces shear panels and hold downs. |

**NOTE:** This section is applicable to structures assigned to Seismic Design Category C, D, E, or F and is not applicable to structures assigned to Seismic Design Category A or B. Confirm Seismic Design Category with structural engineer.

**END SECTION****Y. STRUCTURAL – WIND RESISTING COMPONENTS - SPECIAL INSPECTIONS FOR WIND RESISTANCE****THIS SECTION APPLICABLE IF BOX IS CHECKED:** ☐

SPECIAL INSPECTIONS FOR WIND RESISTANCE – WIND RESISTING COMPONENTS - VERIFY THE FOLLOWING ARE IN COMPLIANCE

IBC 2021 SECTION 1705.12.3

| TASK                                                                                    | CONTINUOUS SPECIAL INSPECTION | PERIODIC SPECIAL INSPECTION | DESCRIPTION                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------|-------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Roof Covering, roof deck, and roof framing connections                               | ----                          | X                           | Visually inspect roof covering, roof deck and roof framing connections. Verify installation is in accordance with manufacturer's recommendations and contract documents.                                     |
| 2. Exterior wall covering and wall connections to roof and floor diaphragms and framing | ----                          | X                           | Visually inspect all exterior wall coverings and wall connections to roof and floor diaphragms and framing. Verify installation is in accordance with manufacturer's recommendations and contract documents. |

**NOTE:** This section required for buildings and structures constructed in the following areas: 1.) In wind Exposure Category B, where  $V_{asd}$  as determined in accordance with IBC 2021 Section 1609.3.1 is 117 mph ( $V_{ult} = 150$  mph) or greater. 2.) In wind Exposure Category C or D, where  $V_{asd}$  as determined in accordance with IBC 2021 Section 1609.3.1 is 109 mph ( $V_{ult} = 140$  mph) or greater.

**END SECTION**

**Z. STRUCTURAL - SEISMIC ISOLATION SYSTEMS - SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE SECTION****THIS SECTION APPLICABLE IF BOX IS CHECKED:** ☐

SEISMIC ISOLATION SYSTEMS - SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE - VERIFY THE FOLLOWING ARE IN COMPLIANCE

IBC 2021 SECTION 1705.13.8

| TASK                                                                                                | INSPECTION TYPE | DESCRIPTION                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Inspections during fabrication and installation of isolator units and energy dissipation devices | Periodic        | Inspect seismic isolation systems in seismically isolated structures assigned to Seismic Design Category B, C, D, E, or F during the fabrication and installation of isolator units and energy dissipation devices. Verify conformance to manufacturer's recommendations and approved construction documents |

**NOTE: This section required for seismic isolation systems in seismically isolated structures assigned to Seismic Design Category B, C, D, E, or F.**

**END SECTION****AA.GEOTECHNICAL - SOILS INSPECTIONS AND TESTS SECTION****THIS SECTION APPLICABLE IF BOX IS CHECKED:** ☒

SOILS INSPECTIONS AND TESTS - REQUIRED SPECIAL INSPECTIONS AND TESTS OF SOILS - VERIFY THE FOLLOWING ARE IN COMPLIANCE

IBC 2021 SECTION 1705.6: TABLE 1705.6

| TYPE                                                                                                                                                                                                                                    | CONTINUOUS SPECIAL INSPECTION | PERIODIC SPECIAL INSPECTION |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------|
| 1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.                                                                                                                                      | ----                          | X                           |
| 2. Verify excavations are extended to proper depth and have reached proper material.                                                                                                                                                    | ----                          | X                           |
| 3. Perform classification and testing of compacted fill materials.                                                                                                                                                                      | ----                          | X                           |
| 4. During fill placement, verify use of proper materials and procedures in accordance with the provisions of the approved geotechnical report. Verify densities and lift thicknesses during placement and compaction of compacted fill. | X                             | ----                        |
| 5. Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.                                                                                                                              | ----                          | X                           |

**END SECTION**

**BB. GEOTECHNICAL - DRIVEN DEEP FOUNDATIONS SECTION****THIS SECTION APPLICABLE IF BOX IS CHECKED:** ☐

| DRIVEN DEEP FOUNDATIONS - SPECIAL INSPECTIONS AND TEST OF DRIVEN DEEP FOUNDATION ELEMENTS - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.7: TABLE 1705.7                                                                                            |                                                     |                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-----------------------------------|
| TYPE                                                                                                                                                                                                                                                                   | CONTINUOUS<br>SPECIAL<br>INSPECTION                 | PERIODIC<br>SPECIAL<br>INSPECTION |
| 1. Verify element materials, sizes and lengths comply with requirements.                                                                                                                                                                                               | X                                                   | ----                              |
| 2. Determine capacities of test elements and conduct additional load tests, as required.                                                                                                                                                                               | X                                                   | ----                              |
| 3. Inspect driving operations and maintain complete and accurate records for each element.                                                                                                                                                                             | X                                                   | ----                              |
| 4. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any damage to foundation element | X                                                   | ----                              |
| 5. For steel elements, perform additional special inspection in accordance with IBC 2021 Section 1705.2.                                                                                                                                                               | In accordance with Section 1705.2                   |                                   |
| 6. For concrete elements and concrete filled elements, perform tests and additional inspections in accordance with IBC 2021 Section 1705.3.                                                                                                                            | In accordance with Section 1705.3                   |                                   |
| 7. For specialty elements, perform additional inspections as determined by the registered design professional in responsible charge.                                                                                                                                   | In accordance with Statement of Special Inspections |                                   |

**END SECTION****CC. GEOTECHNICAL - CAST IN PLACE DEEP FOUNDATIONS SECTION****THIS SECTION APPLICABLE IF BOX IS CHECKED:** ☐

| CAST IN PLACE DEEP FOUNDATIONS - SPECIAL INSPECTIONS AND TESTS OF CAST-IN-PLACE DEEP FOUNDATION ELEMENTS - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.8: TABLE 1705.8                                         |                                     |                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------------------|
| TYPE                                                                                                                                                                                                                               | CONTINUOUS<br>SPECIAL<br>INSPECTION | PERIODIC<br>SPECIAL<br>INSPECTION |
| 1. Inspect drilling operations and maintain complete and accurate records for each element.                                                                                                                                        | X                                   | ----                              |
| 2. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable) and adequate end-bearing strata capacity. Record concrete or grout volumes | X                                   | ----                              |
| 3. For concrete elements, perform tests and additional special inspections in accordance with IBC 2021 Section 1705.3.                                                                                                             | In accordance with Section 1705.3   |                                   |

**END SECTION**

**DD. GEOTECHNICAL - HELICAL PILE FOUNDATIONS SECTION****THIS SECTION APPLICABLE IF BOX IS CHECKED:** ☐

HELICAL PILE FOUNDATIONS - SPECIAL INSPECTIONS OF HELICAL PILE FOUNDATIONS - VERIFY THE FOLLOWING ARE IN COMPLIANCE  
IBC 2021 SECTION 1705.9

| TYPE                                                                                                                                                                                                                                                                                                                                                                                                                                | CONTINUOUS<br>SPECIAL<br>INSPECTION | PERIODIC<br>SPECIAL<br>INSPECTION |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------------------|
| 1. During installation of helical pile foundations. Record installation equipment used, pile dimensions, tip elevations, final depth, final installation torque and other pertinent installation data as required by the registered design professional in responsible charge. The approved geotechnical report and the construction documents prepared by the registered design professional shall be used to determine compliance | X                                   | ----                              |

**END SECTION**

**EE. FIRE PROTECTION - SPRAYED FIRE-RESISTANT MATERIALS SECTION****THIS SECTION APPLICABLE IF BOX IS CHECKED:** ☐

**SPRAYED FIRE-RESISTANT MATERIALS – SPECIAL INSPECTIONS AND TESTS OF SPRAYED FIRE-RESISTANT MATERIALS**  
**- VERIFY THE FOLLOWING ARE IN COMPLIANCE**  
**IBC 2021 SECTION 1705.15**

| TASK                                   | INSPECTION TYPE | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Physical and visual tests           | Observe         | Special inspections and tests of sprayed fire-resistant material shall include the following to demonstrate compliance with the listing and the fire-resistance rating:<br>1. Condition of substrates<br>2. Thickness of application<br>3. Density in pounds per cubic foot<br>4. Bond strength adhesion/cohesion<br>5. Condition of finished application                                                                                                                           |
| 2. Structural member surface condition | Observe         | Prior to application sprayed fire-resistant material, verify that surfaces of structural members to be sprayed have been prepared in accordance with the approved fire-resistance design and the written instructions of approved manufacturers.                                                                                                                                                                                                                                    |
| 3. Application                         | Observe         | Verify the substrate meets the minimum ambient temperature before and after the application as specified in the written instructions of approved manufacturers.                                                                                                                                                                                                                                                                                                                     |
| 4. Material thickness                  | Observe         | Verify that not more than 10 percent of the thickness measurements of the sprayed fire-resistant materials (SFRM) applied to floor, roof, and wall assemblies and structural members shall be less than the thickness required by the approved fire-resistance design, and none shall be less than minimum allowable thickness required by IBC 2021 Section 1705.15.4.1. Thickness measurements shall be made in accordance with IBC 2021 Sections 1705.15.4.2 through 1705.15.4.9. |
| 5. Material density                    | Observe         | Verify that the density of the sprayed fire-resistant material (SFRM) is not less than the density specified in the approved fire-resistance design. Density of the SFRM shall be determined in accordance with ASTM E 605. Test samples for determining the density of the SFRM shall be selected as required by IBC 2021 Section 1705.15.5.                                                                                                                                       |
| 6. Bond strength                       | Observe         | Verify cohesive/adhesive bond strength of the cured sprayed fire-resistant material (SFRM) applied to floor, roof, and wall assemblies and structural members is not less than 150 psf. The cohesive/adhesive bond strength shall be determined in accordance with the field test specified in ASTM E 736 by testing in-place samples of the SFRM selected in accordance with IBC 2021 Sections 1705.15.6.1 through 1705.15.6.3.                                                    |

**END SECTION**

**FF. FIRE PROTECTION - MASTIC AND INTUMESCENT FIRE-RESISTANT COATINGS SECTION****THIS SECTION APPLICABLE IF BOX IS CHECKED:** ☐

MASTIC AND INTUMESCENT FIRE-RESISTANT COATINGS - SPECIAL INSPECTIONS AND TEST FOR MASTIC AND INTUMESCENT FIRE-RESISTANT COATINGS - VERIFY THE FOLLOWING ARE IN COMPLIANCE  
IBC 2021 SECTION 1705.16

| TASK                                    | INSPECTION TYPE | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Surface preparation and application. | Observe         | Special inspections and test for mastic and intumescent fire-resistant coatings applied to structural elements shall be performed in accordance with AWCI 12-B and based on the fire-resistance design as designated in the approved contraction documents. Special inspections and tests shall be performed during construction. Additional visual inspection shall be performed after the rough installation and, where applicable, prior to the concealment of electrical, automatic sprinkler, mechanical and plumbing systems. Confirm installation is in accordance with the manufacturer's instructions and the terms of their listing. |

**END SECTION****GG. FIRE PROTECTION - FIRE RESISTANT PENETRATIONS AND JOINTS SECTION****THIS SECTION APPLICABLE IF BOX IS CHECKED:** ☒

FIRE RESISTANT PENETRATIONS AND JOINTS – SPECIAL INSPECTIONS FOR FIRE-RESISTANT PENETRATIONS AND JOINTS - VERIFY THE FOLLOWING ARE IN COMPLIANCE  
IBC 2021 SECTION 1705.18

| TASK                            | INSPECTION TYPE | DESCRIPTION                                                                                                                                                                                                  |
|---------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Penetration firestops        | Observe         | Inspections of penetration firestop systems that are tested and listed in accordance with IBC 2021 Sections 714.4.1.2 and 714.5.1.2 shall be conducted by an approved agency in accordance with ASTM E 2174. |
| 2. Fire-resistant joint systems | Observe         | Inspections of fire-resistant joint systems that are tested and listed in accordance with IBC 2021 Sections 715.3.1 and 715.4 shall be conducted in accordance with ASTM E 2393.                             |

**NOTE:** This section applies to through-penetrations, membrane penetration firestops, fire-resistant joint systems and perimeter fire containment systems in high-rise buildings, buildings assigned to Risk Category III & IV or in fire areas containing Group R occupancies with an occupant load greater than 250. DOR may choose to uncheck this section where project is assigned to Risk Category I or II. Confirm Risk Category with Structural Engineer.

**END SECTION**

## HH. FIRE PROTECTION - TESTING FOR SMOKE CONTROL SECTION

THIS SECTION APPLICABLE IF BOX IS CHECKED: ☐

TESTING FOR SMOKE CONTROL – SPECIAL INSPECTIONS FOR TESTING FOR SMOKE CONTROL - VERIFY THE FOLLOWING ARE IN COMPLIANCE  
IBC 2021 SECTION 1705.19

| TASK                                                                                                                                                                                                                                                                                                                                                                          | INSPECTION TYPE | DESCRIPTION                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Test Smoke Control System - Verify duct leakage is in accordance with IBC 2021 Section 909.10.2 and verify and document locations of all fire protection devices.                                                                                                                                                                                                          | Observe         | Perform during erection of ductwork and prior to concealment for the purposes of leakage testing and recording of device location.                                    |
| 2. Test Smoke Control System - Verification of pressure differences across smoke barriers as required in IBC 2021 Sections 909.5.1 and 909.18.6, the verification of appropriate volumes of airflow as noted in the design, and the verification of the appropriate operation of the detection and control mechanisms as required by IBC 2021 Sections 909.18.1 and 909.18.7. | Observe         | Perform prior to occupancy and after sufficient completion for the purposes of pressure difference testing, flow measurements and detection and control verification. |
| a. Approved agencies for smoke control testing shall have expertise in fire protection engineering, mechanical engineering and certification as air balancers.                                                                                                                                                                                                                |                 |                                                                                                                                                                       |

END SECTION

## II. ARCHITECTURAL - EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS) SECTION

THIS SECTION APPLICABLE IF BOX IS CHECKED: ☐

EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS) – SPECIAL INSPECTIONS FOR EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS) - VERIFY THE FOLLOWING ARE IN COMPLIANCE  
IBC 2021 SECTION 1705.17.1

| TASK                                                                   | INSPECTION TYPE | DESCRIPTION                                                            |
|------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------|
| 1. Water resistive barrier coating applied over a sheathing substrate. | Observe         | Verify that water resistive barrier coating complies with ASTM E 2570. |

**NOTE: Exceptions: 1. Special inspections shall not be required for EIFS applications installed over a water-resistive barrier with a means of draining moisture to the exterior. 2. Special inspections shall not be required for EIFS applications installed over masonry or concrete walls. Uncheck this section in those cases.**

END SECTION



## JJ. ARCHITECTURAL - ARCHITECTURAL COMPONENTS - SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE SECTION

THIS SECTION APPLICABLE IF BOX IS CHECKED: ☐

| ARCHITECTURAL COMPONENTS – SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE - ARCHITECTURAL COMPONENTS<br>- VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTIONS 1705.13.5                                                                            |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TASK                                                                                                                                                                                                                                                   | INSPECTION TYPE | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 1. Erection and fastening of exterior cladding, interior and exterior nonbearing walls and interior and exterior veneer.                                                                                                                               | Periodic        | Verify appropriate materials, fasteners and attachment at commencement of work and at completion.<br><u>Exceptions:</u> Special inspection not required for the following:<br>1.) Exterior cladding, interior and exterior nonbearing walls and interior and exterior veneer 30 feet or less in height above grade or walking surface. 2.) Exterior cladding and interior and exterior veneer weighing 5 psf or less. 3.) Interior nonbearing walls weighing 15 psf or less. |
| 2. Access floors                                                                                                                                                                                                                                       | Periodic        | Verify that anchorage of access floor system complies with approved construction documents. Verify installation and inspection of post-installed anchors used for anchorage of access floor systems comply with manufacturer's instructions and approved ICC-ES reports.                                                                                                                                                                                                     |
| <b>NOTE:</b> This section is applicable to structures assigned to Seismic Design Category D, E, or F and is not applicable to structures assigned to Seismic Design Category A, B, or C. Confirm Seismic Design Category with the structural engineer. |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

END SECTION

## KK. ARCHITECTURAL – STORAGE RACKS

THIS SECTION APPLICABLE IF BOX IS CHECKED: ☐

| ARCHITECTURAL COMPONENTS – REQUIRED INSPECTIONS OF STORAGE RACK SYSTEMS - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTIONS 1705.13.7                                                                                                                                                                                                                                                            |                       |                     |                              |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------|------------------------------|------------------|
| TYPE                                                                                                                                                                                                                                                                                                                                                                                                       | CONTINUOUS INSPECTION | PERIODIC INSPECTION | REFERENCED STANDARD          | IBC REFERENCE    |
| 1. Materials used, to verify compliance with one or more of the material test reports in accordance with the approved construction documents                                                                                                                                                                                                                                                               | ----                  | X                   | ----                         | ----             |
| 2. Fabricated storage rack elements                                                                                                                                                                                                                                                                                                                                                                        | ----                  | X                   | ----                         | Section 1704.2.5 |
| 3. Storage rack anchorage installation                                                                                                                                                                                                                                                                                                                                                                     | ----                  | X                   | ANSI/MH16.1<br>Section 7.3.2 | ----             |
| 4. Completed storage rack system, to indicate compliance with the approved construction documents                                                                                                                                                                                                                                                                                                          | ----                  | X                   | ----                         | ----             |
| <b>NOTE:</b> Verify the following for storage racks that are 8 feet or greater in height in structures assigned to Seismic Design Category D, E, or F: Verify anchorage of storage racks comply with approved construction documents. Verify installation and inspection of post-installed anchors used for anchorage of storage racks comply with manufacturer's instructions and approved ICC-ES report. |                       |                     |                              |                  |

END SECTION

**LL. PLUMBING/MECHANICAL/ELECTRICAL - DESIGNATED SEISMIC SYSTEMS - SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE SECTION**

**THIS SECTION APPLICABLE IF BOX IS CHECKED: ☐**

| PLUMBING, MECHANICAL AND ELECTRICAL - DESIGNATED SEISMIC SYSTEMS – SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE - VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 2021 SECTION 1705.13.6                                                             |                 |                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------------------------------------------------------------------------------------------|
| TASK                                                                                                                                                                                                                                             | INSPECTION TYPE | DESCRIPTION                                                                                              |
| 1. Anchorage of electrical equipment for emergency and standby power systems                                                                                                                                                                     | OBSERVE         | ✓ Check for general conformance                                                                          |
| 2. Anchorage of all other electrical equipment in Seismic Design Categories E and F only                                                                                                                                                         | OBSERVE         | ✓ Check for general conformance                                                                          |
| 3. Installation and anchorage of piping designed to carry hazardous materials and their associated mechanical units.                                                                                                                             | OBSERVE         | ✓ Check for general conformance                                                                          |
| 4. Installation and anchorage of vibration isolation systems where the construction documents require a nominal clearance of ¼" or less between support framing and restraint.                                                                   | OBSERVE         | ✓ Check for general conformance                                                                          |
| 5. Verification of clearance between fire sprinkler piping and surrounding mechanical and electrical equipment, including ductwork, piping and their structural supports.                                                                        | OBSERVE         | ✓ Check for minimum clearances noted in ASCE7-16 13.2.3 or a nominal clearance of not less than 3 inches |
| <b>NOTE: This section is applicable to structures assigned to Seismic Design Category C, D, E, or F and is not applicable to structures assigned to Seismic Design Category A or B. Confirm Seismic Design Category with structural engineer</b> |                 |                                                                                                          |

**END SECTION**

## **DEFINITIONS FOR SECTIONS A THRU D:**

**A. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - WELDING SECTION**

**B. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - NON-DESTRUCTIVE TESTING (NDT) OF WELDED JOINTS SECTION**

**C. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - BOLTING SECTION**

**D. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - OTHER INSPECTION TASK SECTION**

### General Provisions (AISC 360 Chapter N):

Quality control (QC) as specified in AISC 360 Chapter N shall be provided by the fabricator and erector.

Quality assurance (QA) as specified in AISC 360 Chapter N shall be provided by others when required by the authority having jurisdiction (AHJ), applicable building code, purchaser, owner, or engineer of record (EOR).

Nondestructive testing (NDT) shall be performed by the agency of firm responsible for quality assurance, except as permitted in accordance with AISC 360 Section N6.

### Inspection Definitions (AISC 360 Section N5.4 and N5.6):

Observe (O): The inspector shall observe these items on a random basis. Operations need not be delayed pending these inspections.

Perform (P): These tasks shall be performed for each welded joint or member, each bolted connection, and test or verification noted.

Document: Document, with a report, that the work has been performed in accordance with the contract documents. This is in addition to any other reports required in the Special Inspections guide specification.

## **DEFINITIONS FOR SECTIONS E THRU J:**

- E. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - VISUAL WELDING INSPECTION SECTION**
- F. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - WELDING INSPECTION AND NONDESTRUCTIVE TESTING OF WELDED JOINTS SECTION**
- G. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - BOLTING SECTION**
- H. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - OTHER INSPECTION TASKS SECTION**
- I. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - COMPOSITE STRUCTURES SECTION**
- J. STRUCTURAL – STEEL CONSTRUCTION - STRUCTURAL STEEL - AISC 341 SEISMIC PROVISIONS - H-PILES SECTION**

### **Scope (AISC 341 Chapter J):**

Quality control (QC) as specified in AISC 341 Chapter J shall be provided by the fabricator, erector or other responsible contractor as applicable.

Quality assurance (QA) as specified in AISC 341 Chapter J shall be provided by others when required by the authority having jurisdiction (AHJ), applicable building code (ABC), purchaser, owner, or engineer of record (EOR).

Nondestructive testing (NDT) shall be performed by the agency of firm responsible for Quality Assurance, except as permitted in accordance with AISC 360 Section N6.

### **Inspection Definitions (AISC 341 Section J5, applicable to Sections J6 thru J10):**

Observe (O): The inspector shall observe these functions on a random, daily basis. Operations need not be delayed pending these inspections.

Perform (P): The inspections shall be performed prior to the final acceptance of the item.

Document (D): The inspector shall prepare reports indicating that the work has been performed in accordance with the contract documents. The report need not provide detailed measurements for joint fit-up, WPS settings, completed welds, or other individual items listed in the tables. For shop fabrication, the report shall indicate the piece mark of the piece inspected. For field work, the report shall indicate the reference grid lines and floor or elevation inspected. Work not in compliance with the contract documents and whether the noncompliance has been satisfactorily repaired shall be noted in the inspection report.

Coordinated Inspection: Where a task is stipulated to be performed by both QC and QA, coordination of the inspection function between QC and QA is permitted in accordance with Specification (AISC 360) Section N5.3.

## **DEFINITIONS FOR SECTIONS K, L, AND M:**

**K. STRUCTURAL – STEEL CONSTRUCTION - COLD-FORMED STEEL DECK - PLACEMENT SECTION**

**L. STRUCTURAL – STEEL CONSTRUCTION - COLD-FORMED STEEL DECK - WELDING SECTION**

**M. STRUCTURAL – STEEL CONSTRUCTION - COLD-FORMED STEEL DECK - MECHANICAL FASTENING SECTION**

### General (SDI-QA/QC – 2017):

Quality control (QC) as specified in SDI-QA/QC – 2017 shall be provided by the installer.

Quality assurance (QA) as specified in SDI-QA/QC – 2017 shall be provided by others when required by the authority having jurisdiction (AHJ), the applicable building code, Owner, or Designer.

### Inspection Definitions (SDI QA/QC-2017, APPENDIX 1):

“Observe” shall mean to inspect these items on an intermittent basis. Operations need not be delayed pending these inspections. Frequency of observations shall be adequate to confirm that the work has been performed in accordance with the applicable documents. In event that the observations determine that the materials and/or workmanship are not in conformance with the applicable documents, additional inspections shall be performed to determine the extent of non-conformance.

“Perform” shall mean to perform these tasks prior to final acceptance for each item or element.

Within the listed tasks, “Document” shall mean the inspector shall prepare reports or other appropriate written documentation indicating that the work has or has not been performed in accordance with the construction documents.

## **DEFINITIONS FOR SECTIONS N THRU R, U THRU JJ:**

**N. STRUCTURAL - STEEL CONSTRUCTION - OPEN-WEB STEEL JOISTS AND JOIST GIRDERS SECTION**

**O. STRUCTURAL - STEEL CONSTRUCTION - COLD-FORMED STEEL TRUSSES SPANNING 60 FEET OR GREATER SECTION**

**P. STRUCTURAL - COLD-FORMED STEEL LIGHT-FRAME CONSTRUCTION - SPECIAL INSPECTIONS FOR WIND RESISTANCE SECTION**

**Q. STRUCTURAL - COLD-FORMED STEEL LIGHT-FRAME CONSTRUCTION - SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE SECTION**

**R. STRUCTURAL - CONCRETE CONSTRUCTION SECTION**

**U. STRUCTURAL - WOOD CONSTRUCTION SECTION**

**V. STRUCTURAL - MASS TIMBER CONSTRUCTION**

**W. STRUCTURAL - STRUCTURAL WOOD - SPECIAL INSPECTIONS FOR WIND RESISTANCE SECTION**

**X. STRUCTURAL - STRUCTURAL WOOD - SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE SECTION**

**Y. STRUCTURAL - WIND RESISTING COMPONENTS - SPECIAL INSPECTIONS FOR WIND RESISTANCE**

**Z. STRUCTURAL - SEISMIC ISOLATION SYSTEMS - SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE SECTION**

**AA. GEOTECHNICAL - SOILS INSPECTIONS AND TESTS SECTION**

**BB. GEOTECHNICAL - DRIVEN DEEP FOUNDATIONS SECTION**

**CC. GEOTECHNICAL - CAST IN PLACE DEEP FOUNDATIONS SECTION**

**DD. GEOTECHNICAL - HELICAL PILE FOUNDATIONS SECTION**

**EE. FIRE PROTECTION - SPRAYED FIRE-RESISTANT MATERIALS SECTION**

**FF. FIRE PROTECTION - MASTIC AND INTUMESCENT FIRE-RESISTANT COATINGS SECTION**

**GG. FIRE PROTECTION - FIRE RESISTANT PENETRATIONS AND JOINTS SECTION**

**HH. FIRE PROTECTION - TESTING FOR SMOKE CONTROL SECTION**

**II. ARCHITECTURAL - EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS) SECTION**

**JJ. ARCHITECTURAL - ARCHITECTURAL COMPONENTS - SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE SECTION**

**KK. ARCHITECTURAL - STORAGE RACKS**

**LL. PLUMBING/MECHANICAL/ELECTRICAL - DESIGNATED SEISMIC SYSTEMS - SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE SECTION**

### **Inspection Definitions (IBC 2021-Chapter 2 - Definitions):**

Continuous Special Inspection: Special inspection by the special inspector who is present continuously when and where the work to be inspected is being performed.

Periodic Special Inspection: Special inspection by the special inspector who is intermittently present where the work to be inspected has been or is being performed.

### **Inspection Definitions (Other):**

Perform: Perform these tasks for each welded joint or member, fastener or bolted connection, and noted verification or test.

Observe: Observe these items randomly during the course of each work day to insure that applicable requirements are being met. Operations need not be delayed pending these inspections at contractor's risk.

## **DEFINITIONS FOR SECTIONS S AND T:**

**S. STRUCTURAL - MASONRY CONSTRUCTION - MINIMUM VERIFICATION REQUIREMENTS SECTION**

**T. STRUCTURAL - MASONRY CONSTRUCTION - MINIMUM SPECIAL INSPECTION REQUIREMENTS  
SECTION**

### Inspection Definitions (TMS 602):

Continuous Inspection (C): The Inspection Agency's full-time observation of work by being present in the area where the work is: being performed.

Periodic Inspection (P): The Inspection Agency's part-time or intermittent observation of work during construction by being present in the area where the work has been or is being performed, and observation upon completion of the work.

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## SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes general requirements that apply to implementation, tracking, and verification of the commissioning process without regard to specific systems, assemblies, or components.
- B. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
  - 1. Verify that the work is installed in accordance with Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Construction Verification Checklists executed by Contractor are utilized to achieve this.
  - 2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Provider are utilized to achieve this.
  - 3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
  - 4. Verify that the Owner's operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.
- C. The Commissioning Provider directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Provider's responsibilities.

#### 1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Section 017800 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.
- C. Section 210800 "Commissioning of Fire Suppression" for commissioning process activities for fire suppression systems, assemblies, equipment, and components.
- D. Section 220800 "Commissioning of Plumbing" for commissioning process activities for plumbing systems, assemblies, equipment, and components.
- E. Section 230800 "Commissioning of HVAC" for commissioning process activities for HVAC&R systems, assemblies, equipment, and components.
- F. Section 260800 "Commissioning of Electrical" for commissioning process activities for electrical systems, assemblies, equipment, and components.

### 1.3 DEFINITIONS

- A. Basis of Design (BoD): A document that records concepts, calculations, decisions, and product selections used to meet the Owners Project Requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
- B. Building Enclosure Commissioning Process (BECxP): Commissioning process focused on the planned enclosure and related system interactions during design. Development of mock-up procedures, air infiltration metrics, and water infiltration metrics are incorporated into the specifications at this stage of the project.
- C. Commissioning (Cx): The process of ensuring that systems are designed, installed, functionally tested and performing in conformity with the Owner's Project Requirements and that the building operator has received complete equipment and systems documentation and training.
- D. Commissioning Design Review: Independent review of the design documents as they related specifically to the Basis of Design and Owner's Project Requirement's. This design review commonly focuses on system/facility performance, efficiency, maintainability, and reliability. Design reviews were complete at the Design Document and 98% Construction Documents.
- E. Commissioning Meetings: Meetings conducted by the commissioning provider to address items specifically identified by the commissioning team. This meeting focuses on identifying project challenges proactively and determining and proactive solution.
- F. Commissioning Provider (CxP): The entity identified by the Owner or Project Manager to lead, monitor, coordinate and report on project commissioning activities. The commissioning provider may be the project A/E (most common), or an independent third party.
- G. Commissioning Plan: A detailed plan of the organization, schedule, allocation of resources, procedures and documentation requirements of the commissioning process.
- H. Commissioning Report: A document that records the activities and results of the commissioning process.
- I. Commissioning Site Visit: Site visits conducted by the commissioning provider regularly to review progress, identify challenges, and determine applicable solutions. The commissioning provider will commonly check in with all team members to discuss project progress.
- J. Commissioning Software: A web-based interface utilized to track commissioning documentation and activities through substantial completion. All commissioning documentation including (but not limited to); meeting minutes, site observation reports, construction verification checklists, functional performance tests, and the issues list.
- K. Commissioning Status List: A list of corrective items identified by the commissioning team. The list includes the identified deficiency, assigned team member, and anticipated correction. The items will remain on the status list until they are corrected and verified by the team as resolved.
- L. Commissioning Team: The team of project members representing the owner, A/E, general contractor, construction manager, each discipline of subcontractors, and led by the commissioning provider.

- M. Controls Page-Turn: Meeting held after the temperature controls submittal has been submitted and approved to discuss the intended sequence of operations, system architecture, installation requirements and schedule. This meeting is attended by the commissioning provider, A/E, general contractor, temperature controls contractor, and test and balance contractor.
- N. Construction Verification Checklists: A quality control verification process performed by the installer as building assemblies, components, equipment and systems are being installed which documents that the materials, installation procedures, interfaces with other trades, start-up, testing and operation are correct, complete, in compliance with contract documents and manufacturer's recommendations and are ready for functional performance testing.
- O. Functional Performance Tests (FPT): Contractor testing of installed building assemblies, components, equipment, systems and interfaces which confirms correct performance through all operating modes and compliance with contract documents and manufacturer's recommendations.
- P. Owner's Project Requirements: A written document that details the functional requirements of a project and the expectations of how it will be used and operated. These include project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. The Concept and BR has been identified as the "Owner's Project Requirement's" for this project.
- Q. Seasonal Testing: Functional Testing Procedures conducted during the opposite season as the original functional testing efforts. This testing is completed to verify system operation has been optimized and all alarms associated with the opposite season are set accordingly. These tests commonly verify; freeze stat settings, discharge air reset strategies, hot water reset strategies, humidification modes, and dehumidification modes.
- R. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

#### 1.4 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxP.
- B. Members Appointed by Owner:
  - 1. Commissioning Provider (CxP): The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxP under a separate contract.
  - 2. Representatives of the facility user and operation and maintenance personnel.
  - 3. Architect and engineering design professionals.

#### 1.5 OWNERS RESPONSIBILITIES

- A. Provide the OPR documentation to the CxP and each Contractor for information and use.

- B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.
- C. Provide the BoD documentation, prepared by Architect and approved by Owner, to the CxP and each Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

#### 1.6 CONTRACTOR RESPONSIBILITIES

- A. Each Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
  - 1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
  - 2. Cooperate with the CxP for resolution of issues recorded in the Issues Log.
  - 3. Attend commissioning team meetings held on a monthly basis. At specific times during the construction process there may be meetings held every other week as needed.
  - 4. Integrate and coordinate commissioning process activities with construction schedule.
  - 5. Review and accept construction verification checklists provided by the CxP.
  - 6. Complete electronic construction checklists as Work is completed and provide to the Commissioning Provider on a weekly basis. Commissioning documentation will be maintained utilizing a commissioning software.
  - 7. Review and accept commissioning process functional test procedures provided by the Commissioning Provider.
  - 8. Complete preliminary functional performance tests within the commissioning software prior to scheduling final functional testing to be witnessed by the commissioning provider and owner representative.
  - 9. Conduct final functional testing as directed by the commissioning provider for all equipment listed in the systems to be commissioned in each represented specification section.
  - 10. Conduct seasonal testing with the commissioning provider as necessary to demonstrate system performance in the opposite season of Substantial Completion and the scheduled system functional testing.
  - 11. Participate in lessons learned meeting held 10 months after Substantial Completion and provide updated regarding all "Open" items.
  - 12. Provide corrective action to close all commissioning items related to equipment and installation efforts related to scope of contracted work.

#### 1.7 COMMISSIONING PROVIDER RESPONSIBILITIES

- A. Organize and lead the commissioning team.
- B. Provide commissioning plan.
- C. Develop the Commissioning Software project account and invite all Cx team members to participate.
- D. Convene commissioning team meetings.

- E. Submittals: The commissioning provider provides third party review of submittals for equipment included in the construction verification list below. The commissioning provider should be copied on all submittals in parallel with the A/E and will respond directly to the A/E for consideration to be incorporated into the formal A/E response. The formal submittal process will be discussed and finalized during the project commissioning kick-off meeting.
- F. Provide project-specific construction checklists and commissioning process test procedures.
- G. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Issues Log.
- H. Prepare and maintain the Commissioning Status Log ("Issues Log").
- I. Prepare and monitor completed construction verification checklists via the commissioning software.
- J. Witness systems, assemblies, equipment, and component startup.
- K. Witness, participate, and verify Functional Performance Testing is completed to replicate the intended design strategies per the construction documents.
- L. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

## PART 2 - PRODUCTS

### 2.1 TEST EQUIPMENT

- A. Provide all standard testing equipment required to perform startup, initial checkout and required Functional Testing. Unless otherwise noted such testing equipment will NOT become the property of Owner.
- B. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
  - 1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F (0.3 degree C) and resolution of plus/minus 0.1 degree F (0.05 degree C).
  - 2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
  - 3. Calibration: According to the manufacturer's recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.
- C. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to

accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

- D. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.

## PART 3 - EXECUTION

### 3.1 MEETINGS

- A. Each contractor is required to attend meetings related to commissioning (pre-construction, construction progress, commissioning meetings, etc.) and have personnel requested by CxP in attendance to facilitate quality control and coordinate commissioning efforts.
- B. The CxP will present an overview of the project's commissioning process at the pre-construction meeting. The commissioning team members will be identified, and their responsibilities reviewed.
- C. At subsequent meetings (estimated to be monthly), contractors are to provide a review of project progress, a report on the status of issues, commissioning tasks and scheduling for future commissioning tasks.

### 3.2 SCHEDULING

- A. Reference General Conditions Article 13 for Contractor responsibilities for scheduling. Each contractor shall provide the Contractor a detailed schedule and regular updates of commissioning tasks for incorporation into the project schedule.

### 3.3 COMMISSIONING PLAN

- A. Commissioning Provider has prepared the Commissioning Plan.
  - 1. Attend meetings called by the Commissioning Provider for purposes of completing the commissioning plan.
  - 2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.
- B. Contractor is responsible for compliance with the Commissioning Plan.
- C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.
- D. Commissioning Schedule:
  - 1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Provider within 60 days after award of Contract.
  - 2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.

3. Construction Verification Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
4. Provide sufficient notice to Commissioning Provider for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

### 3.4 COMMISSIONING SOFTWARE

- A. The commissioning process will utilize a web-based commissioning software track, document installation, and manage the construction verification checklists and functional performance tests. During the construction kick-off meeting each discipline will identify a commissioning team representative to participate in commissioning meetings, manage the construction checklists for their discipline, and interact with the team. Directly following the construction kick-off meeting each identified discipline representative will be invited to join the Team thru the BlueRithm commissioning software.
- B. Each contractor is responsible for completing action items, construction checklists, and functional testing documentation using the software and in a timely manner.

### 3.5 COMMISSIONING STATUS LIST

- A. Each contractor is responsible for completing action items in a timely manner that are noted in the Status List as their responsibility. Upon completion the team member shall indicate the completion thru the commissioning software to indicate the measure is ready for verification. Timely response and successful completion are a requirement to avoid withholding of payment.

### 3.6 CxP SITE VISITS

- A. Commissioning is a team effort requiring the cooperation of all parties. Contractors are to proactively carry out their commissioning responsibilities and are to assist the CxP during site visits in performing system installation verifications. This includes providing access to and demonstrating the installation, operation, and testing of commissioned systems; responding to CxP requests for information; carrying out proactive and corrective actions; and accurate reporting on system status and conditions

### 3.7 STARTUP PLANS AND REPORTS

- A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.
- B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.
- C. Submit directly to the Commissioning Provider.

### 3.8 CONSTRUCTION VERIFICATION CHECKLISTS

- A. The construction verification checklists are a formalized means to provide individual workers the criteria for a successful installation, adherence to the construction documents and to easily track construction progress.
- B. Each assembly, component, equipment, system and interface to be commissioned shall be verified by the installer at the site while work is underway and documented on the construction verification checklists available through the commissioning software implemented for this project. The contractor is responsible for successfully completing installations, documenting this on the construction verification checklist forms and correcting all deficiencies.
  - 1. No sampling of identical or near-identical items is allowed.
  - 2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
- C. Contractor shall periodically review the construction verification schedule with the CxP allowing advance notice of activities of 5 business days so that the CxP may witness when necessary. If CxP identifies more than a 10% discrepancy rate during confirmation of construction verification, the contractor shall correct all deficiencies and revalidate all items covered by that checklist and resubmit new checklists. The cost of reconfirmation of construction verification due to equipment or construction deficiencies is the responsibility of the contractor and subject to deductive change order at the owner's discretion. Correction of deficiencies and revalidation are the responsibility of the contractor and are not subject to time extensions or delay claims.
- D. Contractor is responsible for filling out Construction Verification Checklist, during installation and before startup; witnessing by the Commissioning Provider is not required unless otherwise specified.
  - 1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
  - 2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
  - 3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
  - 4. If any Checklist line item is not relevant, record reasons on the form.
  - 5. Contractor may independently perform startup inspections and/or tests, at Contractor's option.
  - 6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
  - 7. Submit completed Checklists to Commissioning Provider within two days of completion.
- E. Commissioning Provider is responsible for furnishing the Construction Verification Checklists to Contractor.



1. Provide all additional information requested by Commissioning Provider to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
  2. Commissioning Provider may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.
  3. When asked to review the proposed Checklists, do so in a timely manner.
- F. Commissioning Provider Witnessing: Required for:
1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
  2. A sampling of non-primary equipment, as allowed by the commissioning plan.
- G. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
1. If difficulty in correction would delay progress, report deficiency to the Commissioning Provider immediately.

### 3.9 FUNCTIONAL PERFORMANCE TESTS

- A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.
- B. Complete the functional performance test procedures included on the functional performance test forms provided within the commissioning documentation or software used for this project. Coordinate with Owner, A/E and CxP so they may witness and document test results.
- C. CxP shall establish sampling protocol and at the time of testing select sample test locations for identical pieces of equipment. Where simulation of conditions or altering of setpoints or values is required to achieve an operating or failure mode for testing, the contractor must receive CxP approval.
- D. Contractors are responsible for completion and coordination of their work with all trades prior to final functional testing. Including completion of point to point, preplanning testing procedures, complete device calibration, performing preliminary functional performance testing using test forms, ensuring necessary staff and resources are on hand and expediting testing and having all equipment and tools on-site. This includes completion of testing and balancing by the HVAC contractor required for successful functional performance testing. Failure to complete or coordinate work, preplan or have staff and resources available to carry out testing will result in retesting. Contact the CxP informing them the system is ready for review prior to scheduling testing for witnessing
- E. Commissioning Provider is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.
- F. Contractor shall coordinate testing with the CM, the A/E, and CxP 10 business days prior to the scheduled testing. Scheduling is to confirm the systems are ready for functional testing and available to be witnessed and test results documented. All contractors involved with specific

assemblies, components, equipment, systems and interfaces shall have qualified installers and technicians present at the same time working together to perform testing and demonstrate correct performance through all operating and failure modes and compliance with contract documents and manufacturer's recommendations.

- G. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner; if a deficiency is not corrected and re-tested immediately, the Commissioning Provider will document the deficiency and the Contractor's stated intentions regarding correction.

1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents, is not complete, not ready for testing, failure of planning, or does not perform properly.
2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and updates the status in the commissioning software ; the Commissioning Provider will reschedule the test and the Contractor shall re-test.
3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide an action plan for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
4. Contractor shall bear the cost of Owner and Commissioning Provider personnel time witnessing re-testing.

- H. Functional Test Procedures:

1. Sample test procedures are included in Contract Documents; where Functional Test procedures are not included in Contract Documents, test procedures will be determined by the Commissioning Provider with input by and coordination with Contractor.
2. Retesting is required when testing cannot be successfully completed. Deficiencies requiring retesting include:
  - a. Incomplete work and/or coordination with others
  - b. Inadequate preparation of systems for testing
  - c. Inadequate preplanning
  - d. Inadequate staff, equipment, tools or resources for testing
  - e. Material, equipment or construction deficiencies
  - f. Incomplete or failed test due to reasons under the Contractor's responsibility
3. The cost of retesting is the responsibility of the contractor and subject to deductive change order at ATW's discretion. Correction of deficiencies and retesting are the responsibility of the contractor and are not subject to time extensions or delay claims.
4. Examples of Functional Testing:
  - a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
  - b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
  - c. Systems are run through all the HVAC control system's sequences of operation and components are verified to be responding as the sequence's state.

- d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Provider the TAB is complete is a step in the Functional Testing process.
- 5. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

### 3.10 SENSOR AND ACTUATOR CALIBRATION

- A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, air flow measuring stations, and pressure sensors and gauges, and all actuators (dampers and valves) installed as part of this project. Sensors and devices installed in the unit at the factory with calibration certification provided need not be field calibrated.
- B. Calibrate using the methods described below; alternate methods may be used, if approved by Commissioning Provider and Owner beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Construction Verification Checklist or other suitable forms, documenting initial, intermediate and final results.
- C. All Sensors:
  - 1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
  - 2. Verify that sensors with shielded cable are grounded only at one end.
  - 3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F (0.1 degree C) of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
  - 4. Tolerances for critical applications may be tighter.
- D. Sensors Without Transmitters - Standard Application:
  - 1. Make a reading with a calibrated test instrument within 6 inches (150 mm) of the site sensor.
  - 2. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances (listed below) of the instrument-measured value.
  - 3. If not, install offset, calibrate or replace sensor.
- E. Sensors With Transmitters - Standard Application.
  - 1. Disconnect sensor.
  - 2. Connect a signal generator in place of sensor.
  - 3. Connect ammeter in series between transmitter and building automation system control panel.
  - 4. Using manufacturer's resistance-temperature data, simulate minimum desired temperature.
  - 5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
  - 6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
  - 7. Record all values and recalibrate controller as necessary to comply with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.

8. Reconnect sensor.
9. Make a reading with a calibrated test instrument within 6 inches (150 mm) of the site sensor.
10. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances (listed below) of the instrument-measured value.
11. If not, replace sensor and repeat.
12. For pressure sensors, perform a similar process with a suitable signal generator.

F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:

1. Watthour, Voltage, Amperage: 1 percent of design.
2. Pressure, Air, Water, Gas: 3 percent of design.
3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F (0.2 degree C).
4. Relative Humidity: 4 percent of design.
5. Barometric Pressure: 0.1 inch of Hg (340 Pa).
6. Flow Rate, Air: 10 percent of design.
7. Flow Rate, Water: 4 percent of design.
8. AHU Wet Bulb and Dew Point: 2.0 degrees F (1.1 degrees C).

G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

H. Valve/Damper Stroke Setup and Check:

1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
2. Set pump/fan to normal operating mode.
3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
4. Command valve/damper to open; verify position is full open and adjust output signal as required.
5. Command valve/damper to a few intermediate positions.
6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.

1. With full pressure in the system, command valve closed.
2. Use an ultra-sonic flow meter to detect flow or leakage.

### 3.11 TEST PROCEDURES - GENERAL

- A. Provide skilled technicians to execute starting of equipment, point to point, and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
- B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.

- C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
  2. Sampling is not allowed for:
    - a. Major equipment.
    - b. Life-safety-critical equipment.
    - c. Construction Verification Checklist execution.
  3. 20% = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.
  4. 25% = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
  5. Randomly test at least 20 percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
  6. If 25% percent of the units in the first sample fail, test another 20% percent of the remaining identical units.
  7. If 25% percent of the units in the second sample fail, test all remaining identical units.
  8. If frequent failures occur, resulting in more troubleshooting than testing, the Commissioning Provider may stop the testing and require Contractor to perform and document a checkout of the remaining units prior to continuing testing.
- D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").
- E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.
- F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.
- G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.
- H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.
- I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
1. All points that are monitored by the relevant control system shall be trended by Contractor; at the Commissioning Provider's request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
  2. Other points will be monitored by the Commissioning Provider using dataloggers.
  3. At the option of the Commissioning Provider, some control system monitoring may be replaced with datalogger monitoring.

4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
5. Graphical output is desirable and is required for all output if the system can produce it.
6. Monitoring may be used to augment manual testing.

### 3.12 OPERATION AND MAINTENANCE MANUALS

- A. See Section 017700 - Closeout Procedures for additional requirements.
- B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.
- C. Submit manuals related to items that were commissioned to Commissioning Provider for review; make changes recommended by Commissioning Provider.
- D. Commissioning Provider will add commissioning records to manuals after submission to Owner.

### 3.13 DEMONSTRATION AND TRAINING

- A. See Section 017900 – Demonstration and Training for additional requirements.
- B. Provide owner training using final O&M data. The Contractor is responsible for developing a cohesive training plan for all equipment and systems required in the project specifications. The plan should include the agenda including topics, objectives, and teaching outline to be covered for each section, the instructor's name and contact information, and the anticipated duration and schedule for each session, a formal training record listing attendee and a training evaluation form. Develop the training schedule including number of hours required within the specifications for each component or system in coordination with the CM, CxP and owner that complies with the owner's and CxP's availability. Submit a preliminary training plan to the CM, owner and CxP for review and finalize the plan to incorporate comments received.
- C. Training sessions to include classroom and site presentations as appropriate. Demonstrate operation of systems and equipment. Review setpoints and operating parameters. Demonstrate preventive and routine maintenance procedures as well as common repairs. Videotape training sessions providing reasonable video/audio quality and provide final record in labeled DVD format to agency along with a sign off sheet demonstrating receipt by the agency.
- D. The CxP shall provide each trainee with a Training Evaluation Form and at completion of training collect forms for review. Based on evaluations and CxP training review, contractor shall repeat training sessions which CxP determines were inadequate or incomplete.

### 3.14 SUBSTANTIAL COMPLETION REVIEW MEETING

- A. Within 10 months of substantial completion and prior to completion of warranty period, CxP shall coordinate and facilitate a substantial completion review meeting. The intent of the meeting will be to review the project design, construction, turnover, operation and warranty issues. Contractor is required to have key project personnel in attendance and participating in the review for the purpose of making future project delivery improvements.

### 3.15 COMMISSIONING REPORT

- A. CxP shall provide the construction manager and owner a draft commissioning report for the project upon substantial completion and a final commissioning report after the Seasonal Testing and Substantial Completion meeting. This report shall include contact information for key members of the commissioning team; description of commissioned systems, commissioning activities, sampling protocol and results; and findings and recommendations from substantial completion meeting. The report to also include the Owner's Project Requirements, Basis of Design/Design Concept and Functional Performance Test forms.

END OF SECTION 019113

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## SECTION 024119 - SELECTIVE DEMOLITION

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

#### 1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged/store or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner's requested location ready for reuse.
- C. Remove and Store: Detach items from existing construction in a manner to prevent damage, and store at an on-site or off-site location. All off-site location storage is at the expense of the contractor. Store in the location until the Owner requests reinstall or is ready for a coordinated relocation. The item(s) is/are stored until the owner requests, or the final completion certificate is issued.
- D. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated. Item may need to be stored for a period as to when it can be reinstalled. Coordinate the work with Construction sequencing.
- E. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged, stored, or reinstalled.
- F. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged, stored or reinstalled. Dismantle can be interchangeable with remove.

#### 1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones, sconces, pendants, and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner. Coordinate findings with owner, items in question should be saved and considered through the Request for proposal process.
1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

- C. Salvaged items shall remain the property of the Owner unless specifically noted otherwise. In addition to items specifically indicated to be salvaged, Owner reserves the right to request other items to be salvaged prior to actual demolition.

#### 1.4 PREINSTALLATION MEETINGS

- A. Pre-demolition Conference: Conduct conference at Job Site Trailer.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review the Pre-Construction Demolition documents and Submittal.
3. Review structural load limitations of existing structure.
4. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
5. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
6. Review areas where existing construction is to remain and requires protection.
7. Review the extent of demolition in various areas with the Owner and identify all items which are to be salvaged to the Owner.

#### 1.5 ACTION SUBMITTALS

- A. Qualification Data:

1. General Contractor Qualifications: An experienced firm will have completed a coordinated demolition of a project in the last five (5) years.
2. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project. Must have managed and Substantially Completed at least two (2) projects at a similar facility with similar security restrictions, (i.e. Prisons, Correctional and Detention facilities, Government facilities, or large hospital buildings) each requiring demolition of at least 5,000 square feet of interior and consisted of exterior elements in the year 2010 or later. Demolition Firm Requirements:
  - a. All demolition subcontractors working in each area and scope of work in line with the demolition drawings will have the appropriate certification for removal of the specific items. For example, the safe removal of refrigerants will only be by refrigerant recovery technician. Comply with all regulatory requirements. Submit a list of the subcontractors and their credentials related to each area.
  - b. Regulatory Requirements submittals: Submit and comply with all Federal, State, and Local governing regulations including but not limited to EPA notification regulations before beginning selective demolition. Submit a copy to the Owner and Architect of all documents submitted to any jurisdiction.
  - c. Comply with hauling and disposal regulations of authorities having jurisdiction and the Airport Operations and Site regulations.

- B. Pre-Construction Submittal should include:

1. The information submittal as outlined above in Section 1.6/A
2. Proposed Protection Measures:

- a. Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property. This should include both the secure areas and public areas, and items described should include but not limited to: environmental protection needed or requested, dust and Foreign Object Debris (FOD) control, noise control, coverings, identified areas that are vulnerable including those called out on drawings. Indicate proposed locations and construction measures including any barriers.
3. Schedule of Selective Demolition Activities:
  - a. Indicate the following:
    - 1) Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure on-site operations of the Owner's staff, Airlines, tenants, and any other Owner approved entity are uninterrupted.
    - 2) Interruption of utility services. Indicate how long utility services will be interrupted.
    - 3) Coordination for shutoff, capping, and continuation of utility services.
    - 4) Use of elevator and stairs as approved by Owner.
    - 5) Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
4. Indicate the frequency the Contractor's will report progress during the schedule.
5. Pre-demolition Survey and Photographs:
  - a. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
    - 1) Provide written report.
  - b. Inventory the areas where demolition will occur and indicate in writing the items in the photographs that will be demolished, salvaged, stored, reinstalled, and existing to remain.
    - 1) This is required for each major phase.
6. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
7. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

## 1.6 CLOSEOUT SUBMITTALS

- A. Walkthrough: Schedule a walkthrough of the areas completed as demolished.
  1. Gain Written approval of areas completed by Owner or Architect.

B. Inventory: Submit a Photographic and written list, similar to the Preconstruction photo inventory of items that have been removed, salvaged, and/or stored.

C. Documentation of Existing Warranty of existing Roofing.

1. Refer to Warranty Section

#### 1.7 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

#### 1.8 PROJECT CONDITIONS

A. Hazardous Materials: Owner will contract separately for hazardous materials inspections/surveys/testing in advance of demolition work.

1. This report on the presence of hazardous materials will be made available and will be on file for review and use. Examine report to become aware of locations where hazardous materials are present.

2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

#### 1.9 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Revise first paragraph below if necessary. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before selective demolition, Coordinate with Owner the items that the Owner will remove.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start or restart of the Work.

2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

## 1.10 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.

## 1.11 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations, Airlines, Public Safety and Other Owner Approved Entities.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.
- C. Refer to and comply with all requirements in Section 017419 Construction Waste Management and Disposal.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Retain first paragraph below if disconnection of utilities is the Work of other Sections or if Owner performs work. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations. Written report in preconstruction submittal.
  - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
    - a. Provide report at frequency indicated in preconstruction submittal.
- D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

- E. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs.

1. Comply with requirements specified in Section 013233 "Photographic Documentation."
2. Inventory and record the condition of items to be removed and salvaged. See the preconstruction submittals. Provide inventory photographs and photographic conditions that might be misconstrued as damage caused by salvage operations.
3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

### 3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

### 3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage. Coordinate all activity with the Civil Documents.

- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
  - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
  - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
  - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
  - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
  - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

### 3.4 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
  - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
  - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
  - 1. Strengthen or add new supports when required during progress of selective demolition.
  - 2. Coordinate the temporary shoring for each phase and document with survey report.
- C. Provide temporary means of egress, pathways, circulation, and others means for Owner and occupants to maintain operations as required by the phasing and sequencing of the demolition or scope of work.
- D. Comply with all regulatory requirements including but not limited to exiting, egress, and occupancy limits.
- E. Remove temporary barricades and protections where hazards no longer exist.

### 3.5 SELECTIVE DEMOLITION, GENERAL

- A. General: General extents of demolition are indicated. Include all additional demolition needed to complete the work. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
  - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
  - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
  - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  - 4. Use of flammable tools or methods:
    - a. Gain flammable permits where required, and approvals that are needed by the airport and or regulatory bodies.

- b. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations. Verify are flammable permits, and approvals that are needed by the airport and or regulatory bodies.
  - c. Maintain fire watch during and for at least twenty-four (24) hours after flame-cutting operations.
  - d. Maintain adequate ventilation when using cutting torches.
- 5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
- 6. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
- 7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- 8. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities. Gain approval by owner or all haul routes, circulation, and timing of all activities.
- C. Removed and Stored and Salvaged Items:
  - 1. Clean stored and salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers.
  - 3. Store items in a secure area until delivery to Owner.
  - 4. Transport salvaged items to Owner's storage area where approved and designated by Owner.
  - 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
  - 1. Clean and repair items to functional condition adequate for intended reuse.
  - 2. Temporary storage of Reinstalled items: Pack or crate items after cleaning and repairing. Identify contents of containers.
  - 3. Protect items from damage during transport and storage.
  - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

### 3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement



at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings.
- E. Piping, electrical and ductwork: Remove as indicated and otherwise needed. Unless otherwise indicated remove abandoned piping, electrical lines and ductwork back to source and permanently cap.

### 3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction. Recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
  - 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.

### 3.8 CLEANING

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

END OF SECTION 024119

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## SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

### 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. Form-facing material for cast-in-place concrete.
- 2. Shoring, bracing, and anchoring.

- B. Related Requirements:

- 1. Review all Division 01 Sections.
- 2. Divisions 02 through 49 Sections for specific requirements.

#### 1.3 DEFINITIONS

- A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.
- B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

#### 1.4 ACTION SUBMITTALS

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

- 1. Form ties.
- 2. Form-release agent.

- B. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.

- 1. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.
  - a. Location of construction joints is subject to approval of the Engineer.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing and inspection agency.
- B. Field quality-control reports.

## 1.6 QUALITY ASSURANCE

- A. Testing and Inspection Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.
  - 1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
  - 2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

## 2.2 FORM-FACING MATERIALS

- A. As-Cast Surface Form-Facing Material:
  - 1. Provide continuous, true, and smooth concrete surfaces.
  - 2. Furnish in largest practicable sizes to minimize number of joints.
  - 3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:
    - a. Plywood, metal, or other approved panel materials.
    - b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
      - 1) APA HDO (high-density overlay).
      - 2) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
      - 3) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
      - 4) APA Plyform Class I, B-B or better; mill oiled and edge sealed.
- B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.
  - 1. Provide lumber dressed on at least two edges and one side for tight fit.

- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces not exceeding specified formwork surface class.
- D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

## 2.3 RELATED MATERIALS

- A. Reglets: Fabricate reglets of not less than 0.022-inch- thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- B. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
  - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
  - 2. Form release agent for form liners shall be acceptable to form liner manufacturer.
- F. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
  - 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
  - 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
  - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF FORMWORK

- A. Comply with ACI 301.
- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes.
- C. Limit concrete surface irregularities as follows:

1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
- D. Construct forms tight enough to prevent loss of concrete mortar.
  1. Minimize joints.
  2. Exposed Concrete: Symmetrically align joints in forms.
- E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
  1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
  2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  3. Install keyways, reglets, recesses, and other accessories, for easy removal.
- F. Do not use rust-stained, steel, form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
  1. Provide and secure units to support screed strips
  2. Use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
  1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
  2. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete.
- J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
- K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.
  1. Determine sizes and locations from trades providing such items.
  2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.
- L. Construction and Movement Joints:
  1. Construct joints true to line with faces perpendicular to surface plane of concrete.
  2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  3. Place joints perpendicular to main reinforcement.
  4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
    - a. 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.
  6. Space vertical joints in walls as indicated on Drawings .

- a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
- M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.
  - 1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
  - 2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.
- N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.2 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 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.
  - 4. Install dovetail anchor slots in concrete structures, as indicated on Drawings.
  - 5. Clean embedded items immediately prior to concrete placement.

### 3.3 REMOVING AND REUSING FORMS

- A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained. Consult with concrete supplier for blended cements in cold weather for possible longer periods of time.
  - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
  - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

- B. Clean and repair surfaces of forms to be reused in the Work.
  - 1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
  - 2. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.
  - 1. Align and secure joints to avoid offsets.
  - 2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

### 3.4 SHORING AND RESHORING INSTALLATION

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
  - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

### 3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
  - 1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.
  - 2. Inspect insulating concrete forms for shape, location, and dimensions of the concrete member being formed.

END OF SECTION 031000



## SECTION 032000 - CONCRETE REINFORCING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

B. Related Requirements:

1. Review all Division 01 Sections.
2. Divisions 02 through 49 Sections for specific requirements.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.

B. Sustainable Design Submittals:

1. Environmental Product Declarations (EPD)
  - a. Submit product data verifying that this product has an EPD.
2. Sourcing of Raw Materials: Recycled content
  - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).

C. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of Architect.

### 1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Statements: For testing and inspection agency.
- B. Welding certificates.
  - 1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.
- C. Material Test Reports: For the following, from a qualified testing agency:
  - 1. Steel Reinforcement:
    - a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.
- D. Field quality-control reports.

### 1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
  - 1. Store reinforcement to avoid contact with earth.

## PART 2 - PRODUCTS

### 2.1 SUSTAINABLE DESIGN REQUIREMENTS

- A. Whole Building Life-Cycle Assessment (WBLCA) (MRc1): Preference should be given to materials/products that have a Product-Specific Type III Environmental Product Declaration (EPD).
- B. Environmental Product Declarations (MRc2): Preference should be given to materials/products that meet the requirements for the LEED credit MRc2, Environmental Product Declarations.
- C. Sourcing of Raw Materials (MRc3), Recycled Content: Preference should be given to materials/products that have post- and/or pre-consumer recycled content by weight of total product.

## 2.2 STEEL REINFORCEMENT

- A. Recycled Content: Provide products with minimum 70 percent total recycled content.
  - 1. Regional Materials: Manufacture steel within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
- B. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- C. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

## 2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
  - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
    - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
- C. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
  - 1. Finish: Plain.

## 2.4 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protection of In-Place Conditions:
  - 1. Do not cut or puncture vapor retarder.
  - 2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

### 3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
  - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
  - 2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings.
  - 1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
  - 2. Stagger splices in accordance with ACI 318.
  - 3. Weld reinforcing bars in accordance with AWS D1.4/D 1.4M, where indicated on Drawings.
- G. Install welded-wire reinforcement in longest practicable lengths.
  - 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
    - a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.
  - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
  - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
  - 4. Lace overlaps with wire.

### 3.3 JOINTS

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  - 1. Place joints perpendicular to main reinforcement.
  - 2. Continue reinforcement across construction joints unless otherwise indicated.
  - 3. Do not continue reinforcement through sides of strip placements of floors and slabs.
- B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

### 3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117.

### 3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
  - 1. Steel-reinforcement placement.
  - 2. Steel-reinforcement welding.

END OF SECTION 032000

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## 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.

B. Related Requirements:

1. Divisions 02 through 49 Sections for specific requirements. Equally Note:
2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.

#### 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, other pozzolans, and silica fume; 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. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
  - a. Contractor's superintendent.
  - b. Independent testing agency responsible for concrete design mixtures.
  - c. Ready-mix concrete manufacturer.
  - d. Concrete Subcontractor.
  - e. Special concrete finish Subcontractor.
2. Review the following:
  - a. Special inspection and testing and inspecting agency procedures for field quality control.
  - b. Construction joints, control joints, isolation joints, and joint-filler strips.
  - c. Semirigid joint fillers.
  - d. Vapor-retarder installation.
  - e. Anchor rod and anchorage device installation tolerances.
  - f. Cold and hot weather concreting procedures.
  - g. Concrete finishes and finishing.
  - h. Curing procedures.
  - i. Forms and form-removal limitations.

- j. Shoring and reshoring procedures.
- k. Methods for achieving specified floor and slab flatness and levelness.
- l. Floor and slab flatness and levelness measurements.
- m. Concrete repair procedures.
- n. Concrete protection.
- o. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
- p. Protection of field cured field test cylinders.

#### 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. Silica fume.
- 6. Aggregates.
- 7. 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.
- 8. Vapor retarders.
- 9. Floor and slab treatments.
- 10. Curing materials.
  - a. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.
- 11. Joint fillers.
- 12. Repair materials.

##### B. Sustainable Design Submittals:

- 1. Environmental Product Declarations (EPD)
  - a. Submit product data verifying that this product has an EPD.
- 2. Sourcing of Raw Materials: Recycled Content
  - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).

##### C. 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. Slump limit.
- 6. Air content.
- 7. Nominal maximum aggregate size.



8. Steel-fiber reinforcement content.
9. Synthetic micro-fiber content.
10. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
11. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.
12. Include certification that dosage rate for permeability-reducing admixture matches dosage rate used in performance compliance test.
13. Intended placement method.
14. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

D. 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.

## 1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3. Testing agency: Include copies of applicable ACI certificates.

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

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Floor and slab treatments.
5. Bonding agents.
6. Adhesives.
7. Vapor retarders.
8. Semirigid joint filler.
9. Joint-filler strips.
10. Repair materials.

C. 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. Silica fume.
6. Aggregates.
7. Admixtures:
  - a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.

D. Research Reports:

1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
2. For sheet vapor retarder/termite barrier, showing compliance with ICC AC380.

E. Field quality-control reports.

F. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician .

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. 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."

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor to be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Field Quality-Control Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests to be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.8 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

## 1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.

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

## PART 2 - PRODUCTS

### 2.1 CONCRETE, GENERAL

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

### 2.2 SUSTAINABLE DESIGN REQUIREMENTS

A. Whole Building Life-Cycle Assessment (WBLCA) (MRc1):

1. Preference should be given to materials/products that have a Product-Specific Type III Environmental Product Declaration (EPD), and the product reported GWP is equal or lower than the project GWP threshold (NRMCA, 2021 North Central Region) of:
  - a. 264 kgCO<sub>2</sub>e/m<sup>3</sup> for concrete strength of 3000 psi @ 28 days.
  - b. 312 kgCO<sub>2</sub>e/m<sup>3</sup> for concrete strength of 4000 psi @ 28 days.
  - c. 372 kgCO<sub>2</sub>e/m<sup>3</sup> for concrete strength of 5000 psi @ 28 days.

B. Environmental Product Declarations (MRc2): Preference should be given to materials/products that meet the requirements for the LEED credit MRc2, Environmental Product Declarations.

- C. Sourcing of Raw Materials (MRc3), Recycled Content: Preference should be given to materials/products that have post- and/or pre-consumer recycled content by weight of total product.
  - 1. Local Valuation Factor: Preference should be given to building materials that are extracted, harvested or recovered, and manufactured and assembled within hundred (100) miles of the jobsite.
- D. Low-Emitting Materials (EQc2):
  - 1. Paints and coatings applied on site within the weather proofing system in this section must comply with South Coast Air Quality Management District Rule 1113 effective February 5, 2016, OR California Air Resource Board (CARB) 2007 - Suggested Control Measures (SCM) for Architectural Coatings. Products must also comply with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Refer to Sustainable Design Requirements Section 018113 for specific VOC requirements.

## 2.3 CONCRETE MATERIALS

- A. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
  - 1. Alkali-Silica Reaction: Comply with one of the following:
    - a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
    - b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
    - c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.
  - 2. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
  - 3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- B. Air-Entraining Admixture: ASTM C260/C260M.
- C. 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.
  - 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.
- D. 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

## 2.4 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Raven Industries, Inc.
    - b. Stego Industries, LLC.
    - c. W. R. Meadows, Inc.

## 2.5 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
  - 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. ChemMasters, Inc.
    - b. Dayton Superior Corporation.
    - c. Euclid Chemical Company (The); an RPM company.
    - d. Sika Corporation.
    - e. W. R. Meadows, Inc.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
  - 1. Color:
    - a. Ambient Temperature Below 50 deg F: Black.
    - b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
    - c. Ambient Temperature Above 85 deg F: White.
- D. Water: Potable or complying with ASTM C1602/C1602M.
- E. Clear, Solvent-Borne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ChemMasters, Inc.
    - b. Dayton Superior Corporation.
    - c. Euclid Chemical Company (The); an RPM company.
    - d. Metacrete Industries.
    - e. W. R. Meadows, Inc.

2. Verify products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

F. Clear, Breathable, High-Performance, Solvent-Borne, Silane Sealer, 100% Silane by Weight

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
  - a. BASF Construction Chemicals - Building Systems; Hydrozo 100
  - b. ChemMasters; Aquanil Plus 100
  - c. Dayton Superior Corporation; Weather Worker S-100 (J-29-A)

## 2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber .
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 in accordance with ASTM D2240.
- C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:
  1. Types I and II, nonload bearing , for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Floor Slab Protective Covering: 8-feet- wide cellulose fabric.
  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. McTech Group, Inc.

## 2.7 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
  1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
  2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
  2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
  3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
  4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

## 2.8 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.
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. Silica Fume: 10 percent by mass.
  4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
  5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 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, and concrete with a w/cm below 0.50.

## 2.9 CONCRETE MIXTURES

- A. Class A: Normal-weight concrete used for footings.

1. Exposure Class: ACI 318 F0 S0 W0 C1 .
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Maximum w/cm: 0.45.
4. Slump Limit: 8 inches , plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site .
5. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

B. Class B : Normal-weight concrete used for foundation walls.

1. Exposure Class: ACI 318 F1 S0 W0 C1 .
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Maximum w/cm: 0.45 .
4. Slump Limit: 8 inches , plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site .
5. 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 nominal maximum aggregate size 4.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size .
6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

C. Class C: Normal-weight concrete used for interior slabs-on-ground.

1. Exposure Class: ACI 318 F0 S0 W0 C1 .
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Minimum Cementitious Materials Content: 540 lb/cu. yd. .
4. Slump Limit: 8 inches , plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site .
5. 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.
6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

D. Class I: Normal-weight concrete used for interior metal pan stairs and landings and toppings:

1. Exposure Class: ACI 318 F0 S0 W0 C0 .
2. Minimum Compressive Strength: 3000 psi at 28 days.
3. Maximum w/cm: 0.53 .
4. Minimum Cementitious Materials Content: 470 lb/cu. yd..
5. Maximum Size Aggregate: 1/2 inch.
6. Slump Limit: 3 inches, plus 1 inch or minus 2 inches.
7. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.
8. Retarding Admixture: Not allowed.
9. Accelerating Admixture: Not allowed.



## 2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification of Conditions:
  - 1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
  - 2. Do not proceed until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
  - 1. Daily access to the Work.
  - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
  - 3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
  - 4. Security and protection for test samples and for testing and inspection equipment at Project site.

### 3.3 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.

### 3.4 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, sealing vapor retarder to concrete.
  4. Lap joints 6 inches 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 on all sides, and sealing to vapor retarder.
- B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with manufacturer's written instructions.

### 3.5 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 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.
  6. Space vertical joints in walls as indicated on Drawings . Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
  7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  8. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth as indicated on structural drawings :
1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. 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- 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 or more than 1 inch 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.

### 3.6 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, 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.
    - 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 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.

### 3.7 FINISHING FORMED SURFACES

#### A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
  - a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
  - b. Remove projections larger than 1 inch.
  - c. Tie holes do not require patching.
  - d. Surface Tolerance: ACI 117 Class D.
  - e. Apply to concrete surfaces not exposed to public view .

#### 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.

### 3.8 FINISHING FLOORS AND SLABS

- A. Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. 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 restraighening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
  - 3. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo .
- C. Trowel Finish:
  - 1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
  - 2. Continue troweling passes and restraighen 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 surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
    - a. Slabs on Ground:
      - 1) Specified overall values of flatness,  $F_F$  35; and of levelness,  $F_L$  25; with minimum local values of flatness,  $F_F$  24; and of levelness,  $F_L$  17.
    - b. Suspended Slabs:
      - 1) Specified overall values of flatness,  $F_F$  35; and of levelness,  $F_L$  20; with minimum local values of flatness,  $F_F$  24; and of levelness,  $F_L$  15.
- D. 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.
- E. 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.

### 3.9 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 high unless otherwise indicated on Drawings, and extend base not less than 6 inches 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 at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch 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.

### 3.10 CONCRETE CURING

#### A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h before and during finishing operations.

#### B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. If forms remain during curing period, moist cure after loosening forms.
3. 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 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.
      - 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, 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. Post-Wet Cure, Floors to Receive Curing and sealing Compound:
    - 1) All new exposed interior and exterior flatwork and other new exposed concrete surfaces not scheduled, specified, or noted to receive post-cure penetrating sealers, ceramic tile, or other bonded systems, coatings, or finish materials shall receive a liquid-applied, post-wet cure, curing compound after wet curing seven (7) days as specified, to extend the curing process.
    - 2) Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions immediately after the seven (7) day wet cure. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
  - c. Post-Wet Cure, Floors to Receive Penetrating Sealer:
    - 1) New concrete floors scheduled to be sealed on Room Finish Schedule shall receive a post-wet cure penetrating sealer after full seven (7) day wet cure and an additional 21-day drying/aging period.

- 2) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subject to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat.

### 3.11 TOLERANCES

- A. Conform to ACI 117.

### 3.12 JOINT FILLING

- A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.
  1. Defer joint filling until concrete has aged at least one month(s).
  2. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.
- D. Overfill joint, and trim joint filler flush with top of joint after hardening.

### 3.13 CONCRETE SURFACE REPAIRS

- A. Defective Concrete:
  1. Repair and patch defective areas when approved by Architect or Engineer.
  2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
  1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.
    - a. Limit cut depth to 3/4 inch.
    - b. Make edges of cuts perpendicular to concrete surface.
    - c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
    - d. Fill and compact with patching mortar before bonding agent has dried.
    - e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
  2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
    - a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.



- b. Compact mortar in place and strike off slightly higher than surrounding surface.
- 3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces:

- 1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
    - a. Correct low and high areas.
    - b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
  - 2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  - 3. After concrete has cured at least 14 days, correct high areas by grinding.
  - 4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
    - a. Finish repaired areas to blend into adjacent concrete.
  - 5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
    - a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
    - b. Feather edges to match adjacent floor elevations.
  - 6. Correct other low areas scheduled to remain exposed with repair topping.
    - a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
    - b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  - 7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
    - a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
    - b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
    - c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
    - d. Place, compact, and finish to blend with adjacent finished concrete.
    - e. Cure in same manner as adjacent concrete.
  - 8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
    - a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
    - b. Dampen cleaned concrete surfaces and apply bonding agent.
    - c. Place patching mortar before bonding agent has dried.
    - d. Compact patching mortar and finish to match adjacent concrete.
    - e. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

### 3.14 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. Delivery Tickets: comply with ASTM C94/C94M.
- C. Inspections:
  - 1. Headed bolts and studs.
  - 2. Verification of use of required design mixture.
  - 3. Concrete placement, including conveying and depositing.
  - 4. Curing procedures and maintenance of curing temperature.
  - 5. Verification of concrete strength before removal of shores and forms from beams and slabs.
  - 6. Batch Plant Inspections: On a random basis, as determined by Architect.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to 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., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. 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; ASTM C173/C173M volumetric method, for 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.
  - 5. Concrete Temperature: ASTM C1064/C1064M:
    - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
  - 6. Compression Test Specimens: ASTM C31/C31M:
    - a. Cast and laboratory cure two sets of three 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.
    - b. Cast, initial cure, and field cure two sets of three standard cylinder specimens for each composite sample.
  - 7. 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.
  - 8. 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.
  - 9. 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 if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
  - 10. 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.
  - 11. 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, Section 1.6.6.3.
  - 12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
  - 13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 24 hours of completion of floor finishing and promptly report test results to Architect.

### 3.15 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 concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 033000

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## SECTION 042000 - UNIT MASONRY

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Concrete masonry units.
2. Lintels.
3. Brick.
4. Mortar and grout materials.
5. Reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Accessories.
9. Mortar and grout mixes.

##### B. Products Installed but not Furnished under This Section:

1. Steel lintels in unit masonry.

#### 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 the following:

1. Masonry Units: Indicate sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Indicate bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315R. Indicate elevations of reinforced walls.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

##### C. Samples for Initial Selection:

1. Clay face brick.
2. Glazed brick.
3. Colored mortar.
4. Weep/cavity vents.

##### D. Sustainable Design Submittals:

1. Environmental Product Declaration (EPD)

- a. Submit product data verifying that this product has an EPD.
- 2. Sourcing of Raw Materials (MRc3), Recycled content:
  - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).

#### 1.4 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
  - 1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Material Certificates: For each type of the following:
  - 1. Masonry units.
    - a. Include material test reports substantiating compliance with requirements.
    - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
    - c. For exposed brick, include test report for efflorescence in accordance with ASTM C67/C67M.
    - d. For surface-coated brick, include test report for durability of surface appearance after 50 cycles of freezing and thawing in accordance with ASTM C67/C67M.
    - e. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
  - 2. Integral water repellent used in CMUs.
  - 3. Cementitious materials. Include name of manufacturer, brand name, and type.
  - 4. Mortar admixtures.
  - 5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
  - 6. Grout mixes. Include description of type and proportions of ingredients.
  - 7. Reinforcing bars.
  - 8. Joint reinforcement.
  - 9. Anchors, ties, and metal accessories.
- C. Qualification Statements: For testing agency.
- D. 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 in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
  - 2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.

- E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined in accordance with TMS 602.
- F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

## 1.5 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Installers: All masonry flashing installers must complete the International Masonry Institute Flashing Upgrade training course.
  - 2. Testing Agency Qualifications: Qualified in accordance with ASTM C1093 for testing indicated.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

## 1.7 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  - 1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
  - 2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  - 2. Protect sills, ledges, and projections from mortar droppings.
  - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. 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.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602.

## PART 2 - PRODUCTS

### 2.1 SOURCE LIMITATIONS

- A. Obtain exposed masonry units cementitious mortar components and mortar aggregate from single source.
- B. For exposed masonry units, obtain each color and grade from single source with resources to provide materials of consistent quality in appearance and physical properties.

### 2.2 SUSTAINABLE DESIGN REQUIREMENTS

- A. Whole Building Life-Cycle Assessment (WBLCA) (MRc1):
  - 1. Preference should be given to materials/products that have a Product-Specific Type III Environmental Product Declaration (EPD).
- B. Environmental Product Declarations (MRc2): Preference should be given to materials/products that meet the requirements for the LEED credit MRc2, Environmental Product Declarations.



- C. Sourcing of Raw Materials (MRc3), Recycled Content: Preference should be given to materials/products that have post- and/or pre-consumer recycled content by weight of total product.
  - 1. Local Valuation Factor: Preference should be given to building materials that are extracted, harvested or recovered, and manufactured and assembled within hundred (100) miles of the jobsite.

## 2.3 PERFORMANCE REQUIREMENTS

## 2.4 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602, 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.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
  - 1. Where fire-resistance-rated construction is indicated, use the equivalent thickness method for masonry units in accordance with ACI 216.1.

## 2.5 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.
  - 2. Provide square-edged units for outside corners unless otherwise indicated.
- B. CMUs: ASTM C90, normal weight unless otherwise indicated.
  - 1. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
  - 2. Minimum 2 percent pre-consumer recycled content.
  - 3. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
  - 4. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

## 2.6 LINTELS

- A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed

as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

## 2.7 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Clay Face Brick: Facing brick complying with ASTM C216 or hollow brick complying with ASTM C652, Class H40V (void areas between 25 and 40 percent of gross cross-sectional area).

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi (23.10 MPa).
2. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C67.
3. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."
4. Application: Use where brick is exposed unless otherwise indicated.
5. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.

C. Brick Types:

1. Brick Manufacturer: Yankee Mill Brick & Tile
2. Products:

a. BRK-1 BRICK BLEND

- 1) Product – (Color): G-3 Velour and Creighton Gray Velour
- 2) Sizes:

a) Standard Brick

- (1) Custom Blend to match existing brick.

## 2.8 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, 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 indicated.
  - 1. Alkali content will not be more than 0.1 percent when tested in accordance with ASTM C114.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Aggregate for Mortar: ASTM C144.
  - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
  - 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
- E. Aggregate for Grout: ASTM C404.
- F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- G. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
- H. Water: Potable.
- I. Brick Mortar Color: As selected by Architect.

## 2.9 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
  - 1. Interior Walls: Mill- galvanized carbon steel.
  - 2. Exterior Walls: Hot-dip galvanized carbon steel.
  - 3. Wire Size for Side Rods: 0.148-inch diameter.
  - 4. Wire Size for Cross Rods: 0.148-inch diameter.
  - 5. Wire Size for Veneer Ties: 0.148-inch diameter.
  - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
  - 7. Provide in lengths of not less than 10 ft., with prefabricated corner and tee units.

- D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.
- E. Masonry-Joint Reinforcement for Multi-wythe Masonry:
  - 1. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch (1.5 mm) and maximum vertical adjustment of 1-1/4 inches (32 mm). Size ties to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face.

## 2.10 TIES AND ANCHORS

- A. General: Ties and anchors extend at least 1-1/2 inches into veneer but with at least a 5/8-inch 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 A82/A82M, with ASTM A153/A153M, Class B-2 coating.
  - 2. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
  - 1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire.
  - 2. Tie Section: Triangular-shaped wire tie made from 0.25-inch- diameter, hot-dip galvanized steel wire.
- D. Adjustable Masonry-Veneer Anchors:
  - 1. General: Provide anchors that allow vertical adjustment but resist a 200 lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
  - 2. Fabricate wire ties from 0.187-inch- diameter, stainless steel wire unless otherwise indicated.
  - 3. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonry-veneer anchors specified.

## 2.11 EMBEDDED FLASHING

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
  - 1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.016 inch thick.

2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 ft. Provide splice plates at joints of formed, smooth metal flashing.
3. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with sawtooth ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
4. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
5. Fabricate through-wall flashing with drip edge where indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees.
6. Fabricate through-wall flashing with sealant stop where indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
7. Fabricate metal drip edges and sealant stops for sawtooth metal flashing from plain metal flashing of same metal as sawtooth flashing and extending at least 3 inches into wall with hemmed inner edge to receive sawtooth flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam sheds water.
8. Fabricate metal drip edges from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees.
9. Fabricate metal sealant stops from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
10. Fabricate metal expansion-joint strips from stainless steel to shapes indicated.
11. Solder metal items at corners.

B. Flexible Flashing: Use the following unless otherwise indicated:

1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 40 mil.
  - a. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

C. Application: Unless otherwise indicated, use the following:

3. Where flashing is indicated to receive counterflashing, use metal flashing.
4. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
5. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing or flexible flashing with a metal drip edge.
6. Where flashing is fully concealed, use metal flashing.

D. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from UV-resistant, high-density polyethylene. Cell flashing pans have integral weep spouts designed to be built into mortar bed joints and that extend into the cell to prevent clogging with mortar.

E. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."

- F. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

## 2.12 ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane.
- B. Preformed Control-Joint Gaskets: Made from PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).
- D. Weep/Cavity Vents: Use the following unless otherwise indicated:
  - 1. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
- F. Proprietary Acidic Masonry 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.

## 2.13 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.
  - 7. Use portland cement-lime mortar unless otherwise indicated.
  - 8. 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.
- D. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
  - 1. For masonry below grade or in contact with earth, use Type S.
  - 2. For reinforced masonry, use Type S.
  - 3. For mortar parge coats, use Type S.

4. For exterior, above-grade, loadbearing and non load-bearing walls and parapet walls; for interior load-bearing walls; for interior non load-bearing partitions; and for other applications where another type is not indicated, use Type S.
- E. Grout for Unit Masonry: Comply with ASTM C476.
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. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2500 psi (17.5 MPa).
  3. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C143/C143M.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
  2. Verify that foundations are within tolerances specified.
  3. Verify that reinforcing dowels are properly placed.
  4. Verify that substrates are free of substances that impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- D. 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.
- E. 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.

- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested in accordance with ASTM C67/C67M. Allow units to absorb water so they are damp but not wet at time of laying.

### 3.3 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 or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2-inch 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 ft., or 1/2-inch 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 ft., 1/4 inch in 20 ft., or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2-inch 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 ft., 1/4 inch in 20 ft., or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 ft., or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

#### C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.



### 3.4 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 horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
  - 1. Install compressible filler in joint between top of partition and underside of structure above.
  - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors, and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
  - 3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
  - 4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

### 3.5 MORTAR BEDDING AND JOINTING

- A. Lay CMUs and hollow brick 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.
  5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
- B. Lay solid masonry units and hollow brick 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. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
  - D. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
  - E. Cut joints flush where indicated to receive waterproofing or air barriers unless otherwise indicated.

### 3.6 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
  1. Fasten screw-attached anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
  2. Embed connector sections and continuous wire in masonry joints.
  3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
  4. Space anchors as indicated, but not more than 16 inches o.c. vertically and horizontally. Install additional anchors within 12 inches of openings and at intervals, not exceeding 16 inches, around perimeter.

### 3.7 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
  1. Space reinforcement not more than 16 inches o.c.
  2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
  3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches 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.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

### 3.8 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 1/2 inch 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 o.c. vertically and 36 inches o.c. horizontally.

### 3.9 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
  - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
  - 2. Install preformed control-joint gaskets designed to fit standard sash block.
  - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
  - 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
- C. Form expansion joints in brick as follows:
  - 1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
  - 2. Build flanges of factory-fabricated, expansion-joint units into masonry.
  - 3. Build in compressible joint fillers where indicated.
  - 4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."
- D. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch.
  - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

### 3.10 LINTELS

- A. Install galvanized steel lintels where indicated.
- B. Provide masonry or lintels where indicated and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are indicated without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

### 3.11 FLASHING, WEEP HOLES, AND CAVITY VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
  - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
  - 2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and through inner wythe to within 1/2 inch of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches on interior face.
  - 3. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and 1-1/2 inches into the inner wythe.
  - 4. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under water-resistive barrier, lapping at least 4 inches. Fasten upper edge of flexible flashing to sheathing through termination bar.
  - 5. At lintels and shelf angles, extend flashing 6 inches minimum, to edge of next full unit at each end. At heads and sills, extend flashing 6 inches minimum, to edge of next full unit and turn ends up not less than 2 inches to form end dams.
  - 6. Interlock end joints of sawtooth sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
  - 7. Install metal drip edges and sealant stops with sawtooth sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
  - 8. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
  - 9. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.

10. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.
- D. Install reglets and nailers for flashing and other related construction where they are indicated to be built into masonry.
- E. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
  1. Use specified weep/cavity vent products to form weep holes.
  2. Space weep holes 24 inches o.c. unless otherwise indicated.
- F. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Accessories" Article.
- G. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.
  1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

### 3.12 REINFORCED UNIT MASONRY

- 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.
- 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 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

### 3.13 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. 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. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 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 concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
  - 7. Clean masonry with a proprietary acidic masonry cleaner applied according to manufacturer's written instructions.

### 3.14 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. 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. Crush masonry waste to less than 4 inches in each dimension.
  - 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
  - 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- D. 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

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## SECTION 051200 - STRUCTURAL STEEL FRAMING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Structural-steel materials.
2. Shrinkage-resistant grout.

##### B. Related Requirements:

1. Divisions 02 through 49 Sections for specific requirements. Equally Note:
2. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for painting requirements.

#### 1.2 DEFINITIONS

- ##### A. Structural Steel:
- Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

#### 1.3 COORDINATION

- ##### A.
- Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- ##### B.
- Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

#### 1.4 PREINSTALLATION MEETINGS

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

#### 1.5 ACTION SUBMITTALS

##### A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Anchor rods.
4. Threaded rods.
5. Shop primer.

6. Galvanized-steel primer.
7. Etching cleaner.
8. Galvanized repair paint.
9. Shrinkage-resistant grout.

B. Sustainable Design Submittals:

1. Environmental Product Declaration (EPD):
  - a. Submit product data verifying that this product has an EPD.
2. Sourcing of Raw Materials: Recycled content
  - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).

C. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
5. Identify members not to be shop primed.

D. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1/D1.1M for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand-critical welds.

E. Delegated Design Submittal: For structural-steel connections not specifically indicated on Drawings to comply with design criteria, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer fabricator professional engineer.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural-steel materials, including chemical and physical properties.
- E. Product Test Reports: For the following:

1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength, bolt-nut-washer assemblies.

F. Survey of existing conditions.

## 1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).
- B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.
- C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.
  1. Welders and welding operators performing work on bottom-flange, demand-critical welds are to pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G are to be considered separate processes for welding personnel qualification.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
  1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
  1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
  2. Clean and relubricate bolts and nuts that become dry or rusty before use.
  3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.
2. ANSI/AISC 360.
3. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

B. Connection Design Information:

1. Connection designs have been completed and connections indicated on the Drawings.

C. Moment Connections: Type FR, fully restrained.

D. Construction: Combined system of moment frame, and shear walls.

## 2.2 SUSTAINABLE DESIGN REQUIREMENTS

A. Whole Building Life-Cycle Assessment (WBLCA) (MRc1):

1. Preference should be given to materials/products that have a Product-Specific Type III Environmental Product Declaration (EPD).

B. Environmental Product Declarations (MRc2): Preference should be given to materials/products that meet the requirements for the LEED credit MRc2, Environmental Product Declarations.

C. Sourcing of Raw Materials (MRc3), Recycled Content: Preference should be given to materials/products that have post- and/or pre-consumer recycled content by weight of total product.

## 2.3 STRUCTURAL-STEEL MATERIALS

A. Minimum 60% total recycled content. W shaped, Channels, Angles, M, S Shapes - 60% , Others - 25%; BOF Steel - 25.5% post- and 6.8% pre-consumer recycled content per Building Green; EAF steel - 56.9% post- and 31.4% pre-consumer recycled content per Building Green.

B. W-Shapes: See Structural Drawings.

C. Channels, Angles, M-Shapes: See Structural Drawings.

D. Plate and Bar: See Structural Drawings.

E. Cold-Formed Hollow Structural Sections: See Structural Drawings.

F. Steel Pipe: ASTM A53/A53M, Grade B.

1. Weight Class: Per Structural Drawings.

G. Welding Electrodes: Comply with AWS requirements.

## 2.4 BOLTS AND CONNECTORS

- A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
  - 1. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with plain finish.
- B. Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
  - 1. Finish: Hot-dip or mechanically deposited zinc coating.
  - 2. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with mechanically deposited zinc coating, baked epoxy-coated finish.

## 2.5 RODS

- A. Headed Anchor Rods: ASTM F1554, Grade 36, or ASTM F1554, Grade 55, weldable , straight.
  - 1. Nuts: ASTM A563 hex carbon steel.
  - 2. Plate Washers: ASTM A36/A36M carbon steel.
  - 3. Washers: ASTM F436, Type 1, hardened carbon steel.
  - 4. Finish: Plain .
- B. Threaded Rods: ASTM A36/A36M or ASTM A572/A572M, Grade 50.
  - 1. Nuts: ASTM A63 hex carbon steel.
  - 2. Washers: ASTM F436 , Type 1, hardened carbon steel.
  - 3. Finish: Plain .

## 2.6 PRIMER

- A. Steel Primer:
  - 1. Fabricator's standard lead- and chromate-free, non-asphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- B. Galvanized-Steel Primer: MPI#134.
  - 1. Etching Cleaner: MPI#25, for galvanized steel.
  - 2. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20 .

## 2.7 SHRINKAGE-RESISTANT GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

## 2.8 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.
  - 1. Camber structural-steel members where indicated.
  - 2. Fabricate beams with rolling camber up.
  - 3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
  - 4. Mark and match-mark materials for field assembly.
  - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.
- C. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- D. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 2.
- E. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
  - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
  - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
  - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

## 2.9 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened .
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  - 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

## 2.10 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.
  - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

## 2.11 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
  1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
  2. Surfaces to be field welded.
  3. Surfaces of high-strength bolted, slip-critical connections.
  4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
  5. Galvanized surfaces .
  6. Corrosion-resisting (weathering) steel surfaces.
  7. Surfaces enclosed in interior construction.
- B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
  1. SSPC-SP 3.
- C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner or in accordance with SSPC-SP 16.
- D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
  1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
  2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
  1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.
  - 1. Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

### 3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.
- B. Baseplates, Bearing Plates, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
  - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Weld plate washers to top of baseplate.
  - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
  - 4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.
- C. Maintain erection tolerances of structural steel within ANSI/AISC 303.
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
  - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.



### 3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.
  - 1. Joint Type: Snug tightened .
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  - 1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
  - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
  - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

### 3.5 REPAIR

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.
- B. Touchup Painting:
  - 1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
    - a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
  - 2. Cleaning and touchup painting are specified in Section 099113 "Exterior Painting." Section 099123 "Interior Painting." Section 099600 "High-Performance Coatings."
- C. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

### 3.6 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:
  - 1. Verify structural-steel materials and inspect steel frame joint details.
  - 2. Verify weld materials and inspect welds.
  - 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
  - 1. Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
  - 2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.

- a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
  - 1) Liquid Penetrant Inspection: ASTM E165/E165M.
  - 2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
  - 3) Ultrasonic Inspection: ASTM E164.
  - 4) Radiographic Inspection: ASTM E94/E94M.

END OF SECTION 051200

## SECTION 052100 - STEEL JOIST FRAMING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. LH-series long-span steel joists.
2. Steel joist accessories.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing bearing plates in concrete.
2. Section 042000 "Unit Masonry" for installing bearing plates in unit masonry.
3. Section 051200 "Structural Steel Framing" for field-welded shear connectors.

#### 1.2 DEFINITIONS

- A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

#### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings:

1. Include layout, designation, number, type, location, and spacing of joists.
2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
3. Indicate locations and details of bearing plates to be embedded in other construction.

C. Sustainable Design Submittals:

1. Environmental Product Declarations (EPD)
  - a. Submit product data verifying that this product has an EPD.
2. Sourcing of Raw Materials: Recycled content
  - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Welding certificates.
- C. Manufacturer certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Mill Certificates: For each type of bolt.
- F. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.
- G. Field quality-control reports.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."
  - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications."
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. New Millennium Building Systems, LLC.
  - 2. Vulcraft/Vercor Group; a division of Nucor Corp.

## 2.2 STEEL JOISTS

- A. Long-Span Steel Joist: Manufactured steel joists according to "Standard Specification for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated on Drawings.
1. Joist Type: LH-series long-span steel joists.
  2. End Arrangement: Underslung.
  3. Top-Chord Arrangement: Parallel.
  4. Provide holes in chord members for connecting and securing other construction to joists.
  5. Camber long-span steel joists according to SJI's "Specifications".
  6. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

## 2.3 PRIMERS

- A. Primer:
1. SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.
  2. Provide shop primer that complies with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

## 2.4 STEEL JOIST ACCESSORIES

- A. Bridging:
1. Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Fabricate steel bearing plates from ASTM A36/A36M steel with integral anchorages of sizes and thicknesses indicated on Drawings. Shop prime paint.
- C. Steel bearing plates with integral anchorages are specified in Section 055000 "Metal Fabrications."
- D. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
1. Finish: Plain.
- E. Welding Electrodes: Comply with AWS standards.
- F. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

## 2.5 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by power-tool cleaning, SSPC-SP 3.
- B. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.
- C. Shop priming of joists and joist accessories is specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written instructions, and requirements in this Section.
  - 1. Before installation, splice joists delivered to Project site in more than one piece.
  - 2. Space, adjust, and align joists accurately in location before permanently fastening.
  - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
  - 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.
- C. Field weld joists to supporting steel framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using carbon-steel bolts.
- E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for high-strength structural bolt installation and tightening requirements.
- F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

### 3.3 REPAIRS

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.
- B. Touchup Painting:
  - 1. Immediately after installation, clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists abutting structural steel, and accessories.
    - a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
    - b. Apply a compatible primer of same type as primer used on adjacent surfaces.
  - 2. Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

### 3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Visually inspect field welds according to AWS D1.1/D1.1M.
- C. Visually inspect bolted connections.
- D. Prepare test and inspection reports.

END OF SECTION 052100

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## SECTION 053100 - STEEL DECKING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Composite floor deck.
  - 2. Noncomposite form deck.
- B. Related Requirements:
  - 1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
  - 2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
  - 3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

#### 1.2 ACTION SUBMITTALS

- A. Product Data:
  - 1. Composite floor deck.
  - 2. Noncomposite form deck.
- B. Shop Drawings:
  - 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
- C. Sustainable Design Submittals:
  - 1. Environmental Product Declarations (EPD)
    - a. Submit product data verifying that this product has an EPD.
  - 2. Sourcing of Raw Materials: Recycled content
    - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.
- C. Test and Evaluation Reports:

1. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
    - a. Power-actuated mechanical fasteners.
  2. Research Reports: For steel deck, from ICC-ES showing compliance with the building code.
- D. Field Quality-Control Submittals:
1. Field quality-control reports.
- E. Qualification Statements: For welding personnel and testing agency.

#### 1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with SDI QA/QC and the following welding codes:
1. AWS D1.1/D1.1M.
  2. AWS D1.3/D1.3M.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store products in accordance with SDI MOC3. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck in accordance with AISI S100.

#### 2.2 COMPOSITE FLOOR DECK

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. New Millennium Building Systems, LLC.
  2. Vulcraft Group; Division of Nucor Corp.

- B. Fabrication of Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with SDI C, with the minimum section properties indicated, and with the following:
  - 1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33 (230), **G60 (Z180)** zinc coating.

## 2.3 NONCOMPOSITE FORM DECK

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. New Millennium Building Systems, LLC.
  - 2. Vulcraft Group; Division of Nucor Corp.
- B. Fabrication of Noncomposite Form Deck: Fabricate ribbed-steel sheet noncomposite deck panels used as a form to comply with SDI NC, with the minimum section properties indicated, and with the following:
  - 1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), G60 zinc coating.
  - 2. Retain one option in "Profile Depth" Subparagraph below or revise to suit Project. Indicate locations on Drawings if various depths are required.
  - 3. Profile Depth: Per Structural Drawings.
  - 4. Design Uncoated-Steel Thickness: Per Structural Drawings.
  - 5. Span Condition: Triple span or more.
  - 6. Side Laps: Overlapped.

## 2.4 ACCESSORIES

- A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI standards for overhang and slab depth.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

- H. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- I. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.
- J. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories in accordance with SDI C, SDI NC, and SDI RD, as applicable; manufacturer's written instructions; and requirements in this Section.
- B. Locate deck bundles to prevent overloading of supporting members.
- C. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- D. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- E. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- F. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- G. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

### 3.3 INSTALLATION OF FLOOR DECK

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
  - 1. Weld Diameter: 5/8 inch, nominal.
  - 2. Weld Spacing:

- a. Weld edge ribs of panels at each support. Space additional welds an average of 16 inches apart, but not more than 18 inches apart.
  - b. Space and locate welds as indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches, and as follows:
  - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
  - 1. End Joints: Lapped or butted at Contractor's option.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure in accordance with SDI recommendations unless otherwise indicated.
- E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, in accordance with SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

### 3.4 REPAIR

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.
- B. Repair Painting:
  - 1. Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
  - 2. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
  - 3. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
  - 4. Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
  - 1. Special inspections and qualification of welding special inspectors for cold-formed steel floor and roof deck in accordance with quality-assurance inspection requirements of SDI QA/QC.

- a. Field welds will be subject to inspection.
- 2. Steel decking will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 053100

## SECTION 054000 - COLD-FORMED METAL FRAMING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Exterior non-axial-load-bearing wall framing.
2. Ceiling joist framing.
3. Soffit framing.

##### B. Related Requirements:

1. Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.
2. Section 055000 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
3. Section 092216 "Non-Structural Metal Framing" for standard, interior non-load bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies.

#### 1.2 ACTION SUBMITTALS

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

1. Cold-formed steel framing materials.
2. Exterior non-axial-load-bearing wall framing.
3. Vertical deflection clips.
4. Single deflection track.
5. Double deflection track.
6. Drift clips.
7. Soffit framing.
8. Post-installed anchors.
9. Power-actuated anchors.
10. Sill sealer gasket.

##### B. Sustainable Design Submittals:

1. Environmental Product Declaration (EPD)
  - a. Submit product data verifying that this product has an EPD.
2. Sourcing of Raw Materials: Recycled content
  - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).

##### C. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

D. Delegated Design Submittal: For cold-formed steel framing.

### 1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of code-compliance certification for studs and tracks.

C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency .

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

D. Research Reports:

1. For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
2. For sill sealer gasket/termite barrier, showing compliance with ICC-ES AC380.

### 1.4 QUALITY ASSURANCE

A. Product Tests: Mill certificates or data from a qualified independent testing agency , or in-house testing with calibrated test equipment, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

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

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

D. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."



## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect and store cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling as required in AISI S202.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. ClarkDietrich.
  - 2. Marino\WARE.
  - 3. Steel Network, Inc. (The).

### 2.2 SUSTAINABLE DESIGN REQUIREMENTS

- A. Whole Building Life-Cycle Assessment (WBLCA) (MRc1):
  - 1. Preference should be given to materials/products that have a Product-Specific Type III Environmental Product Declaration (EPD).
- B. Environmental Product Declarations (MRc2): Preference should be given to materials/products that meet the requirements for the LEED credit MRc2, Environmental Product Declarations.
- C. Sourcing of Raw Materials (MRc3), Recycled Content: Preference should be given to materials/products that have post- and/or pre-consumer recycled content by weight of total product.
- D. Material Ingredients (MRc4): Preference should be given to materials/products that meet the LEED requirements for MRc4, Material Ingredient Reporting.

### 2.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
  - 1. Design Loads: As derived by Structural Design Criteria in the Drawings and the dead load of supported materials
  - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.

3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
  4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
    - a. Upward and downward movement of 1-1/2 inches.
  5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing complies with AISI S100 and AISI S200 and ASTM C955, Section 8 .

## 2.4 COLD-FORMED STEEL FRAMING MATERIALS

- A. Minimum 25% total recycled content.
- B. Framing Members, General: Comply with AISI S200 and ASTM C955, Section 8 for conditions indicated.
- C. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
1. Grade: As required by structural performance .
  2. Coating: G60 , A60 , AZ50 , or GF30 .
- D. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: As required by structural performance .
  2. Coating: G60 .

## 2.5 EXTERIOR NON-AXIAL-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch .
  2. Flange Width: 1-5/8 inches .
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch .
  2. Flange Width: 1-1/4 inches .
- C. Vertical Deflection Clips, Exterior: Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. ClarkDietrich.
  - b. Marino\WARE.
  - c. Steel Network, Inc. (The).
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
  1. Minimum Base-Metal Thickness: 0.0538 inch .
  2. Flange Width: 1 inch plus twice the design gap for other applications .
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
  1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
    - a. Minimum Base-Metal Thickness: 0.0428 inch .
  2. Inner Track: Of web depth indicated, and as follows:
    - a. Minimum Base-Metal Thickness: 0.0428 inch .
- F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

## 2.6 INTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
  1. Minimum Base-Metal Thickness: 0.0428 inch .
  2. Flange Width: 1-5/8 inches .
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
  1. Minimum Base-Metal Thickness: 0.0428 inch .
  2. Flange Width: 1-1/4 inches .
- C. Vertical Deflection Clips, Interior: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. ClarkDietrich.
  - b. Marino\WARE.
  - c. Steel Network, Inc. (The).
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
  - 1. Minimum Base-Metal Thickness: 0.0538 inch .
  - 2. Flange Width: 1 inch plus twice the design gap for other applications .
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
  - 1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
    - a. Minimum Base-Metal Thickness: 0.0538 inch .
    - b. Flange Width: 1 inch plus twice the design gap for other applications .
  - 2. Inner Track: Of web depth indicated, and as follows:
    - a. Minimum Base-Metal Thickness: 0.0428 inch .
- F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

## 2.7 CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with standard holes, with stiffened flanges, and as follows:
  - 1. Minimum Base-Metal Thickness: 0.0428 inch .
  - 2. Flange Width: 1-5/8 inches , minimum.

## 2.8 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
  - 1. Minimum Base-Metal Thickness: 0.0329 inch .
  - 2. Flange Width: 1-5/8 inches , minimum.

## 2.9 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.
  2. Bracing, bridging, and solid blocking.
  3. Web stiffeners.
  4. Anchor clips.
  5. End clips.
  6. Foundation clips.
  7. Gusset plates.
  8. Stud kickers and knee braces.
  9. Hole-reinforcing plates.
  10. Backer plates.

## 2.10 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.
- B. Anchor Bolts: ASTM F1554, Grade 36 , threaded carbon-steel hex-headed bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C .
- C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; 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 AC01 ICC-ES AC193 ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate.
1. Uses: Securing cold-formed steel framing to structure.
  2. Type: Torque-controlled expansion anchor Torque-controlled adhesive anchor or adhesive anchor.
  3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
  4. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.
- D. Power-Actuated 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 AC70.
- E. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

## 2.11 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A780/A780M, MIL-P-21035B or SSPC-Paint 20.
- B. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.
- C. Sill Sealer Gasket: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

## 2.12 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
  - 1. Fabricate framing assemblies using jigs or templates.
  - 2. Cut framing members by sawing or shearing; do not torch cut.
  - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.
  - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.
- C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:
  - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.
  - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.
- C. Install sill sealer gasket at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.
- D. Install sill sealer gasket/termite barrier in accordance with manufacturer's written instructions at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

### 3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
  - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
  - 1. Cut framing members by sawing or shearing; do not torch cut.
  - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

### 3.4 INSTALLATION OF EXTERIOR NONLOADBEARING WALL FRAMING

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
  - 1. Stud Spacing: 16 inches.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
  - 1. Install single deep-leg deflection tracks and anchor to building structure.
  - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
  - 3. Connect vertical deflection clips to bypassing studs and anchor to building structure.
  - 4. Connect drift clips to cold-formed steel framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
  - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
  - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
  - 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
  - 1. Install solid blocking at centers indicated on Shop Drawings.
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.



### 3.5 INSTALLATION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
  - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.

### 3.6 REPAIR

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

### 3.7 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.8 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

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## SECTION 055000 - METAL FABRICATIONS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Miscellaneous framing and supports.
2. Shelf angles.
3. Metal floor plate.
4. Miscellaneous steel trim.
5. Metal bollards.
6. Abrasive metal nosings, treads, and thresholds.
7. Loose bearing and leveling plates.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
3. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Requirements:

1. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
2. Section 051200 "Structural Steel Framing" for steel framing, supports, elevator machine beams, hoist beams, divider beams, door frames, and other steel items attached to the structural-steel framing.
3. Section 077200 "Roof Accessories" for manufactured metal roof walkways and metal roof stairs.

#### 1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.

### 1.3 ACTION SUBMITTALS

#### A. Product Data:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Fasteners.
3. Shop primers.
4. Shrinkage-resisting grout.
5. Slotted channel framing.
6. Metal bollards.

#### B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Miscellaneous framing and supports for applications where framing and supports are not specified in other Sections.
2. Shelf angles.
3. Miscellaneous steel trim including steel angle corner guards and steel edgings.
4. Metal bollards.
5. Loose steel lintels.

#### C. Samples for Verification: For each type and finish of extruded nosing and tread.

#### D. Delegated Design Submittals: Analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

### 1.4 INFORMATIONAL SUBMITTALS

#### A. Mill Certificates: Signed by stainless steel manufacturers, certifying that products furnished comply with requirements.

#### B. Welding certificates.

#### C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

#### D. Research Reports: For post-installed anchors.

#### E. Delegated design engineer qualifications.

### 1.5 QUALITY ASSURANCE

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

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

## 1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

## 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 fabrications.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

### 2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Stainless Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 304.
- D. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 304.
- E. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.
- F. Rolled-Stainless Steel Floor Plate: ASTM A793.
- G. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.
- H. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.
- I. Zinc-Coated Steel Wire Rope: ASTM A741.
  - 1. Wire Rope Fittings: Hot-dip galvanized-steel connectors with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.
- J. Stainless Steel Wire Rope: Wire rope manufactured from stainless steel wire complying with ASTM A492, Type 316.

1. Wire Rope Fittings: Stainless steel connectors, Type 316, with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.
- K. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
1. Size of Channels: As required by delegated design.
  2. Galvanized Steel: ASTM A653/A653M, structural steel, Grade 33, with G90 coating; 0.108-inch nominal thickness.
  3. Cold-Rolled Steel: ASTM A1008/A1008M, structural steel, Grade 33; 0.0966-inch minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.
- L. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.
- M. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.
- N. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.
- O. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.
- P. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

## 2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
1. Provide stainless steel fasteners for fastening aluminum or stainless steel.
  2. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.
- D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.
- E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in

concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

- G. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.
- H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
  - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
  - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.
- I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

## 2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting," and Section 099123 "Interior Painting."
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  - 1. Use primer that contains pigments that make it easily distinguishable from zinc-rich primer.
- C. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- H. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

- I. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

## 2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

## 2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.



- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
  - 1. Fabricate units from slotted channel framing where indicated.
  - 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.
- D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

## 2.7 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
  - 1. Provide mitered and welded units at corners.
  - 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize and prime shelf angles located in exterior walls.
- D. Prime shelf angles located in exterior walls with zinc-rich primer.
- E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

## 2.8 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
  - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanized and prime exterior miscellaneous steel trim.
- D. Prime exterior miscellaneous steel trim with zinc-rich primer.

## 2.9 METAL BOLLARDS

- A. Fabricate metal bollards from steel shapes, as indicated.
  - 1. Where bollards are indicated to receive controls for door operators, provide cutouts for controls and holes for wire.
  - 2. Where bollards are indicated to receive light fixtures, provide cutouts for fixtures and holes for wire.
- B. Prime steel bollards with zinc-rich primer.

## 2.10 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize bearing and leveling plates.
- C. Prime plates with zinc-rich primer.

## 2.11 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

## 2.12 GENERAL FINISH REQUIREMENTS

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

## 2.13 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
  - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## 2.14 ALUMINUM FINISHES

- A. As-Fabricated Finish: AA-M12.
- B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  - 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
  - 1. Cast Aluminum: Heavy coat of bituminous paint.
  - 2. Extruded Aluminum: Two coats of clear lacquer.

### 3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports securely to, and rigidly brace from, building structure.

### 3.3 INSTALLATION OF MISCELLANEOUS STEEL TRIM

- A. Anchor to concrete construction to comply with manufacturer's written instructions.

### 3.4 INSTALLATION OF METAL BOLLARDS

- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
  - 1. Do not fill removable bollards with concrete.
- B. Fill bollards solidly with concrete, mounding top surface to shed water.
  - 1. Do not fill removable bollards with concrete.

### 3.5 INSTALLATION OF LOOSE BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### 3.6 REPAIRS

- A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
    - a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
  2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting."
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055000

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## SECTION 055113 - METAL PAN STAIRS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Preassembled steel stairs with concrete-filled and treads.

#### 1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal stairs , railings, and guards.
  1. 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.
  2. Deliver such items to Project site in time for installation.
- C. Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure.

#### 1.3 ACTION SUBMITTALS

##### A. Sustainable Design Submittals:

1. Environmental Product Declarations (EPD)
  - a. Submit product data verifying that this product has an EPD.
2. Sourcing of Raw Materials: Recycled content
  - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).

##### B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
3. Include plan at each level.
4. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.

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

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification.
  - 1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
  - 2. Protect steel members and packaged materials from corrosion and deterioration.
  - 3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
    - a. Repair or replace damaged materials or structures as directed.

### PART 2 - PRODUCTS

#### 2.1 SUSTAINABLE DESIGN REQUIREMENTS

- A. Environmental Product Declarations (MRc2): Preference should be given to materials/products that meet the requirements for the LEED credit MRc2, Environmental Product Declarations.
- B. Sourcing of Raw Materials (MRc3), Recycled Content: Preference should be given to materials/products that have post- and/or pre-consumer recycled content by weight of total product.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs, railings and guards, , including attachment to building construction.
- B. Structural Performance of Stairs: Metal stairs withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Uniform Load: 100 lbf/sq. ft.
  - 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
  - 3. Uniform and concentrated loads need not be assumed to act concurrently.
  - 4. Stair Framing: Capable of withstanding stresses resulting from railing and guard loads in addition to loads specified above.
  - 5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.

#### 2.3 METALS

- A. Minimum 25% total recycled content.



- B. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- C. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- D. Uncoated, Hot-Rolled Steel Sheet: ASTM A1011/A1011M, structural steel, Grade 30, unless another grade is required by design loads.

## 2.4 FASTENERS

- A. Fasteners for Anchoring Railings and Guards to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings and guards to other types of construction indicated and capable of withstanding design loads.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
  - 1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for stairs indicated to be shop primed with zinc-rich primer.

## 2.5 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for interior use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

## 2.6 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
  - 1. Join components by welding unless otherwise indicated.
  - 2. Use connections that maintain structural value of joined pieces.
- B. Assemble stairs in shop to greatest extent possible.
  - 1. Disassemble units only as necessary for shipping and handling limitations.
  - 2. Clearly mark units for reassembly and coordinated installation.

- C. Cut, drill, and punch metals cleanly and accurately.
  - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
  - 2. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- F. Weld connections to comply 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. Weld exposed corners and seams continuously unless otherwise indicated.
  - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 - No evidence of welded joint .
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
  - 1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
  - 2. Locate joints where least conspicuous.

## 2.7 FABRICATION OF STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Architectural Class, unless more stringent requirements are indicated.
- B. Stair Framing:
  - 1. Stringers: Fabricated of general shapes as indicated on Drawings.
    - a. Stringer Size: As required to comply with "Performance Requirements.
    - b. Provide closures for exposed ends of channel and rectangular tube stringers.
    - c. Finish: Shop primed.
  - 2. Platforms: Construct of steel rectangular tube headers and miscellaneous framing members as indicated on Drawings.
    - a. Provide closures for exposed ends of channel and rectangular tube framing.
    - b. Finish: Shop primed.
  - 3. Weld stringers to headers; weld framing members to stringers and headers.
  - 4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below.

- a. Locate hanger rods and struts where they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.
- 5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C. Metal Pan Stairs: Form risers, subread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch.
  - 1. Steel Sheet, Uncoated: Hot-rolled steel sheet unless otherwise indicated.
  - 2. Directly weld metal pans to stringers; locate welds on top of subreads where they will be concealed by concrete fill. Do not weld risers to stringers.
  - 3. Provide subplatforms of configuration indicated or, if not indicated, the same as subreads. Weld subplatforms to platform framing.

## 2.8 FABRICATION OF STAIR RAILINGS AND GUARDS

- A. Comply with applicable requirements in Section 055213 "Pipe and Tube Railings."

## 2.9 FINISHES

- A. Finish metal stairs after assembly.
- B. Preparation for Shop Priming: Prepare uncoated, ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION OF METAL PAN STAIRS

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.

1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints.
  1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
  2. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
  3. Comply with requirements for welding in "Fabrication, General" Article.
- F. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."

### 3.3 REPAIR

- A. Touchup Painting:
  1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
    - a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
  2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- B. Repair of Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055113

## SECTION 055213 - PIPE AND TUBE RAILINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Steel railings.

B. Related Requirements:

1. Section 055113 "Metal Pan Stairs" for steel tube railings associated with metal pan stairs.

#### 1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. 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.

#### 1.3 ACTION SUBMITTALS

A. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

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

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

#### 1.5 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

### 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.

### 2.3 STEEL RAILINGS

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- B. Recycled Content of Steel Products: Total recycled content not less than 25 percent.
- C. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

### 2.4 FASTENERS

- A. Fastener Materials:
  - 1. Ungalvanized-Steel Railing Components: Plated steel fasteners complying with ASTM F1941/F1941M, Class Fe/Zn 5 for zinc coating.

### 2.5 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

### 2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage , but not less than that required to support structural loads.

- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
  - 1. Clearly mark units for reassembly and coordinated installation.
  - 2. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately.
  - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
  - 2. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- F. Connections: Fabricate railings with welded connections unless otherwise indicated.
- G. 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 .
- H. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- I. Form changes in direction as follows:
  - 1. As detailed.
- J. 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.
- K. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
- L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
- N. 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.

## 2.7 STEEL AND IRON FINISHES

- A. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, hot-dip galvanize anchors to be embedded in exterior concrete or masonry.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3.
  1. Other Railings: SSPC-SP 3.
- C. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1 for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
  1. Shop prime uncoated railings with universal shop primer unless indicated.
  2. Do not apply primer to galvanized surfaces.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

### 3.2 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.
  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.
- 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.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

### 3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve, extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; and locate joint within 6 inches of post.

### 3.4 ANCHORING POSTS

- A. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material .

### 3.5 ATTACHING RAILINGS

- A. Install railing gates level, plumb, and secure for full opening without interference.
  1. Attach hardware using tamper-resistant or concealed means.
  2. Adjust hardware for smooth operation.

### 3.6 REPAIR

- A. Touchup Painting:
  1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
    - a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
  2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in

### 3.7 CLEANING

- A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.

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

### 3.8 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 055213

## Section 057000 - Decorative Metal

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Decorative metal units.

#### 1.2 RELATED REQUIREMENTS

- A. Section 055000 - Metal Fabrications.

#### 1.3 REFERENCE STANDARDS

- A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- D. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.
- E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- H. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

#### 1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor and joint locations, brazed connections, transitions, and terminations.
- C. Samples for Verification: For each type of finish.
- D. 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 Project is located.

- E. Delegated Design Submittal: For the plant chandelier, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in factory-provided protective coverings and packaging.
- B. Protect materials against damage during transit, delivery, storage, and installation at site.
- C. Inspect materials for damage upon delivery. Replace damaged and unrepairable materials. Ensure replacement materials are indistinguishable from undamaged parts and finishes.
- D. Prior to installation, store materials and components under cover in a dry location.

## PART 2 PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design the plant chandelier, including attachment to building construction.
- B. Structural Performance of plant chandelier: withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Uniform Load: 20 lbf/sq. ft.
    - a. Concurrently with weight of light fixtures.
  - 2. Concentrated Load: 100 lbf applied on an area of 8 sq. in.
  - 3. Uniform and concentrated loads need not be assumed to act concurrently.
  - 4. Limit deflection of platforms, and framing members to  $L/180$ .
  - 5. Consider connection eccentricities and incidental forces to ensure stability.

### 2.2 DECORATIVE METAL UNITS

### 2.3 MATERIALS

- A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections exposed to view on finished units.
- B. Aluminum Components: ASTM B221 or ASTM B221M.
  - 1. Tubes: Schedule 40 pipe.
  - 2. Aluminum-Alloy Bars: ASTM B211/B211M, 6061 alloy, T6 temper.
  - 3. Sheet Thickness: 1/8 inch (3 mm), minimum.
  - 4. Welding Materials: Comply with AWS D1.2/D1.2M.
  - 5. Aluminum Mesh: (MT-X)
    - a. Size: As indicated in Drawings

### 2.4 FABRICATION

- A. Fit and shop assemble items in largest practical sections for delivery to site.

- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- E. Welding Fittings: Factory- or shop-welded; joints and seams ground smooth.

## 2.5 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).
- C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).
- D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).
- E. Maximum Deviation from Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

## 2.6 FINISHES

- A. General: Comply with NAAMM AMP 500-06.
  - 1. Complete mechanical finishes before fabrication. After fabrication, finish joints, bends, abrasions, and surface blemishes to match sheet.
  - 2. Protect mechanical finishes on exposed surfaces from damage.
  - 3. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
  - 4. Appearance: Limit variations in appearance of adjacent pieces to one-half of range represented in approved samples. Noticeable variations in same piece are not acceptable. Install components within range of approved samples to minimize contrast.
- B. Aluminum Finishes:
  - 1. High Performance Organic Coatings: ; AAMA 2603 multiple coats, thermally cured fluoropolymer system.
  - 2. Color: As indicated on drawings.
  - 3. Touch-Up Materials: As recommended by coating manufacturer for field application.

## 2.7 ACCESSORIES

- A. Anchors and Fasteners: Provide anchors, fasteners, and other attachment devices required to attach to structure. Ensure attachment devices are of same material as components unless indicated otherwise.

# PART 3 EXECUTION

## 3.1 EXAMINATION

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

- B. Verify field dimensions of locations and areas to receive work.
- C. Notify Architect immediately of conditions that would prevent satisfactory installation.
- D. Do not proceed with work until detrimental conditions have been corrected.

### 3.2 PREPARATION

- A. Protect existing work.
- B. Clean surfaces to receive units. Remove materials and substances detrimental to installation.

### 3.3 INSTALLATION

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

### 3.4 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.
- B. Remove protective film from exposed metal surfaces.
- C. Metal: Clean exposed metal finishes with potable water and mild detergent, in accordance with manufacturer recommendations; do not use abrasive materials or chemicals, detergents, or other substances that may damage the material or finish.

### 3.5 PROTECTION

- A. Protect installed components and finishes from damage after installation.
- B. Repair damage to exposed finishes to be indistinguishable from undamaged areas.

- C. If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.

END OF SECTION

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## SECTION 061000 - ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Wood blocking and nailers.
2. Wood furring.

B. Related Requirements:

1. Section 061719 "Cross-Laminated Timber" for timber decking.
2. Section 061800 "Glue-Laminated Construction" for timber beams, girders and connectors.

#### 1.2 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.
- D. OSB: Oriented strand board.
- E. Timber: Lumber of 5 inches nominal size or greater in least dimension.
- F. Lumber grading agencies, and abbreviations used to reference them, include the following:
1. NeLMA: Northeastern Lumber Manufacturers' Association.
  2. NLGA: National Lumber Grades Authority.
  3. SPIB: The Southern Pine Inspection Bureau.
  4. WCLIB: West Coast Lumber Inspection Bureau.
  5. WWPA: Western Wood Products Association.

#### 1.3 ACTION SUBMITTALS

A. Sustainable Design Submittals:

1. Sourcing of Raw Materials (MRc3): Recycled content
  - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).

- b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
- 2. Sourcing of Raw Materials (MRc3): Wood products
  - a. Forest Stewardship Council (FSC): Provide letter of certification signed by vendor. Indicate compliance with FSC "Principles for Natural Forest Management" and identify certifying organization.
    - 1) Submit copies of invoices identifying cost of each FSC certified product on a line-item basis, vendor's FSC chain-of-custody certificate code, and verification of if the product is "FSC 100%," "FSC Mix Credit," or "FSC Mix [NN]%"
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
- 3. Low Emitting Materials (EQc2): Paints and Coatings
  - a. For paints and coatings applied on site and inside the weatherproofing system, submit product data or other published information verifying the VOC (Volatile Organic Compound) content is less than or equal to the allowable VOC content established by the governing standards.
  - b. For paints and coatings applied on site and inside the weatherproofing system, submit product data or other published information verifying compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Manufacturer's claims of compliance must also state the range of total VOCs after 14 days.
  - c. Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.
- 4. Low Emitting Materials (EQc2): Composite Wood
  - a. Submit product data or other published information verifying the composite wood has low formaldehyde emissions that meet the California Air Resources Board ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde resins.
  - b. Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.

#### 1.4 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.

#### 1.5 QUALITY ASSURANCE

- A. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

## 1.6 DELIVERY, STORAGE, AND HANDLING

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

## PART 2 - PRODUCTS

### 2.1 SUSTAINABLE DESIGN REQUIREMENTS

- A. Sourcing of Raw Materials (MRc3), Recycled Content: Preference should be given to materials/products that have post- and/or pre-consumer recycled content by weight of total product.
- B. Sourcing of Raw Materials (MRc3), Wood Products: Preference should be given to materials/products that meet the LEED requirements for FSC certified wood.
  - 1. Applies to solid wood and wood veneer materials only.
- C. Low-Emitting Materials (EQc2): Composite Wood
  - 1. Composite wood must be documented to meet the EPA TSCA Title VI or California Air Resources Board (CARB) ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins.

### 2.2 WOOD PRODUCTS, GENERAL

- A. Regional Materials: Give preference to wood products with recycled content manufactured within 100 miles of Project site from materials that have been recovered, as well as manufactured, within 100 miles of Project site.
  - 1. Dimension lumber .
  - 2. Laminated-veneer lumber.
  - 3. Rim boards.
  - 4. Prefabricated wood I-joists.
  - 5. Parallel-strand lumber.
- B. Certified Wood: Certify the following wood products as "FSC Pure" or "FSC Mixed Credit" in accordance with FSC STD-01-001 and FSC STD-40-004.
  - 1. Dimension lumber .
  - 2. Laminated-veneer lumber.
  - 3. Parallel-strand lumber.
  - 4. Prefabricated wood I-joists.
  - 5. Rim boards.
- C. 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. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
4. Dress lumber, S4S, unless otherwise indicated.

D. Maximum Moisture Content of Lumber:

1. Boards: 15 percent.
2. Dimension Lumber: 15 percent unless otherwise indicated.
3. Timber: 19 percent .

E. 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.

## 2.3 MISCELLANEOUS LUMBER

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

1. Blocking.
2. Nailers.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of the following species:

1. Hem-fir (north); NLGA.
2. Spruce-pine-fir; NLGA.
3. Hem-fir; WCLIB or WWPA.
4. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. Concealed Boards: 15 percent maximum moisture content and the following species and grades:

1. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
2. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

## 2.4 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 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 or ASTM F2329 .
  - 2. For pressure-preservative-treated wood, use stainless steel fasteners.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

## 2.5 METAL FRAMING ANCHORS

- A. Allowable design loads, 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. Framing anchors are to be punched for fasteners adequate to withstand same loads as framing anchors.
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.
  - 1. Use for interior locations unless otherwise indicated.
- C. Bridging: Rigid, V-section, nailless type, 0.050 inch thick, length to suit joist size and spacing.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

- B. Set 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, and similar supports to comply with requirements for attaching other construction.
- C. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
  - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
  - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
  - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
  - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
  - 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- G. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- H. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
  - 1. Use inorganic boron for items that are continuously protected from liquid water.
  - 2. Use copper naphthenate for items not continuously protected from liquid water.
- I. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- J. 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.
- K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
1. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
  2. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

### 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

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## SECTION 061600 - SHEATHING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Wall sheathing.

#### 1.2 ACTION SUBMITTALS

- ##### A. Product Data:
- For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

#### 1.3 QUALITY ASSURANCE

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

#### 1.4 DELIVERY, STORAGE, AND HANDLING

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

### PART 2 - PRODUCTS

#### WALL SHEATHING

##### A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.

##### 1. Acceptable manufacturers:

- a. Certaineed Corporation
- b. Georgia-Pacific Building Products
- c. National Gypsum Company
- d. United States Gypsum Company

2. Type and Thickness: As indicated on the drawings but not less than 1/2 inch thick.
3. Size: 48 by 96 inches for vertical installation.

## 2.2 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  - 1. For parapet and wall sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
  - 2. For roof sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153.
- B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
  - 1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
  - 2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

## 2.3 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
  - 1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
  - 2. ICC-ES evaluation report for fastener.

- D. Coordinate wall, roof, and parapet sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

### 3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
  - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
  - 2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
  - 3. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.
  - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
- D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
  - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
- E. Seal sheathing joints according to sheathing manufacturer's written instructions.
  - 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
  - 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

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## SECTION 062013 – EXTERIOR FINISH CARPENTRY

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Exterior wood, medium-density overlay (MDO) and cellular PVC trim.
2. Lumber, Plywood and/or Hardboard siding
3. Plywood and/or Hardboard soffits.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
- B. Samples for Initial Selection: For each type of product involving selections of colors, profiles, or textures.

#### 1.3 DELIVERY, STORAGE, AND HANDLING

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

#### 1.2 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.
  1. For exterior ornamental wood columns, comply with manufacturer's written instructions and warranty requirements.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
  1. Indications that materials are wet, or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  2. Indications that materials are mold damaged include, but are not limited to, fuzzy or blotchy surface contamination and discoloration.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and the following grading rules:
  - 1. NeLMA: Northeastern Lumber Manufacturers' Association, "Standard Grading Rules for Northeastern Lumber."
  - 2. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."
  - 3. RIS: Redwood Inspection Service, "Standard Specifications for Grades of California Redwood Lumber."
  - 4. SPIB: The Southern Pine Inspection Bureau, "Standard Grading Rules for Southern Pine Lumber."
  - 5. WCLIB: West Coast Lumber Inspection Bureau, Standard No. 17, "Grading Rules for West Coast Lumber."
  - 6. WWPAA: Western Wood Products Association, "Western Lumber Grading Rules."
- B. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
  - 1. For exposed lumber, mark grade stamp on end or back of each piece.
- C. Softwood Plywood: DOC PS 1.
- D. Hardboard: ANSI A135.4.

### 2.2 EXTERIOR TRIM

- A. Lumber Trim for Semitransparent-Stained Finish, Clear Finish or Unfinished Applications:
  - 1. Maximum Moisture Content: 19 or 15 percent with at least 85 percent of shipment at 12 percent or less.
  - 2. Finger Jointing: Not allowed or allowed if made with wet-use adhesive complying with ASTM D 5572.
  - 3. Face Surface: Surfaced (smooth) or saw textured.
- B. Lumber Trim for Opaque-Stained or Painted Finish:
  - 1. Species and Grade: Redwood, Clear or Grade B; RIS.
  - 2. Species and Grade: Western red cedar, Grade A or Grade B; NLGA, WCLIB, or WWPAA.
  - 3. Species and Grade: Hem-fir, Prime or D finish, 1 Common or 2 Common; NLGA, WCLIB, or WWPAA.
  - 4. Species and Grade: Eastern white pine, eastern hemlock-balsam fir-tamarack, eastern spruce, or white woods; D Select (Quality), Finish or 1 Common (Colonial) or Premium or 2 Common (Sterling); NeLMA, NLGA, WCLIB, or WWPAA.
  - 5. Species and Grade: Northern white cedar, D Select, 1 Common or 2 Common; NeLMA or NLGA.

6. Maximum Moisture Content: 19 or 15 percent with at least 85 percent of shipment at 12 percent or less.
  7. Finger Jointing: Not allowed or allowed if made with wet-use adhesive complying with ASTM D 5572.
  8. Face Surface: Surfaced (smooth) or Saw textured.
  9. Factory Priming: Factory coated on faces and edges with exterior primer compatible with topcoats specified.
- C. Moldings for Semitransparent-Stained Finish, Clear Finish or Unfinished Applications: WMMPA WM 4, N-grade wood moldings, without finger jointing. Made from kiln-dried stock to patterns included in WMMPA WM 12.
1. Species: Redwood, Western red cedar or Eastern white, Idaho white, lodge-pole, ponderosa, radiata, or sugar pine.
- D. Moldings for Opaque-Stained or Painted Finish: Made from kiln-dried stock.
1. Species: Redwood, Western red cedar or Eastern white, Idaho white, lodge-pole, ponderosa, radiata, or sugar pine.
  2. Finger Jointing: Not allowed or allowed if made with wet-use adhesive complying with ASTM D 5572.
  3. Factory Priming: Factory coated on faces and edges with exterior primer compatible with topcoats specified.
- E. MDO Trim: Exterior Grade B-B, MDO plywood.
- F. Primed Hardboard Trim: High-temperature-cured, high-resin, wood-fiber composite; factory primed on faces and edges. Recommended by manufacturer for exterior use.

## 2.3 LUMBER SIDING

- A. Provide kiln-dried lumber siding complying with DOC PS 20, factory coated with exterior primer compatible with topcoats specified.
- B. Species and Grade: Clear All Heart VG, Clear All Heart, Clear VG (Vertical Grain), Clear or Grade B redwood; RIS.
- C. Species and Grade: Clear VG (Vertical Grain) Heart, Grade A or Grade B western red cedar; NLGA, WCLIB, or WWPA.
- D. Species and Grade: 1 Common or 2 Common spruce-pine-fir; NeLMA, NLGA, WCLIB, or WWPA.
- E. Species and Grade: D Select (Quality), Finish or 1 Common (Colonial) or Premium or 2 Common (Sterling) eastern white pine, eastern hemlock-balsam fir-tamarack, eastern spruce, or white woods; NeLMA, NLGA, WCLIB, or WWPA.
- F. Species and Grade: D Select, 1 Common or 2 Common northern white cedar; NeLMA or NLGA.

## 2.4 PLYWOOD SIDING

- A. Plywood Type: APA-rated siding in panel sizes indicated.
- B. Thickness: 11/32 inch, 3/8 inch, 15/32 inch, 1/2 inch, 19/32 inch, 5/8 inch or as indicated.
- C. Face Species: Southern pine, Douglas fir, Western red cedar or Redwood.
- D. Pattern: Plain. Channel groove; grooves 4 inches o.c., Texture 1-11; grooves 4 inches o.c. or Reverse board and batten; grooves 12 inches o.c.
- E. Surface: Smooth or rough sawn.

## 2.5 HARDBOARD SIDING

- A. Colors, Textures, and Patterns: As indicated by manufacturer's designations, match Architect's samples or as selected by Architect from manufacturer's full range.

## 2.6 PLYWOOD SOFFITS

- A. Plywood Type: Exterior, Grade A-C, Grade B-C, Grade C-C, plugged and touch sanded or APA-rated siding.
- B. Thickness: 11/32 inch, 3/8 inch, 15/32 inch, 1/2 inch, 19/32 inch or as indicated.
- C. Face Species: Southern pine, Douglas fir, Western red cedar or Redwood.
- D. Pattern: Plain, Channel groove; grooves 4 inches o.c. or Texture 1-11; grooves 4 inches o.c.
- E. Surface: Smooth or Rough sawn.

## 2.7 HARDBOARD SOFFITS

- A. Colors, Textures, and Patterns: As indicated by manufacturer's designations, match Architect's samples or as selected by Architect from manufacturer's full range.

## 2.8 MISCELLANEOUS MATERIALS

- A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.
  - 1. For face-fastening siding, provide ringed-shank siding nails or hot-dip galvanized-steel siding nails or unless otherwise indicated.
  - 2. For redwood, provide brass/bronze, stainless-steel or hot-dip galvanized-steel fasteners.
  - 3. For prefinished items, provide matching prefinished aluminum fasteners where face fastening is required.
  - 4. For pressure-preservative-treated wood, provide stainless-steel or hot-dip galvanized- steel fasteners.



5. For applications not otherwise indicated, provide stainless-steel, hot-dip galvanized-steel or aluminum fasteners.
- B. Wood Glue: Waterproof resorcinol glue recommended by manufacturer for exterior carpentry use.
- C. Adhesive for Cellular PVC Trim: Product recommended by trim manufacturer.
- D. Flashing: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.
  1. Horizontal Joint Flashing for Panel Siding: Preformed, galvanized-steel, aluminum, prefinished-aluminum or stainless-steel, Z-shaped flashing.
- E. Insect Screening for Soffit Vents: Aluminum, 18-by-16-inch mesh, PVC-coated glass-fiber fabric, 18-by-14-inch or 18-by-16-inch mesh or Stainless steel, 18-by-18-inch mesh.
- F. Continuous Soffit Vents: Aluminum hat channel shape with stamped louvers or perforations, 2 inches wide and in lengths not less than 96 inches.
  1. Net Free Area: 4 sq. in./linear ft., 6 sq. in./linear ft. or 8 sq. in./linear ft..
  2. Finish: Mill finish, White or Brown paint.
- G. Round Soffit Vents: Stamped aluminum louvered vents, 2 inches, 2-1/2 inches, 3 inches or 4 inches in diameter, made to be inserted into round holes cut into soffit.
  1. Finish: Mill finish, White or Brown paint.
- H. Round Soffit Vents: Molded plastic louvered vents, 2 inches, 2-1/2 inches, 3 inches or 4 inches in diameter, made to be inserted into round holes cut into soffit.
- I. Sealants: Latex, complying with ASTM C 834 Type OP, Grade NF and with recommendations by sealant manufacturer and manufacturer of substrates for intended application.

## 2.9 FABRICATION

- A. Back out or kerf backs of standing and running trim wider than 5 inches, except members with ends exposed in finished work.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed. Cut to required lengths and prime ends. Comply with requirements in "Exterior Painting" specification section.

### 3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
  - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
  - 1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
  - 2. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
  - 3. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.
  - 4. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

### 3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install flat-grain lumber with bark side exposed to weather.
- B. Install cellular PVC trim to comply with manufacturer's written instructions.
- C. Install trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long except where necessary.
  - 1. Use scarf joints for end-to-end joints.
  - 2. Stagger end joints in adjacent and related members.
- D. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

- E. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

### 3.5 SIDING INSTALLATION

- A. Install siding to comply with manufacturer's written instructions and warranty requirements.
- B. Horizontal Lumber Siding: Apply starter strip along bottom edge of sheathing or sill. Install first course of siding with lower edge at least 1/8 inch below starter strip and subsequent courses lapped 1 inch over course below. Nail at each stud. Do not allow nails to penetrate more than one thickness of siding.
  - 1. Leave 1/8-inch gap at trim and corners unless otherwise recommended by manufacturer and apply sealant.
  - 2. Butt joints only over framing or blocking, nailing top and bottom on each side and staggering joints in subsequent courses.
  - 3. Install prefabricated outside corners as recommended by manufacturer of siding materials.
- C. Diagonal Lumber Siding: Begin application at corner with tongue edge up. Install subsequent courses with tongue-and-groove edges tightly fitted together. Nail at each stud.
  - 1. Leave 1/8-inch gap at trim and corners unless otherwise recommended by manufacturer and apply sealant.
  - 2. Butt joints only over framing or blocking, nailing top and bottom on each side and staggering joints in subsequent courses.
  - 3. Install prefabricated outside corners as recommended by manufacturer of siding materials.
- D. Plywood Siding: Install panels with edges over framing or blocking. Nail at 6 inches o.c. at panel perimeter and 12 inches o.c. at intermediate supports unless manufacturer recommends closer spacing. Leave 1/16-inch gap between adjacent panels and 1/8-inch gap at perimeter, openings, and horizontal joints unless otherwise recommended by panel manufacturer.
  - 1. Seal butt joints at inside and outside corners and at trim locations.
  - 2. Install continuous metal flashing at horizontal panel joints.
  - 3. Apply battens and corner trim as indicated. Countersink nail heads.
  - 4. Conceal fasteners to greatest practical extent by countersinking, by placing in grooves of siding pattern or by concealing with applied trim or battens as detailed. Do not nail through overlapping pieces.
- E. Flashing: Install metal flashing as indicated on Drawings and as recommended by siding manufacturer.
- F. Finish: Apply finish within two weeks of installation.

### 3.6 ADJUSTING

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

### 3.7 CLEANING

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

### 3.8 PROTECTION

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

END OF SECTION 062013

## SECTION 062023 – INTERIOR FINISH CARPENTRY

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Interior trim, including non-fire-rated interior door and sidelight frames.
2. Interior plywood, hardboard or board paneling.
3. Shelving and clothes rods.

#### 1.2 DEFINITIONS

- A. MDF: Medium-density fiberboard.
- B. MDO: Plywood with a medium-density overlay on the face.

#### 1.3 ACTION SUBMITTALS

- C. Product Data: For each of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
- D. Samples for Initial Selection: For each type of product involving selections of colors, profiles, or textures.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
- B. Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

#### 1.2 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet, or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

#### A. Lumber: DOC PS 20 and the following grading rules:

1. NeLMA: Northeastern Lumber Manufacturers' Association, "Standard Grading Rules for Northeastern Lumber."
2. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."
3. RIS: Redwood Inspection Service, "Standard Specifications for Grades of California Redwood Lumber."
4. SPIB: The Southern Pine Inspection Bureau, "Standard Grading Rules for Southern Pine Lumber."
5. WCLIB: West Coast Lumber Inspection Bureau, Standard No. 17, "Grading Rules for West Coast Lumber."
6. WWPA: Western Wood Products Association, "Western Lumber Grading Rules."

#### B. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, mark grade stamp on end or back of each piece.

#### C. Softwood Plywood: DOC PS 1.

#### D. Hardboard: ANSI A135.4.

#### A. MDF: ANSI A208.2, Grade 130.

#### B. Particleboard: ANSI A208.1, Grade M-2 or Grade M-2-Exterior Glue.

#### C. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

1. Color: White, as indicated by manufacturer's designations, match Architect's samples or as selected by Architect from manufacturer's full range.

### 2.2 INTERIOR TRIM

#### A. Softwood Lumber Trim for Transparent Finish (Stain or Clear Finish):

1. Species and Grade: Eastern white pine, C Select, D Select, Finish or 1 Common and Premium or 2 Common; NeLMA or NLGA.
2. Species and Grade: Idaho white, lodgepole, ponderosa, radiata, or sugar pine; C Select (Choice), D Select (Quality), 1 Common (Colonial) or 2 Common (Sterling); NLGA or WWP.
3. Species and Grade: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine; C Select (Choice), D Select (Quality), Finish or 1 Common (Colonial) and Premium or 2 Common (Sterling); NeLMA, NLGA, or WWP.
4. Species and Grade: White woods, C Select, D Select, 1 Common or 2 Common; WWP.
5. Species and Grade: Douglas fir-larch or Douglas fir south, Superior or C & Btr or Prime or D finish; NLGA, WCLIB, or WWP.
6. Species and Grade: Southern pine, B & B or C & Btr finish; SPIB.
7. Species and Grade: Western red cedar, Clear, Heart, Grade A or Grade B; NLGA, WCLIB, or WWP.
8. Maximum Moisture Content: 19 or 15 percent with at least 85 percent of shipment at 12 percent or less.
9. Finger Jointing: Allowed or Not allowed.
10. Face Surface: Surfaced (smooth) or Saw textured.

B. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish):

1. Species and Grade: Red oak, White maple, Alder or Aspen, basswood, cottonwood, sap gum, sycamore, white maple, or yellow poplar; Clear, A Finish or B Finish; NHLA.
2. Maximum Moisture Content: 13, 10 or 9 percent.
3. Finger Jointing: Not allowed.
4. Face Surface: Surfaced (smooth) or Saw textured.
5. Matching: Selected for compatible grain and color.

C. Lumber Trim for Opaque Finish (Painted Finish):

1. Species and Grade: Eastern white pine, D Select, Finish or 1 Common, Premium or 2 Common; NeLMA or NLGA.
2. Species and Grade: Idaho white, lodgepole, ponderosa, radiata, or sugar pine; D Select (Quality), 1 Common (Colonial) or 2 Common (Sterling); NLGA or WWP.
3. Species and Grade: Eastern white, Idaho white, lodge-pole, ponderosa, radiata, or sugar pine; D Select (Quality), Finish or 1 Common (Colonial), Premium or 2 Common (Sterling); NeLMA, NLGA, or WWP.
4. Species and Grade: White woods, D Select, 1 Common or 2 Common; WWP.
5. Species and Grade: Douglas fir-larch or Douglas fir south, Superior or C & Btr or Prime or D finish; NLGA, WCLIB, or WWP.
6. Species and Grade: Spruce-pine-fir, 1 Common or 2 Common; NeLMA, NLGA, WCLIB, or WWP.
7. Species and Grade: Alder, aspen, basswood, cottonwood, gum, magnolia, soft maple, sycamore, tupelo, or yellow poplar; A Finish or B Finish; NHLA.
8. Maximum Moisture Content: 19 or 15 percent with at least 85 percent of shipment at 12 percent or less.
9. Maximum Moisture Content: 13, 10 or 9 percent.
10. Finger Jointing: Allowed or Not allowed.
11. Face Surface: Surfaced (smooth) or Saw textured.
12. Optional Material: Primed MDF of same actual dimensions as lumber indicated may be used in lieu of lumber.

- D. Softwood Moldings for Transparent Finish (Stain or Clear Finish): WMMPA WM 4, N-grade wood moldings. Made to patterns included in WMMPA WM 12.
1. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine Southern pine, Western red cedar or Douglas fir.
  2. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
  3. Finger Jointing: Not allowed.
  4. Matching: Selected for compatible grain and color.
- E. Hardwood Moldings for Transparent Finish (Stain or Clear Finish): WMMPA HWM 2, N- grade wood moldings made to patterns included in WMMPA HWM 1.
1. Species: Red oak White maple Aspen, basswood, cottonwood, sap gum, sycamore, white maple, or yellow poplar.
  2. Kiln-dried softwood or MDF, with exposed surfaces veneered with species indicated, may be used in lieu of solid wood.
  3. Maximum Moisture Content: 9 percent.
  4. Finger Jointing: Not allowed.
- F. Moldings for Opaque Finish (Painted Finish): Made to patterns included in WMMPA WM 12.
1. Softwood Moldings: WMMPA WM 4, P grade.
    - a. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine.
    - b. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
  2. Hardwood Moldings: WMMPA HWM 2, P-grade.
    - a. Species: Aspen, basswood, cottonwood, gum, magnolia, soft maple, tupelo, or yellow poplar.
    - b. Maximum Moisture Content: 9 percent.
  3. Optional Material: Primed MDF.
  4. Finger Jointing: Allowed or Not allowed.

## 2.3 PANELING

- A. Hardwood Veneer Plywood Paneling: Manufacturer's stock hardwood plywood panels complying with HPVA HP-1, made without urea-formaldehyde adhesive.
1. Face Veneer Species and Cut: Rotary-cut white birch, Plain-sliced red oak or Plain- sliced hickory.
  2. Veneer Matching: Random match or selected for similar color and grain.
  3. Backing Veneer Species: Same species as face veneer or any hardwood compatible with face species.
  4. Construction: Veneer core.
  5. Thickness: 1/8 inch, 5/32 inch, 5 mm, 1/4 inch, 5/16 inch or 7/16 inch.
  6. Panel Size: 48 by 96 inches or 48 by 120 inches.



7. Glue Bond: Type II (interior).
  8. Face Pattern: Manufacturer's standard V or channel-grooved pattern, with grooves at edges, center, and third points of panels, and at other locations to provide pattern resembling random-width boards.
  9. Finish: Manufacturer's standard, transparent, UV-resistant, protective finish, as indicated by manufacturer's designations Match Architect's samples or as selected by Architect from manufacturer's full range.
- B. Hardboard Paneling: Interior factory-finished hardboard paneling complying with AHA 135.5
1. Thickness: 1/8 inch, 5/32 inch or inch.
  2. Finish: Class I or Class II.
  3. Surface-Burning Characteristics: As follows, tested according to ASTM E 84:
    - a. Flame-Spread Index: 25 or less.
    - b. Smoke-Developed Index: 450 or less.
  4. Colors, Textures, and Patterns: As indicated by manufacturer's designations, match Architect's samples or as selected by Architect from manufacturer's full range.
- C. Board Paneling: Interior wood-board paneling complying with WMPA WM 9.
1. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine, Southern pine, Western red cedar or Figured red gum.
  2. Grade: Clear No. 1, Clear No. 2, Knotty No. 1, Knotty No. 2 or Finger jointed.
  3. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less or 9 percent.
  4. Pattern: V-joint, tongue and groove, PT 82 Beaded ceiling, PT 85 Beveled-edge channel, ship-lapped, PT 82 or as indicated.
  5. Net Coverage Width: Not less than 5-1/16 inches, 6-3/4 inches or 8-3/4 inches.
- D. Board Paneling:
1. Species and Grade: Eastern white pine, C Select, D Select, Finish or 1 Common Premium or 2 Common; NeLMA or NLGA.
  2. Species and Grade: Idaho white, lodgepole, ponderosa, radiata, or sugar pine; C Select (Choice), D Select (Quality), 1 Common (Colonial) or 2 Common (Sterling); NLGA or WHPA.
  3. Species and Grade: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine; C Select (Choice), D Select (Quality), Finish or 1 Common (Colonial) and Premium or 2 Common (Sterling); NeLMA, NLGA, or WHPA.
  4. Species and Grade: Southern pine, B & B, C & Btr or No. 2 Paneling; SPIB.
  5. Species and Grade: Western red cedar, Clear, Heart, Grade A or Grade B; NLGA, WCLIB, or WHPA.
  6. Maximum Moisture Content: 19 or 15 percent with at least 85 percent of shipment at 12 percent or less.
  7. Pattern: V-joint, tongue and groove, NeLMA EWP 4, SPIB SPP 54 or WHPA WP 4.
  8. Pattern: Pickwick, tongue and groove, NeLMA EWP 2, SPIB SPP 52 or WHPA WP 2.
  9. Pattern: Rounded-edge channel groove, tongue and groove, SPIB SPP 60 or WHPA WP 6.

10. Pattern: Edge and center bead, tongue and groove, NeLMA E & CB or WWPA E & CB Ceiling.
11. Net Coverage Width: Not less than 5-1/16 inches, 6-3/4 inches or 8-3/4 inches.

## 2.4 SHELVING AND CLOTHES RODS

- A. Exposed, Closet or Utility Shelving: Made from the following material or one of the following materials, 3/4 inch thick.
  1. Particleboard with radiused and filled or solid-wood front edge.
  2. MDF with radiused or solid-wood front edge.
  3. MDO softwood plywood with solid-wood edge.
  4. Melamine-faced particleboard with radiused and filled or applied-PVC front edge.
  5. Wood boards as specified above for lumber trim for opaque, softwood lumber trim for transparent or hardwood lumber trim for transparent finish.
  6. Softwood Boards: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine; C Select (Choice), D Select (Quality), Finish or 1 Common (Colonial) and Premium or 2 Common (Sterling); NeLMA, NLGA, or WWPA; kiln dried.
  7. Softwood Boards: Douglas fir-larch, Douglas fir south, or hem-fir; Superior or C & Btr and Prime or D finish; NLGA, WCLIB, or WWPA; or southern pine, B & B or C finish; SPIB; kiln dried.
- B. Shelf Cleats: 3/4-by-3-1/2-inch boards, 3/4-by-5-1/2-inch boards or 3/4-by-5-1/2-inch boards with hole and notch to receive clothes rods, as specified above for shelving lumber trim for opaque finish, softwood lumber trim for transparent finish or hardwood lumber trim for transparent finish.
- C. Shelf Brackets with Rod Support: BHMA A156.16, B04051; prime-painted formed steel.
- D. Clothes Rods: 1-1/2-inch- diameter, clear, kiln-dried hardwood or clear, kiln-dried Douglas fir or southern pine.
- E. Clothes Rods: 1-5/16-inch- diameter, aluminum tubes, chrome-plated-steel tubes, color-coated steel tubes, stainless-steel tubes or chrome-plated-steel telescoping tubes with end brackets for mounting on shelf cleats.
- F. Rod Flanges: Aluminum, Chrome-plated steel or Stainless steel.

## 2.5 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- B. Low-Emitting Materials: Adhesives 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. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
  - 1. Wood glue shall have a VOC content of 30 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Installation Adhesive for Foam Plastic Moldings: Product recommended for indicated use by foam plastic molding manufacturer.
  - 1. Adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Paneling Adhesive: Comply with paneling manufacturer's written recommendations for adhesives.
  - 1. Adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- F. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.
  - 1. Adhesive shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## 2.6 FABRICATION

- A. Back out or kerf backs of the following members except those with ends exposed in finished work:
  - 1. Interior standing and running trim except shoe and crown molds.
  - 2. Wood-board paneling.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

### 3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
  - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
  - 2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
  - 3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
  - 4. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.
  - 5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

### 3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope or Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
  - 1. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
  - 2. Install trim after gypsum-board joint finishing operations are completed.
  - 3. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

### 3.5 PANELING INSTALLATION

- A. Plywood Paneling: Select and arrange panels on each wall to minimize noticeable variations in grain character and color between adjacent panels. Leave 1/4-inch gap to be covered with trim at top, bottom, and openings. Install with uniform tight joints between panels.
  - 1. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners. Space fasteners and adhesive as recommended by panel manufacturer.
  - 2. Conceal fasteners to greatest practical extent.
  - 3. Arrange panels with grooves and joints over supports. Fasten to supports with nails of type and at spacing recommended by panel manufacturer. Use fasteners with prefinished heads matching groove color.
- B. Hardboard Paneling: Install according to manufacturer's written recommendations. Leave 1/4-inch gap to be covered with trim at top, bottom, and openings. Butt adjacent panels with moderate contact. Use fasteners with prefinished heads matching paneling color.
  - 1. Wood Stud or Furring Substrate: Install with 1-inch annular-ring shank hardboard nails.
  - 2. Plaster or Gypsum-Board Substrate: Install with 1-5/8-inch annular-ring shank hardboard nails.
  - 3. Nailing: Space nails 4 inches o.c. at panel perimeter and 8 inches o.c. at intermediate supports unless otherwise required by manufacturer.
- C. Board Paneling: Install according to manufacturer's written instructions. Arrange in random-width pattern suggested by manufacturer unless boards or planks are of uniform width.
  - 1. Install in full lengths without end joints.
  - 2. Stagger end joints in random pattern to uniformly distribute joints on each wall.
  - 3. Install with uniform end joints with only end-matched (tongue-and-groove) joints within each field of paneling.
  - 4. Install with uniform end joints. Locate end joints only over furring or blocking.
  - 5. Select and arrange boards on each wall to minimize noticeable variations in grain character and color between adjacent boards. Install with uniform tight joints between boards.
  - 6. Fasten paneling by face nailing, setting nails, and filling over nail heads.
  - 7. Fasten paneling with trim screws, set below face and filled.
  - 8. Fasten paneling by blind nailing through tongues.
  - 9. Fasten paneling with paneling system manufacturer's concealed clips.
  - 10. Fasten paneling to gypsum wallboard with panel adhesive.

### 3.6 SHELVING AND CLOTHES ROD INSTALLATION

- A. Cut shelf cleats at ends of shelves about 1/2 inch less than width of shelves and sand exposed ends smooth.
- B. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled. Space fasteners not more than 16 inches o.c. Use 2 fasteners at each framing member or fastener location for cleats 4 inches nominal in width and wider.
  - 1. Apply a bead of multipurpose construction adhesive to back of shelf cleats before installing. Remove adhesive that is squeezed out after fastening shelf cleats in place.

- C. Install shelf brackets according to manufacturer's written instructions, spaced not more than 32 inches or 36 inches o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
- D. Install standards for adjustable shelf supports according to manufacturer's written instructions. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Space fasteners not more than 12 inches o.c.
- E. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches o.c. and within 6 inches of end of shelves. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
- F. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on cleats, brackets, and supports.
  - 1. Fasten shelves to cleats with finish nails or trim screws, set flush.
  - 2. Fasten shelves to brackets to comply with bracket manufacturer's written instructions.
- G. Install rod flanges for rods as indicated. Fasten to shelf cleats, framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Install rods in rod flanges.

### 3.7 ADJUSTING

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

### 3.8 CLEANING

- A. Clean interior finish carpentry on exposed and semi exposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes, if any.

### 3.9 PROTECTION

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

END OF SECTION 062023

## SECTION 062200 - MILLWORK

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Coordination, fabrication, and installation of all Millwork, wood cabinets, panel work, counters, and shelving as shown on the drawings and specified herein.

#### 1.2 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.
- D. OSB: Oriented strand board.
- E. Timber: Lumber of 5 inches nominal size or greater in least dimension.
- F. Lumber grading agencies, and abbreviations used to reference them, include the following:
  - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
  - 2. NLGA: National Lumber Grades Authority.
  - 3. SPIB: The Southern Pine Inspection Bureau.
  - 4. WCLIB: West Coast Lumber Inspection Bureau.
  - 5. WWPA: Western Wood Products Association.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For all specialty items not manufactured by the Millwork Fabricator.
- B. Sustainable Design Submittals:
  - 1. Sourcing of Raw Materials (MRc3): Recycled content
    - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).
    - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
  - 2. Sourcing of Raw Materials (MRc3): Wood products

- a. Forest Stewardship Council (FSC): Provide letter of certification signed by vendor. Indicate compliance with FSC "Principles for Natural Forest Management" and identify certifying organization.
      - 1) Submit copies of invoices identifying cost of each FSC certified product on a line-item basis, vendor's FSC chain-of-custody certificate code, and verification of if the product is "FSC 100%," "FSC Mix Credit," or "FSC Mix [NN]%"
    - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
  - 3. Low Emitting Materials (EQc2): Paints and Coatings
    - a. For paints and coatings applied on site and inside the weatherproofing system, submit product data or other published information verifying the VOC (Volatile Organic Compound) content is less than or equal to the allowable VOC content established by the governing standards.
    - b. For paints and coatings applied on site and inside the weatherproofing system, submit product data or other published information verifying compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Manufacturer's claims of compliance must also state the range of total VOCs after 14 days.
    - c. Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.
  - 4. Low Emitting Materials (EQc2): Composite Wood
    - a. Submit product data or other published information verifying the composite wood has low formaldehyde emissions that meet the California Air Resources Board ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde resins.
    - b. Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.
- C. Shop Drawings:
  - 1. Include fabrication and installation methods with plans and elevations at not less than 1/2" = 1'-0" scale details at not less than 3" = 1'-0" scale. Indicate required anchorage and blocking, accessory items, field dimensions, materials, and finishes. Indicate compliance with specification requirements.
- D. Samples for Selection and Approval by the Architect:
  - 1. Two samples of each species of specified wood, cut and finish. Samples shall be minimum 12" x 12" (or full member width and thickness) finished as specified on one face, one edge, and one end. Samples shall be fire-retardant treated wood where such has been specified or is required by code. Review will be for color and texture only; compliance with other requirements is responsibility of Millwork Contractor. Samples of finishes shall be applied on the appropriate wood or base material as will occur in the final Millwork item when installed.
- E. Wood Veneer Samples for Selection and Approval by the Architect:



1. A minimum of three different flitches of any and all veneers specified shall be submitted to the Architect for approval unless veneers have been previously selected by the Architect and herein specified. Flitches shall indicate the color, grain, texture, and finish range to be expected in the Project.
- F. Where variations in wood and finish may occur, a minimum of three variations showing extremes which may be expected of any and all wood finishes as specified shall be submitted to the Consultant for approval. Minimum size: 12" x 20".
- G. Where required by the Architect, the Millwork Contractor shall provide full size mock-up of panel or millwork assembly for approval.
- H. Millwork Contractor shall submit to the Consultant three samples 20" minimum length, of all mouldings and/or moulding assemblies to be used for the Project. These shall be full size and finished as specified in the Contract Documents.

#### 1.4 QUALITY ASSURANCE

- A. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- C. All work of this Section shall be performed by skilled mechanics of the trade and shall be of the highest quality. Comply with applicable Industry Standards for all work and materials as specified. Such Industry Standards are to include but not be limited to the applicable provisions or standards of the following:
  1. American Society for Testing and Materials (ASTM):
    - a. ASTM E-84: Test for Surface Burning Characteristics of Building Materials.
  2. Federal Specifications (FedSpec):
    - a. FF-N-105B (2): Nails, Brads, Staples and Spikes: Wire Cut and Wrought.
    - b. FF-S-111C (1): Screws, Wood
  3. U.S. Department of Commerce:
    - a. Product Standard (PS) 1-66 Softwood Plywood, Construction and Industrial.
    - b. Product Standard (PS) 20-70 American Softwood Lumber Standard.
  4. Architectural Woodwork Institute (AWI): Quality Standards and Guide Specification, latest edition. (Premium Grade).
  5. National Electrical Manufacturers Association (NEMA):
    - a. LD-3-1975 Laminated Plastic Specification.
  6. National Hardwood Lumber Association (NHLA).

- 7. National Particleboard Association (NPA).
- 8. American Plywood Association (APA) plywood grades:
  - a. for softwood plywood: Product Standard PS-1
  - b. for hardwood plywood: Product Standard PS- 51

- D. The Millwork Contractor shall be responsible for obtaining and complying with all Code and regulatory agencies for materials and methods. He shall also be responsible for obtaining permits and approvals.
- E. The Millwork Contractor shall be responsible for accurately obtaining all field dimensions related to his work prior to fabrication. Where discrepancies are found, he shall notify the Consultant immediately in writing.
- F. All Millwork materials and completed Millwork shall be stored in a dry, ventilated place, protected from the weather and complying with the temperature and humidity conditions specified by AWI Quality Standards.
- G. Protect sanded and finished surfaces from soiling and damage during handling and installation.
- H. Maintain requirements for heating, cooling and ventilation in installation areas as required to reach relative humidity necessary to maintain optimum moisture content specified for Millwork by AWI Standards.
- I. Provide temporary protection of all Millwork as required to protect work from damage.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

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

### PART 2 - PRODUCTS

#### 2.1 SUSTAINABLE DESIGN REQUIREMENTS

- A. Sourcing of Raw Materials (MRc3), Recycled Content: Preference should be given to materials/products that have post- and/or pre-consumer recycled content by weight of total product.
- B. Sourcing of Raw Materials (MRc3), Wood Products: Preference should be given to materials/products that meet the LEED requirements for FSC certified wood.
  - 1. Applies to solid wood and wood veneer materials only.
- C. Low-Emitting Materials (EQc2): Composite Wood
  - 1. Composite wood must be documented to meet the EPA TSCA Title VI or California Air Resources Board (CARB) ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins.

## 2.2 WOOD PRODUCTS, GENERAL

- A. Regional Materials: Give preference to wood products with recycled content manufactured within 100 miles of Project site from materials that have been recovered, as well as manufactured, within 100 miles of Project site.
  - 1. Dimension lumber .
  - 2. Laminated-veneer lumber.
  - 3. Rim boards.
  - 4. Prefabricated wood I-joists.
  - 5. Parallel-strand lumber.
- B. Certified Wood: Certify the following wood products as "FSC Pure" or "FSC Mixed Credit" in accordance with FSC STD-01-001 and FSC STD-40-004.
  - 1. Dimension lumber .
  - 2. Laminated-veneer lumber.
  - 3. Parallel-strand lumber.
  - 4. Prefabricated wood I-joists.
  - 5. Rim boards.
- C. 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. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
  - 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
  - 4. Dress lumber, S4S, unless otherwise indicated.
- D. Maximum Moisture Content of Lumber:
  - 1. Boards: 15 percent.
  - 2. Dimension Lumber: 15 percent unless otherwise indicated.
  - 3. Timber. 19 percent.
- E. 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.

## 2.3 PRODUCTS

### A. Materials listed in the Finish Schedule on the Architectural Drawings:

1. WD-5
2. Material: Vertical Grain Douglas Fir.
3. Grade: cv – Clear Vertical Grain
4. Thickness: 3/4-inch
5. Finish: Stain, to be selected by Architect.

## 2.4 MATERIALS

### A. All woodwork materials shall be new and shall conform to the Premium Grade requirements of the AWI Quality Standards, latest edition.

### B. All lumber shall be kiln-dried to the average moisture content as recommended by the AWI Quality Standards; latest edition appropriate for the regional climatic conditions of the project site.

### C. All solid wood elements shall be clear, straight-grain lumber of the best grade of specified species as listed by the NHLA. Lumber shall be free of any defects which might impair serviceability, aesthetics, and/or finish. Solid wood elements shall also be according to the following, unless indicated otherwise on drawings and/or specifications:

1. Specie of Face Woods receiving transparent finishes shall be as specified on the drawings and shall be selected for specified grain with uniform color and grain suitable for use with the finished plywood with which it is used.
2. Face Woods receiving opaque finishes shall be Birch, Poplar, or Custom Grade but otherwise shall have same specification as solid stock for Face Woods above.
3. Unexposed woods shall be Custom Grade Poplar, kiln dried unexposed woods come into contact with drawers, they shall be Birch or Maple, unselect.

### D. All veneer core elements shall be clear straight-grain lumber of the best grade of the specified species as listed by the N.H.L.A. Lumber shall be free of any defects which might impair serviceability, aesthetics, and/or finish. Where veneer differs on two sides, veneers shall be of similar thickness, density, and characteristics to prevent any warpage. Veneer core elements shall also be according to the following, unless indicated on drawings or specifications:

1. Adhesives shall be water-resistant resin or approved equal; process shall be hot plate method using the following number of plies to achieve specified thickness:
  - a. 1/4" (6 mm) overall thickness shall be of 3- ply veneer core construction.
  - b. 3/8" (9 mm) overall thickness shall be of 5- ply veneer core construction.
  - c. 1/2" (12 mm) overall thickness shall be of 5-ply veneer core construction.
  - d. 3/4" (20 mm) overall thickness shall be of 7-ply veneer core construction.
  - e. 1" (25 mm) overall thickness shall be of 9- ply veneer core construction.
2. Where burl panels are specified, core must be crossbanded with Poplar prior to applying burl veneer.

3. Provide Douglas or Poplar Fir V-type solid edge trim on all exposed edges of plywood not designated to be surfaced by plastic laminate.
  4. For Face Woods receiving transparent finishes, Species shall be as specified on drawings; faces shall be selected and matched by the Interior Contractor/Vendor with respect to cutting lengths, uniformity of color, figure, and grain character. Face veneers shall not contain open joints, face depressions, glue stain or other manufacturing irregularities.
  5. Face Woods receiving opaque finishes shall have custom grade (face veneer) Birch or Poplar, selected, but otherwise shall have same specification as Plywood for Face Woods.
  6. Unexposed woods shall be Birch, Poplar or Douglas Fir, rotary cut, Unselect, good one side, interior type plywood, one side Grade A and one side Grade B; Grade A faces shall not contain plugs, knots, pitch pockets, splits, rough grain, or other open defects.
  7. Wood for plastic lamination shall be minimum 3/4" Mahogany face core plywood, good one side.
- E. All medium density fiberboard (MDF) shall be resin impregnated wood flakes of high-density construction and shall be 3/4" (20mm) minimum thickness, unless otherwise specified.
1. For Enameled Face Woods: Medium density fiberboard (MDF) may be substituted for plywood panels, unless specified otherwise on drawings.
  2. For Unexposed Woods: Medium density fiberboard (MDF) may be substituted for plywood panels, unless specified otherwise on drawings.
- F. All high density fiberboard (HDF) shall be 1/8" (3 mm) thick tempered.
- G. All pegboards shall be 1/8" (3 mm) thick tempered high-density fiberboard (HDF).
- H. All panel work materials shall be as indicated on drawings and specifications constructed of 3/4" (20 mm) plywood (or high-density particleboard) with finish veneer front side, and veneer of similar thickness, density and characteristics back side, and hardwood edges. Finish veneer and hardwood edges shall be of species indicated on drawings and specifications using the type of veneer cut and type of match between individual veneer pieces as indicated.
- I. All Millwork shall be finished as indicated on drawings and specifications. Transparent and Opaque Finishes shall match approved samples. All plastic laminate finishes shall be of the quality, color and finish as indicated on the drawings and specifications.

## 2.5 MILLWORK TRIM, REVEALS, AND TRANSITIONS

- A. Trim and Reveals: Where shown on millwork details provide extruded aluminum trim and reveals. Finish to be selected by Architect from Manufacturer's full range of standard finishes. Following are Basis-of-Design products provided by Fry Reglet:
1. Millwork 1/4" Post
    - a. 1/2" Post: MWP2550
    - b. 3/4" Post: MWP2570
    - c. 1" Post: MWP25100
  2. Millwork 1/4" Post Termination

- a. 1/2" Post: MWPT2550
  - b. 3/4" Post: MWPT2570
  - c. 1" Post: MWPT25100
- 3. Millwork 1/4" Post Outside Corner
  - a. 1/2" Post: MWPOSC2550
  - b. 3/4" Post: MWPOSC2570
  - c. 1" Post: MWPOSC25100
- 4. Wallcovering Outside Corner (Wallcovering Thickness)
  - a. 1/8" or Less: WCTOSC
- B. Floor Transitions: Where shown on the drawings provide aluminum floor transitions between tile coverings and floor coverings at lower elevations. Finish to be selected by Architect from Manufacturer's full range of standard finishes. Basis-of-Design product:
  - 1. Schluter Systems: RENO-RAMP.
    - a. When bonding to existing floor covering, provide: RENO-RAMP-K

## 2.1 CERAMIC TILE TRIM

- A. Ceramic Tile Edge Protection: Where shown on the drawings provide extruded aluminum trim with a rounded reveal surface. Square reveal trim pieces are not acceptable. Finish to be selected by Architect from Manufacturer's full range of standard finishes. Basis-of-Design product:
  - 1. Schluter Systems: RONDEC

## 2.2 FINISHES

- A. All millwork shall be finished in accordance with the drawings, specifications and the quality levels indicated in this Section.
- B. All finishes shall be in compliance with all Code and Regulatory Agency requirements for the Project and location within in the Project.
- C. All finish materials shall be treated with flame-retardant process where required by local code. Should flame-retardant process cause change in color and effect on finish material, Interior
- D. Prior to finishing woods shall be filled, sanded, primed, and cleaned. When necessary for an even final finish color bleach woods prior to filling and sanding.
- E. Transparent finishes on wood shall be full filled, stained to match the color required by the Consultant, and have a water, alcohol, and burn resistant finish, the degree of sheen to match the sample provided by the Consultant.

- F. All paint and other finish material shall be pure, unadulterated and best quality from specified manufacturer as indicated on the drawings and specifications.

## 2.3 HARDWARE AND ACCESSORIES

- A. Where products are not specified in the Contract Documents the Millwork Contractor shall recommend hardware to provide the function or condition indicated in the Documents. Hinges, screws, slips, and all other mountings, attachments, and fasteners to be concealed unless otherwise noted.
- B. All Millwork hardware and accessories shall be furnished and installed by Millwork Contractor and shall be as indicated on drawings and specifications.
- C. Millwork Contractor shall submit samples of each hardware item/type and accessory item/type to Architect for approval.
- D. All Millwork hardware and accessories shall be installed in accordance with manufacturer's recommendations.
- E. All hardware shall be provided with necessary facilities for locking, unless otherwise specified. Locks shall be flush mounted unless noted otherwise. All locks shall be furnished with two (2) keys and all locks shall be master keyed. Unless otherwise specified, doors with die-stamped door pulls shall not require locking devices, unless otherwise specified.

## PART 3 - EXECUTION

### 3.1 EXAMINATION OF CONDITIONS

- A. The Millwork Contractor shall be responsible for examination of the substrate and the conditions under which the work under this section is to be performed. Do not proceed with the work under this section until unsatisfactory conditions have been corrected.

### 3.2 FABRICATION

- A. All work shall be performed in such manner as to fulfill the intent of the drawings and specifications.
- B. All items to be mill fabricated per AWI Premium Grade specifications and according to the sizes and designs indicated on the drawings and specifications, and assembled in single and complete units insofar as the dimensions thereof will permit shipment to and installation at the building. Large pieces requiring sectional construction shall have their several parts accurately fitted and aligned with each other and be provided with ample screws, glue and bolt blocks, tongues, grooves and splines, dowels, mortises and tenons, screws, bolts, or suitable means of concealed fastening, as required to render the work substantial, rigid and permanently secured in proper position to each related section.
- C. Where necessary to fit at site provide ample allowance for cutting and fitting. Sufficient additional material shall be allowed to permit accurate scribing to walls, floors and related

work; and due allowance made wherever possible for such shrinkage as may develop after installation. All single and sectional units shall be provided with adequate cleating, blocking, crating and other forms of protection as required to preclude damages thereto during shipping and handling.

- D. Framing and blocking members shall be assembled with bolted and screwed connections and shall be secured to the structural backings with expansion screws, or toggle bolts, as required, spaced and installed so as to insure ample strength and rigidity. Rails and stiles shall be mortised and tenoned, work neatly mitered and membered, all butt joints made flush and smooth, and all permanent joints made up with water- resistant glue. All fixtures shall be assembled without face screws or nails, except where it may be necessary to attach trim items. All face screws or nails which are necessary to attach trim items shall be countersunk and plastic wood or wood plugs used to cover heads, and the plug neatly touched up. The heads of all screws used in any assembly shall be countersunk below the surface.
- E. On Millwork whose face is to receive a transparent finish, all exposed surfaces of wood and/or plywood behind closed doors (i.e., millwork interior) shall be sanded smooth, given one coat of transparent finish, and two coats of clear polyurethane varnish in the mill before shipping to job site. The transparent finish shall match the face finish unless indicated otherwise on drawings and specifications.
- F. On Millwork whose face is to receive an opaque finish, or to be finished with plastic laminate, all exposed surfaces of wood and/or plywood behind closed doors (i.e., millwork interior) shall be sanded smooth and given two coats of semi-gloss paint in the mill before shipping to job site. The color of the paint shall match the opaque face finish or plastic laminate face finish unless indicated otherwise on drawings or specifications.
- G. All items where paint is required shall be shop spray finished except where impractical or otherwise specified.
- H. Backsides of all Millwork cabinets, counters and shelving concealed by the building shall be given a prime coat of paint, color to closely approximate the value and hue of the face finish.
- I. All shelving shall be adjustable unless indicated otherwise on drawings and specifications.
- J. Plastic Laminate edges shall be square, self- edged, or postformed as indicated on drawings. Metal trim is not acceptable. Edges shall be neatly beveled; joints shall be minimized in quantity and be made to a smooth hairline and puttied. Appearance of unsightly or excessive joints will be cause for rejection.

### 3.3 INSTALLATION

- A. Install all Millwork straight, plumb, level and in true alignment except where otherwise indicated. Fit all joints closely and fasten all pieces rigidly in place. Nails shall be finish or casing nails. Countersink nail heads and leave ready for putty. Joints shall be neatly matched and mitered. Fill exposed joints prior to jointing.
  - 1. Finished size shall be as indicated on the drawings.
  - 2. Surfaces shall be left free from hammer marks, free from warp, twist, open joints or other defects and shall be cleaned, scraped and sanded ready for finishing.



3. Lengths of all running trim shall be as long as practical.
  4. Shim as required using concealed shims.
- B. Cut Millwork to fit unless specified to be shop- fabricated or shop-cut to exact size. Where Millwork abuts other finished work, scribe and cut for accurate fit. Before making cutouts, drill pilot holes at corners.
  - C. Distribute defects allowed in the quality grade specified to the best overall advantage, when installing job assembled Millwork items.
  - D. Install trim and moldings in single, unjointed lengths for openings and for runs less than maximum length of lumber available. For longer runs, use only one piece less than maximum length available in any straight run. Stagger joints in adjacent members.
  - E. Attach Millwork securely in place with uniform joints providing for thermal and building movements. Attach to substrates by anchoring and fastening as shown, as required by recognized standards, and as follows:
    1. Nailing: Blind nail where possible. Use fine finishing nails where exposed. Set exposed nail heads for filling except for exterior wood which is to receive a natural finish (if any).
    2. Anchoring: Secure millwork to anchors or blocking built-in or directly attached to substrates.
  - F. Where finishes are applied at job site, clean Millwork and fill nail holes in preparation for finishes application. Where Millwork is to receive a transparent finish, use matching wood filler.
  - G. For Fire-Retardant Millwork, handle, store and install in accordance with manufacturer's direction and as required to meet the required classification or rating. Provide special fasteners, adhesives and other accessories as tested and listed for the type of fire-retardant work indicated. Re- coat any and all cut surfaces with a heavy brush coating of the same compound used for wood treatment.
  - H. Fit Millwork to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper support.

### 3.4 CLEANING AND PROTECTION

- A. Clean shop finished Millwork, touch-up finish as required and remove and refinish damaged or soiled areas of finish.
- B. Provide temporary boxing as required and protect installed Millwork from damage by work of other trades until Architect's acceptance of the work. General Contractor to advise Millwork Contractor of procedures and precautions for protection of materials and installed Millwork from damage and of the required temperature/humidity conditions which must be maintained during the remainder of the construction period in areas of Millwork installations.

END OF SECTION 062200

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

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Solid-surfacing-material countertops
3. Solid-surfacing material lavatory countertops with integral sink bowls
4. Solid-surfacing material window sills
5. Closet and utility shelving.
6. Cabinet hardware and accessories.
7. Miscellaneous materials.

#### 1.2 DEFINITIONS

- ##### A.
- Interior plastic-laminate-clad architectural cabinets include wood furring, blocking, shims, and hanging strips for installing casework items unless concealed within other construction before casework installation.

#### 1.3 COORDINATION

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

#### 1.4 ACTION SUBMITTALS

- ##### A.
- Product Data: For each type of product indicated, including cabinet hardware and accessories.

##### B. Sustainable Design Submittals:

1. Environmental Product Declarations (MRc2): Option 1 Environmental Product Declaration (EPD)
  - a. Submit product data or other published information verifying that this product has an EPD. Submit in accordance with Section 018113, LEED Submittals – MRc2 - Environmental Product Declarations.
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
2. Sourcing of Raw Materials (MRc3): Recycled content
  - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).

- b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
  - 3. Sourcing of Raw Materials (MRc3): Wood products
    - a. Forest Stewardship Council (FSC): Provide letter of certification signed by vendor. Indicate compliance with FSC "Principles for Natural Forest Management" and identify certifying organization.
      - 1) Submit copies of invoices identifying cost of each FSC certified product on a line-item basis, vendor's FSC chain-of-custody certificate code, and verification of if the product is "FSC 100%," "FSC Mix Credit," or "FSC Mix XX%"
    - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
  - 4. Low Emitting Materials (EQc2): Composite Wood
    - a. Submit product data or other published information verifying the composite wood has low formaldehyde emissions that meet the California Air Resources Board ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde resins.
    - b. Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.

C. Shop Drawings:

- 1. Include plans, elevations, sections, and attachment details.
- 2. Show large-scale details.
- 3. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.

D. Samples for Selection and Approval by the Architect:

- 1. Provide manufacturer's samples as indicated in the Architectural Finish in minimum sizes of 8 b 10 inches for each color, pattern, and surface finish required.
  - a. Plastic Laminates
  - b. Solid-Surfacing Material

## 1.5 QUALITY ASSURANCE

- A. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior woodwork indicated for construction, finishes, installation, and other requirements.
- B. Installer Qualifications: Licensed participant in AWI's Quality Certification Program.

## 1.6 DELIVERY, STORAGE, AND HANDLING

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

## 1.7 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.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.

## 1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

## PART 2 - PRODUCTS

### 2.1 SUSTAINABLE DESIGN REQUIREMENTS

- A. Environmental Product Declarations (MRc2): Preference should be given to materials/products that meet the requirements for the LEED credit MRc2, Environmental Product Declarations.
- B. Sourcing of Raw Materials (MRc3), Recycled Content: Preference should be given to materials/products that have post- and/or pre-consumer recycled content by weight of total product.

- C. Sourcing of Raw Materials (MRc3), Wood Products: Preference should be given to materials/products that meet the LEED requirements for FSC certified wood.
- D. Low-Emitting Materials (EQc2): Composite Wood
  - 1. Composite wood must be documented to meet the EPA TSCA Title VI or California Air Resources Board (CARB) ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins.

## 2.2 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Products: Comply with the following:
  - 1. Hardboard: AHA A135.4
  - 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
  - 3. Particleboard: ANSI A208.1, Grade M-2 Exterior Glue
    - a. 100% pre-consumer recycled content for particleboard.
  - 4. Softwood Plywood: DOC PS 1, Medium Density Overlay.
  - 5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
- C. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
  - 1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semi exposed edges.
- D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

## 2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Manufacturer's standard units complying with BHMA A156.9, of type, size, style material, and finish.
- B. Pulls: Wire pulls. Solid stainless steel wire pulls, fastened from back with two screws. For sliding doors, provided recessed stainless steel flush pulls. Provide 2 pulls for drawers more than 24 inches wide.
- C. Hinges: Fully concealed (European style) hinges for overlay doors with 110-degree opening. Hinges to be fully adjustable with nickel finish.

- D. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball bearing rollers; and complying with BHMA A156.9. Type B05011 or B05091.
- E. Countertop Support Brackets:
  - 1. Standard Counter Supports (to 25-inches deep): 6063-T6 aluminum, TIG welded, all edges ground and deburred, black power coated finish, for surface-mounting.
    - a. 18-inches x 18-inches Counter Support.
    - b. Basis-of-Design Manufacturer and Product:
      - 1) Manufacturer: Rangine Corp.
      - 2) Product: Rakks Model EH-1818.
  - 2. Lavatory Counter Supports: 6063-T6 aluminum, TIG welded, all edges ground and deburred; black powder coated finish, for surface-mounting.
    - a. 21-1/2 inch horizontal leg x 18-inch vertical leg Counter Support.
    - b. Basis-of-Design Manufacturer and Product:
      - 1) Manufacturer: Rangine Corp.
      - 2) Product: Rakks Model EH-1818LV
        - a) Include face panel mounting hardware.
        - b) Delete privacy screen bracket.
- F. Grommets for Cable Passage through Counters: 1-1/4 inch OD, black insert color, molded-plastic grommets and matching plastic caps with slot for wire passage.
- G. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

## 2.4 MISCELLANEOUS MATERIALS

- A. Adhesives for Bonding Plastic Laminate: Unpigmented contact cement.

## 2.5 FABRICATION, GENERAL

- A. Fabricate cabinets to dimensions, profiles and details indicated. Ease edges to radius indicated for the following.
  - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.

## 2.6 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

- A. Architectural Woodwork Standards Grade: Custom.

- B. Certified Wood: Certify wood products as "FSC Pure" or "FSC Mixed Credit" in accordance with FSC STD-01-001 and FSC STD-40-004.
- C. Type of Construction: Frameless.
- D. Door and Drawer-Front Style: Flush overlay.
- E. Exposed Surfaces:
  - 1. Plastic-Laminate Grade: VGS.
  - 2. Edges: Grade VGS.
  - 3. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
- F. Semiexposed Surfaces:
  - 1. Surfaces Other Than Drawer Bodies: Thermally fused laminate panels.
    - a. Edges of Plastic-Laminate Shelves: PVC edge banding, 3.0 mm thick, matching laminate in color, pattern, and finish.
    - b. Edges of Thermally Fused Laminate Panel Shelves: PVC or polyester edge banding.
    - c. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, ISO 4586-3, grade to match exposed surface.
  - 2. Drawer Sides and Backs: Thermally fused laminate panels with PVC or polyester edge banding.
  - 3. Drawer Bottoms: Thermally fused laminate panels.
- G. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.
- H. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
  - 1. Horizontal Surfaces Other Than Tops: Grade HGL.
  - 2. Postformed Surfaces: Grade HGP.
  - 3. Vertical Surfaces: Grade VGS.
  - 4. Edges: Grade VGS.
- I. Materials for Semi-exposed Surfaces:
  - 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
  - 2. Drawer Sides and Backs: Thermoset decorative panels.
  - 3. Drawer Bottoms: Thermoset decorative panels.
- J. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.
- K. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:



1. As indicated on the Architectural Finish Schedule.

## 2.7 SOLID-SURFACING-MATERIAL COUNTERTOPS

- A. Grade: Custom.
- B. Solid-Surfacing-Material Thickness: 15 mm (1/2 inch).
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:
  1. As indicated on the Architectural Finish Schedule.
- D. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
- E. Install integral sink bowls in countertops in shop.
- F. Drill holes in countertops for plumbing fittings and soap dispensers in shop.

## 2.8 SOLID-SURFACING-MATERIAL WINDOW SILLS

- A. Grade: Custom.
- B. Solid-Surfacing-Material Thickness: 1 inch.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:
  1. As indicated on the Architectural Finish Schedule.
- D. Fabricate in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

## 2.9 CLOSET AND UTILITY SHELVING

- A. Shelf Material: 20-mm (3/4-inch) melamine-faced particleboard with applied-PVC exposed edges.
- B. Color: White

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Before installing architectural cabinets, examine shop-fabricated work for completion and complete work as required, including removal of packing and back-priming.

### 3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 3.2 mm in 2420 mm (1/8 inch in 96 inches).
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- F. 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 3.2 mm in 2420-mm (1/8 inch in 96-inch) sag, bow, or other variation from a straight line.
  - 2. Maintain veneer sequence matching of cabinets with transparent finish.
- G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
  - 1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
  - 2. Install countertops with no more than 3.2 mm in 2420 mm (1/8 inch in 96-inch) sag, bow, or other variation from a straight line.
  - 3. Caulk space between backsplash and wall with sealant suitable for application.
    - a. Caulk Color: Clear.
- H.

### 3.3 ADJUSTING AND CLEANING

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

END OF SECTION 064116

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## SECTION 070150.19 – PREPARATION FOR REROOFING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Partial tear-off of roof areas indicated on Drawings.
2. Re-cover preparation of roof areas indicated on Drawings.
3. Removal of flashings and counterflashings.
4. Temporary roofing.

#### 1.2 DEFINITIONS

- A. Partial Roof Tear-off: Removal of selected components and accessories from existing roofing system.
- B. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preliminary Roofing Conference: Before starting removal Work, conduct conference at Project site.
  1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
  2. Review methods and procedures related to roofing tear-off, including, but not limited to, the following:
    - a. Reroofing preparation, including roofing system manufacturer's written instructions.
    - b. Temporary protection requirements for existing roofing system components that are to remain.
    - c. Existing roof drains and roof drainage during each stage of reroofing, and roof-drain plugging and plug removal.
    - d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
    - e. Existing roof deck conditions requiring Architect notification.
    - f. Existing roof deck removal procedures and Owner notifications.
    - g. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
    - h. Structural loading limitations of roof deck during reroofing.
    - i. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.

- j. HVAC shutdown and sealing of air intakes.
- k. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
- l. Asbestos removal and discovery of asbestos-containing materials.
- m. Governing regulations and requirements for insurance and certificates if applicable.
- n. Existing conditions that may require Architect notification before proceeding.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Temporary Roofing Submittal: Product data and description of temporary roofing system.
- C. Qualification Data: For Installer.
  - 1. Include certificate that Installer is approved by warrantor of existing roofing system.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Approved by warrantor of existing roofing system to work on existing roofing.
- B. Regulatory Requirements:
  - 1. Comply with hauling and disposal regulations of authorities having jurisdiction.

#### 1.6 FIELD CONDITIONS

- A. Existing Roofing System:
  - 1. The existing roof system is membrane roofing over cover board, insulation, and deck board over a metal deck.
- B. Owner will occupy portions of building immediately below reroofing area.
  - 1. Conduct reroofing so Owner's operations are not disrupted.
  - 2. Provide Owner with not less than 72 hours' written notice of activities that may affect Owner's operations.
  - 3. Coordinate work activities daily with Owner so Owner has adequate advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.
  - 4. Before working over any structurally impaired areas of deck, notify Owner to evacuate occupants from below affected area.
    - a. Verify that occupants below work area have been evacuated before proceeding with work over impaired deck area.

- C. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.
- D. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
- E. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.
- F. Limit construction loads on existing roof areas to remain, and existing roof areas scheduled to be reroofed.
- G. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
  - 1. Remove only as much roofing in one day as can be made watertight in the same day.

## PART 2 - PRODUCTS

### 2.1 TEMPORARY PROTECTION MATERIALS

- A. Plywood: DOC PS 1, Grade CD, Exposure 1.

### 2.2 TEMPORARY ROOFING MATERIALS

- A. Design and selection of materials for temporary roofing are Contractor's responsibilities.

### 2.3 INFILL AND REPLACEMENT MATERIALS

- A. Use infill materials matching existing roofing materials unless otherwise indicated.
- B. Fasteners: Stainless steel, and acceptable to new roofing system installation to maintain the warranty.

### 2.4 AUXILIARY REROOFING MATERIALS

- A. General: Use auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of new roofing system.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protection of In-Place Conditions:

1. Protect existing roofing system that is not to be reroofed.
- B. Seal or isolate windows that may be exposed to airborne substances created in removal of existing materials.
- C. Test existing downspouts and/or roof drains to verify that they are not blocked or restricted.
  1. Immediately notify Architect of any blockages or restrictions.
- D. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work.
  1. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.
- E. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- F. Maintain roof drainage in functioning condition to ensure roof drains at end of each workday.
  1. Prevent debris from entering or blocking gutters and downspouts and/or roof drains.
  2. If roof drainage system is temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding.
    - a. Do not permit water to enter into or under existing roofing system components that are to remain.

### 3.2 ROOF TEAR-OFF

- A. Confirm with the Owner each day the extent of roof tear-off proposed for that day and obtain authorization to proceed.
- B. Lower removed roofing materials to ground and onto lower roof levels, using dust-tight chutes or other acceptable means of removing materials from roof areas.
- C. Remove accessories from roofing.
- D. Full Roof Tear-off: Where indicated on Drawings, remove existing roofing and other roofing system components down to the existing roof deck to the extent indicated on the drawings.
  1. Remove base flashings and counter flashings.
  2. Remove flashings at walls, and curbs.
  3. Remove downspouts indicated on Drawings to be removed.
  4. Remove wood blocking, curbs, and nailers as required.

### 3.3 DECK PREPARATION

- A. Inspect roof sheathing after tear-off of roofing system.



- B. If roof sheathing is unsuitable for receiving new roofing immediately notify Architect.
  - 1. Do not proceed with installation until directed by Architect.
- C. Replace roof sheathing as directed by Architect.

### 3.4 INFILL MATERIALS INSTALLATION

- A. Immediately after roof tear-off, and inspection and repair, if needed, of deck, fill in tear-off areas to match existing roofing system construction.
- B. Install new roofing patch over roof infill area.
  - 1. If new roofing is installed the same day tear-off is made, roofing patch is not required.

### 3.5 TEMPORARY ROOFING

- A. Install approved temporary roofing over area to be reroofed.
  - 1. Temporary roofing shall include the high temperature ice and water shield underlayment.
  - 2. The exposure to sunlight shall not exceed that limited by the manufacturer. If exposure does exceed the maximum duration the existing underlayment shall be removed and replaced with new underlayment.

### 3.6 DISPOSAL

- A. Collect demolished materials and place in containers.
  - 1. Promptly dispose of demolished materials.
  - 2. Do not allow demolished materials to accumulate on-site.
  - 3. Storage or sale of demolished items or materials on-site is not permitted.
- B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION 070150.19

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## SECTION 071416 - COLD FLUID-APPLIED WATERPROOFING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Surface preparation.
2. Single-component, cold-applied, liquid waterproofing membrane.
3. Rolled matrix drainage system.

#### 1.2 REFERENCES

- A. ASTM C1250 – Standard Test Method for Nonvolatile Content of Cold Liquid-Applied Elastomeric Waterproofing Membranes.
- B. ASTM C836 - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
- C. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
- D. ASTM D2240 - Standard Test Method for Rubber Property—Durometer Hardness.
- E. ASTM D2369 - Standard Test Method for Volatile Content of Coatings.
- F. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

#### 1.3 PRECONSTRUCTION MEETING

- A. Preinstallation Conference: Conduct conference at Project site with Owner and Architect prior to commencing work of this section.
1. Review waterproofing requirements including, but not limited to, the following:
    - a. Surface preparation specified in other Sections.
    - b. Minimum curing period.
    - c. Forecasted weather conditions.
    - d. Special details and sheet flashings.
    - e. Repairs.

#### 1.4 ACTION SUBMITTALS

- A. Manufacturer's Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Qualification Data: For Installer.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Use an experienced installer and adequate number of skilled personnel who are thoroughly trained and experienced in the application of fluid applied waterproofing membranes.

B. Obtain waterproofing materials from a single manufacturer regularly engaged in manufacturing the product.

C. Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOCs).

## 1.6 MOCK-UPS

A. Mock-ups: Build mock-ups to verify materials and to set quality standards for installation.

1. Prior to installation of waterproofing system, apply all components and waterproofing membrane to 100 sq.ft. of wall to demonstrate surface preparation, crack and joint treatment, corner treatment, thickness, and to demonstrate tie-ins with adjoining construction, and other termination conditions, as well as qualities of materials and execution.
2. Coordinate with the manufacturer's inspection and testing agency. Do not cover any installed waterproofing membrane unless it has been inspected, tested, and approved.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.7 ENVIRONMENTAL REQUIREMENTS

A. Product not intended for uses subject to abuse or permanent exposure to the elements.

B. Do not apply membrane when air, material, or surface temperatures are expected to fall below 30 degrees F (-1 degrees C) within four hours of completed application.

C. Do not apply membrane if rainfall is forecast or imminent within 12 hours.

D. Do not apply waterproofing membrane to any surfaces containing frost.

- E. Consult manufacturer for applications to green concrete.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store materials in a clean, dry area in accordance with manufacturer's instructions.
- C. Store at temperatures between 40 degrees to 70 degrees F (4 degrees to 21 degrees C).
- D. Protect materials during handling and application to prevent damage or contamination.

## 1.9 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace waterproofing that fails in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Manufacturer's standard warranty from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. Source limitations for waterproofing membrane and drainage board: Obtain waterproofing materials and sheet drainage from single source from single manufacturer.

### 2.2 MANUFACTURER

- A. Basis-of-Design: W.R. MEADOWS®, INC.
  - 1. PO Box 338, Hampshire, Illinois 60140-0338.
  - 2. (800) 342-5976. (847) 683-4500. Fax (847) 683-4544.
  - 3. Website: [www.wrmeadows.com](http://www.wrmeadows.com).

### 2.3 SINGLE-COMPONENT COLD-APPLIED WATERPROOFING

- A. Waterproofing Membrane: Single-component, cold-applied, solvent-free, non-shrink, liquid waterproofing membrane.
  - 1. Performance Based Spec: Waterproofing membrane shall have the following properties as determined by laboratory testing:
    - a. Solids content by weight, ASTM C1250: 98%.
    - b. Tensile Strength, ASTM D412: 100 psi.
    - c. Elongation at break, ASTM D412: 425%.

- d. Water Vapor Transmission, ASTM E96 (Method BW): 0.1 perms.
  - e. Shore 00 Hardness, ASTM D2240: 57.
  - f. VOC, ASTM D2369: 36 g/L.
2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
- a. W.R. MEADOWS, INC. HYDRALASTIC 836 Waterproofing Membrane.

## 2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials recommended in writing by waterproofing manufacturer for intended use and compatible with one another and with waterproofing.
  - 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Primer: Manufacturer's epoxy primer.
- C. Joint Tape: 6" wide reinforcing fabric for corners, crack, and joint treatment: Manufacturer's recommended fabric.
- D. Membrane-Reinforcing Fabric for High Build Applications: Manufacturer's recommended fiberglass mesh or polyester fabric, manufacturer's standard weight.
- E. Reinforced Joint Tape for outside corners subject to backfill: Manufacturer's recommended fiberglass mesh or polyester fabric.
- F. Concrete Repair Materials: Manufacturer's recommended repair mortars.

## 2.5 DRAINAGE BOARD

- A. Nonwoven-Geotextile-Faced, Rolled Matrix Drainage System: Composite subsurface drainage sheet consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side of the core and a polymeric film bonded to the other side; and with a vertical flow rate of 17 gpm per ft.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. W.R. MEADOWS, INC. MEL-DRAIN 5035.
- B. Accessories
  - 1. Pointing Mastic: Manufacturer's recommended pointing mastic.

## 2.6 FOAM CRACK INJECTION

- A. Hydrophobic polyurethane: A two-part hydrophobic polyurethane (mixed 50%/50%) filler injected into concrete cracks and joints to form a tough, flexible closed-cell polyurethane foam that is resistant to most organic solvents, mild acids, alkali, petroleum and micro-organisms.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. GRACE Construction Products, DE NEEF Flex LV PRe (50%) and CUT PRe (50%), and catalyst as recommended by the manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
  - 1. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, acid residues, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, and other projections, and fill honeycomb, aggregate pockets, holes, and other voids.

### 3.3 TREATMENT OF EXISTING CRACKS AND NON-STRUCTURAL JOINTS

- A. Prepare, treat, rout, and fill joints and cracks in exterior substrate according to waterproofing manufacturer's written instructions and to recommendations in ASTM C 1471. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.
  - 1. Identify and install detailing membrane in all cracks and all non-structural joints.
  - 2. Apply a 30 wet mil coat of the fluid applied membrane ensuring that there is a minimum of 3" (75 mm) of membrane extending onto the wall in all directions.

3. Embed the non-woven reinforcing fabric over the entire area of this membrane and work in using trowel.
4. Completely cover the glass mesh with a second coat of the fluid applied membrane at 30 wet mils while the first coat is still wet, again extending 3" onto the wall in all directions.

### 3.4 PREPARATION AT TERMINATIONS, PENETRATIONS, AND CORNERS

- A. Prepare surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, sleeves, and corners according to waterproofing manufacturer's written instructions and to recommendations in ASTM C 1471.
  1. Install detailing membrane to create a minimum 3/4" (25.4 mm) fillet in all inside corners.
  2. Apply a 30 wet mil coat of the fluid applied membrane ensuring that there is a minimum of 3" (75 mm) of membrane extending onto the wall in all directions.
  3. Embed the non-woven reinforcing fabric over the entire area of this membrane and work in using trowel.
  4. Completely cover the glass mesh with a second coat of fluid applied membrane at 30 wet mils while the first coat is still wet, again extending 3" (75 mm) onto the wall in all directions.
  5. On outside corners subject to backfilling, install reinforced joint tape in lieu of fabric joint tape following the same procedure.

### 3.5 TREATMENT OF FOUNDATION WALL JOINT

- A. Clean and prepare the joint at the top of the concrete foundation wall.
  1. Identify extent of voids to be filled.
  2. Drill holes at a maximum of 24-inch intervals to ensure filling entire extent of joint.
  3. Mix polyurethane foam and catalyst according to manufacturer's written instructions.
  4. Inject the foam until it stops penetrating, forming a dense, closed cell foam.

### 3.6 PRIMING

- A. Apply the low viscosity epoxy with a nap roller or squeegee at a coverage rate of 150 - 200 ft.<sup>2</sup> per gallon (3.75 - 5.0 m<sup>2</sup>/L) providing a uniform coverage over the substrate.
- B. Allow the epoxy primer to become tack-free prior to the application of the fluid applied waterproofing membrane.

### 3.7 WATERPROOFING APPLICATION

- A. Install waterproofing system in presence of manufacturer's technical representative, and after mockup has been approved.
- B. Apply primer over prepared substrate unless otherwise instructed in writing by waterproofing manufacturer.



C. Apply waterproofing according to manufacturer's written instructions and to recommendations in ASTM C 1471.

1. Gently mix membrane prior to application.
2. Apply membrane by trowel, flat-blade squeegee, or roller, at a minimum coverage rate of 25 ft.<sup>2</sup>/U.S. gal (2.3 m<sup>2</sup>/3.78 L), providing a thickness of 60 wet mils.
3. Two-coat application is required - apply second coat as soon as possible with no more than eight hours between coats providing a minimum total thickness of 120 wet mils. Fully embed the reinforcing fabric into the first coat of material.
4. Frequently inspect surface area to ensure proper adhesion and consistent thickness is achieved.
5. Work material into any fluted rib forming indentations.
6. Provide minimum cured membrane thickness of 120 mils dry.

D. Cure waterproofing, taking care to prevent contamination and damage during application and curing.

E. Install protection course with butted joints over waterproofing before starting subsequent construction operations.

1. For vertical applications, set protection course in nominally cured membrane, which will act as an adhesive. If membrane cures before application of protection course, use adhesive.

### 3.8 ROLLED MATRIX DRAINAGE SYSTEM INSTALLATION

A. Vertical Application:

1. Unroll drainage board with flat, core side against the insulation board.
2. Adhere drainage board with mastic, compatible with this installation.

### 3.9 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components and to furnish daily reports to Architect.
- B. If test results or inspections show waterproofing does not comply with requirements, remove, and replace or repair the waterproofing as recommended in writing by manufacturer, and make further repairs after retesting and inspecting until waterproofing installation passes.
- C. Prepare test and inspection reports.

### 3.10 PROTECTION

- A. Protect waterproofing from damage and wear during remainder of construction period.

- B. Protect installed board insulation from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- C. Backfill immediately after installation of matrix drainage board, using care to avoid damaging drainage layer and to ensure permanent placement of the drainage board.
- D. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
- E. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 071416

## SECTION 072100 - THERMAL INSULATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Extruded polystyrene foam-plastic board insulation.
2. Polyisocyanurate foam-plastic board insulation.
3. Glass-fiber blanket insulation.
4. Mineral-wool blanket insulation.
5. Mineral-wool board insulation.
6. Loose-fill insulation.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data:

1. Extruded polystyrene foam-plastic board insulation.
2. Polyisocyanurate foam-plastic board insulation.
3. Glass-fiber blanket insulation.
4. Mineral-wool blanket insulation.
5. Mineral-wool board insulation.
6. Loose-fill insulation.

##### B. Sustainable Design Submittals:

1. Whole Building Life-Cycle Assessment (WBLCA) (MRc1):
  - a. Submit product data or other published information verifying that this product has a Product-Specific Type III EPD or an industry-wide EPD. Submit in accordance with Section 018113, 1.7 Action Submittals – MRc1 Option 2 – Whole Building Life-Cycle Assessment (WBLCA).
  - b. Include an updated Environmental Impact Calculator with submittal, which includes the estimated declared unit material quantity.
2. Environmental Product Declarations (MRc2): Option 1 Environmental Product Declaration (EPD)
  - a. Submit product data or other published information verifying that this product has an EPD. Submit in accordance with Section 018113, LEED Submittals – MRc2 - Environmental Product Declarations.
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
3. Sourcing of Raw Materials (MRc3): Recycled content
  - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight.

- b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
- 4. Material Ingredients (MRc4): Option 1 Material Ingredient Reporting
  - a. Submit product data or other published information verifying product uses any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm): Manufacturer inventory of all ingredients or Health Product Declaration, Declare, Living Product Challenge, Cradle to Cradle v2 Basic or v3 Bronze, Product Lens Certification, Facts - NSF/ANSI 336, ANSI/BIFMA e3 Furniture Sustainability Standard; or other USGBC approved program, if applicable.
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
- 5. Low Emitting Materials (EQc2): Thermal and acoustic insulation
  - a. Submit product data or other published information verifying compliance with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Manufacturer's claims of compliance must also state the range of total VOCs after 14 days.
  - b. Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.
- 6. Procurement of Low Carbon Construction Materials (MRpc132):
  - a. Submit product data or other published information verifying that this product has a Product-Specific Type III EPD or an industry-wide EPD. Submit in accordance with Section 018113, 1.7 Action Submittals – MRpc132: Procurement of Low Carbon Construction Materials.
  - b. Include an updated Environmental Impact Calculator with submittal, which includes the following:
    - 1) Estimated declared unit material quantity.
    - 2) Required baseline or project threshold as indicated in applicable Section.
    - 3) Realized carbon emissions (declared unit quantity x kgCO<sub>2</sub>e/declared unit)
    - 4) Verification that product GWP does not exceed the project GWP threshold as stated in the applicable specification Section.

### 1.3 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
  - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
  - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

## PART 2 - PRODUCTS

### 2.1 SUSTAINABLE DESIGN REQUIREMENTS

- A. Whole Building Life-Cycle Assessment (WBLCA) (MRc1): Preference should be given to materials/products that have a Product-Specific Type III Environmental Product Declaration (EPD).
- B. Environmental Product Declarations (MRc2): Preference should be given to materials/products that meet the requirements for the LEED credit MRc2, Environmental Product Declarations.
- C. Sourcing of Raw Materials (MRc3), Recycled Content: Preference should be given to materials/products that have post- and/or pre-consumer recycled content.
- D. Material Ingredients (MRc4): Preference should be given to materials/products that meet the LEED requirements for MRc4, Material Ingredient Reporting.
- E. Low-Emitting Materials (EQc2): Thermal and acoustic insulation
  - 1. Thermal and acoustic insulation installed within the weather proofing system in this section must comply with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Refer to Sustainable Design Requirements Section 018113 for specific VOC requirements.
- F. Procurement of Low Carbon Construction Materials (MRpc132):
  - 1. Preference should be given to materials/products that have a Product-Specific Type III Environmental Product Declaration (EPD).
  - 2. Preference should be given to products that have a reported Global Warming Potential (GWP) equal or lower than the following listed values:
    - a. PIR: 10.68 kgCO<sub>2</sub>e/m<sup>2</sup>-Rsi.
    - b. XPS: 29.4 kgCO<sub>2</sub>e/m<sup>2</sup>-Rsi.
    - c. Rockwool: 9.71 kgCO<sub>2</sub>e/m<sup>2</sup>-Rsi.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes less than 75 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 and wider in width.

- E. Thermal-Resistance Value (R-Value): R-value as indicated below in accordance with ASTM C518. R-Value of overhead to be a minimum of R-XXX.

1. R-Value at Extruded Polystyrene: R: 5 per inch.
2. R-value of insulation

## 2.3 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

- A. Extruded Polystyrene Board Insulation, Type IV: ASTM C578, Type IV, 25-psi minimum compressive strength; unfaced.
1. Type IV insulation to be used at above grade installations.
  2. Minimum of 8% pre-consumer recycled content.
  3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. DiversiFoam Products.
    - b. DuPont de Nemours, Inc.
    - c. Kingspan Insulation LLC.
- B. Extruded Polystyrene Board Insulation, Type VI: ASTM C578, Type VI, 40-psi minimum compressive strength.
1. Type VI insulation to be used at below grade installations.
  2. Minimum of 8% pre-consumer recycled content
  3. Manufacturers: Subject to compliance with requirements, provide products by one of the following
    - a. DiversiFoam Products.
    - b. DuPont de Nemours, Inc.
    - c. Kingspan Insulation LLC.

## 2.4 POLYISOCYANURATE FOAM-PLASTIC BOARD INSULATION

- A. Minimum of 8% pre-consumer recycled content.
- B. Polyisocyanurate Board Insulation, Glass-Fiber-Mat Faced: ASTM C1289, glass-fiber-mat faced, Type II, Class 2.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Atlas Polyiso Roof and Wall Insulation.
    - b. Carlisle Coatings & Waterproofing Inc.
    - c. Elevate; Holcim Building Envelope.
    - d. Johns Manville; a Berkshire Hathaway company.

## 2.5 GLASS-FIBER BLANKET INSULATION

- A. Minimum of 30% post-consumer recycled content.

- B. Glass-Fiber Blanket Insulation, Unfaced: ASTM C665, Type I; passing ASTM E136 for combustion characteristics.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. CertainTeed; SAINT-GOBAIN.
    - b. Johns Manville; a Berkshire Hathaway company.
    - c. Knauf Insulation.

## 2.6 MINERAL-WOOL BLANKET INSULATION

- A. Minimum of 80% pre-consumer recycled content for cotton batt.
- B. Mineral-Wool Blanket Insulation, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; passing ASTM E136 for combustion characteristics.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Johns Manville; a Berkshire Hathaway company.

## 2.7 MINERAL-WOOL BOARD INSULATION

- A. Minimum of 8% pre-consumer recycled content.
- B. Mineral-Wool Board Insulation, Types IA and IB, Unfaced: ASTM C612, Types IA and IB; passing ASTM E136 for combustion characteristics.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Johns Manville; a Berkshire Hathaway company.
  - 2. Nominal Density: 3 lb/cu. ft.
- C. Mineral-Wool Board Insulation, Type II, Unfaced: ASTM C612, Type II; passing ASTM E136 for combustion characteristics.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Johns Manville; a Berkshire Hathaway company.
  - 2. Nominal Density: 4 lb/cu. ft.
- D. Mineral-Wool Board Insulation, Type III, Unfaced: ASTM C612, Type III; passing ASTM E136 for combustion characteristics.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Johns Manville; a Berkshire Hathaway company.
  - 2. Nominal Density: 4 lb/cu. ft.
- E. Mineral-Wool Board Insulation, Type IVA: ASTM C612, Type IVA; unfaced.

1. Nominal Density: 4 lb/cu. ft.
- F. Mineral-Wool Board Insulation, Type IVB: ASTM C612, Type IVB; unfaced.
1. Nominal Density: 4.3 lb/cu. ft.

## 2.8 LOOSE-FILL INSULATION

- A. Minimum 75% post-consumer recycled content for blown cellulose.
- B. Glass-Fiber Loose-Fill Insulation: ASTM C764, Type I for pneumatic application.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
    - a. CertainTeed; SAINT-GOBAIN.
    - b. Johns Manville; a Berkshire Hathaway company.
    - c. Knauf Insulation.

## 2.9 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. AGM Industries, Inc.
    - b. Gemco.
  2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.

## 2.10 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
1. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.
- 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.



## PART 3 - EXECUTION

### 3.1 PREPARATION

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

### 3.2 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.

### 3.3 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 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 48 inches in from exterior walls.

### 3.4 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 as follows:
  - 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions.
  - 2. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.

3. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
  4. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
  5. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
- C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

### 3.5 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches 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."
- B. Mineral-Wool Board Insulation: Install insulation fasteners 4 inches from each corner of board insulation, at center of board, and as recommended by manufacturer.
1. Fit courses of insulation between masonry wall ties and other obstructions, with edges butted tightly in both directions, and with faces flush.
  2. Press units firmly against inside substrates.

### 3.6 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. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
  4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
  5. For wood-framed construction, install blankets in accordance with 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.

6. 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 as indicated on Drawings.
  - b. Interior Walls: Set units with facing placed as indicated on Drawings.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
  1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

### 3.7 INSTALLATION OF CURTAIN-WALL INSULATION

- A. Install board insulation in curtain-wall construction according to curtain-wall manufacturer's written instructions.
  1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass.
  2. Maintain cavity width of dimension indicated on Drawings between insulation and glass.
  3. Install insulation to fit snugly without bowing.

### 3.8 INSTALLATION OF REFLECTIVE INSULATION

- A. Install sheet reflective insulation in accordance with ASTM C727.
- B. Install sheet radiant barriers in accordance with ASTM C1744.
- C. Install interior radiation control coating system in accordance with ASTM C1321.

### 3.9 PROTECTION

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

END OF SECTION 072100

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## SECTION 072119 - FOAMED-IN-PLACE INSULATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Closed-cell spray polyurethane foam insulation.
2. Accessories.

#### 1.2 ACTION SUBMITTALS

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

1. Closed-cell spray polyurethane foam.

##### B. Sustainable Design Submittals:

1. Whole Building Life-Cycle Assessment (WBLCA) (MRc1):
  - a. Submit product data or other published information verifying that this product has a Product-Specific Type III EPD or an industry-wide EPD. Submit in accordance with Section 018113, 1.7 Action Submittals – MRc1 Option 2 – Whole Building Life-Cycle Assessment (WBLCA).
  - b. Include an updated Environmental Impact Calculator with submittal, which includes the estimated declared unit material quantity.
2. Environmental Product Declarations (MRc2): Option 1 Environmental Product Declaration (EPD)
  - a. Submit product data or other published information verifying that this product has an EPD. Submit in accordance with Section 018113, LEED Submittals – MRc2 - Environmental Product Declarations.
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
3. Material Ingredients (MRc4): Option 1 Material Ingredient Reporting
  - a. a. Submit product data or other published information verifying product uses any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm): Manufacturer inventory of all ingredients or Health Product Declaration, Declare, Living Product Challenge, Cradle to Cradle v2 Basic or v3 Bronze, Product Lens Certification, Facts - NSF/ANSI 336, ANSI/BIFMA e3 Furniture Sustainability Standard; or other USGBC approved program, if applicable.
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
4. Low Emitting Materials (EQc2): Thermal and acoustic insulation
  - a. Submit product data or other published information verifying compliance with the California Department of Public Health (CDPH) Standard Method v1.2-2017,

- using the applicable exposure scenario. Manufacturer's claims of compliance must also state the range of total VOCs after 14 days.
  - b. Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.
- 5. Procurement of Low Carbon Construction Materials (MRpc132):
  - a. Submit product data or other published information verifying that this product has a Product-Specific Type III EPD or an industry-wide EPD. Submit in accordance with Section 018113.
  - b. Include an updated Environmental Impact Calculator with submittal, which includes the following:
    - 1) Estimated declared unit material quantity.
    - 2) Required baseline or project threshold as indicated in applicable Section.
    - 3) Realized carbon emissions (declared unit quantity x kgCO<sub>2</sub>e/declared unit)
    - 4) Verification that product GWP does not exceed the project GWP threshold as stated in the applicable specification Section.

### 1.3 INFORMATIONAL SUBMITTALS

#### A. Test and Evaluation Reports:

- 1. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- 2. Research Reports: For spray-applied polyurethane foam-plastic insulation, from an agency acceptable to authorities having jurisdiction or ICC-ES showing compliance with specified surface-burning characteristics and NFPA 276.

#### B. Field Quality-Control Submittals:

- 1. Field quality-control reports.

#### C. Qualification Statements: For Installer.

### 1.4 QUALITY ASSURANCE

#### A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

## PART 2 - PRODUCTS

### 2.1 SUSTAINABLE DESIGN REQUIREMENTS

- A. Whole Building Life-Cycle Assessment (WBLCA) (MRc1): Preference should be given to materials/products that have a Product-Specific Type III Environmental Product Declaration (EPD).
- B. Environmental Product Declarations (MRc2): Preference should be given to materials/products that meet the requirements for the LEED credit MRc2, Environmental Product Declarations.

- C. Material Ingredients (MRc4): Preference should be given to materials/products that meet the LEED requirements for MRc4, Material Ingredient Reporting.
- D. Low-Emitting Materials (EQc2): Thermal and acoustic insulation
  - 1. Thermal and acoustic insulation installed within the weather proofing system in this section must comply with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Refer to Sustainable Design Requirements Section 018113 for specific VOC requirements.
- E. Procurement of Low Carbon Construction Materials (MRpc132):
  - 1. Preference should be given to materials/products that have a Product-Specific Type III Environmental Product Declaration (EPD).
  - 2. Preference should be given to products that have a reported Global Warming Potential (GWP) equal or lower than the following listed values:
    - a. Foamed-in-place: 20 kgCO<sub>2</sub>e/m<sup>2</sup>-Rsi.

## 2.2 CLOSED-CELL SPRAY POLYURETHANE FOAM

- A. Closed-Cell Spray Polyurethane Foam: ASTM C1029, Type II, minimum density of 2 lb/cu. ft. (32 kg/cu. m) and minimum aged R-value at 1-inch (25.4-mm) thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F (25 mm of 43 K x sq. m/W at 24 deg C).
  - 1. Manufacturers: Subject to compliance with requirements provide one of the following products or equivalent approved by Architect:
    - a. Carlisle Spray Foam Insulation; SealTite PRO HFO.
    - b. Huntsman Building Solutions; Heatlock HFO Pro.
    - c. Johns Manville; JM Corbond IV (Basis of Design)
  - 2. Surface Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - a. Flame-Spread Index: 25 or less.
    - b. Smoke-Developed Index: 450 or less.

## 2.3 ACCESSORIES

- A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrate.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.

- B. Priming: Prime substrates as recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

### 3.2 INSTALLATION

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Spray insulation to envelop entire area to be insulated and fill voids.
- C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.
- D. Miscellaneous Voids: Apply according to manufacturer's written instructions and to voids as indicated on Drawings.
  - 1. Do not cover insulation prior to any required spray foam insulation inspections.

### 3.3 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION 072119



## SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes:
- B. Surface preparation.
- C. Application of liquid-applied, vapor-retarding air barrier.
- D. Application of materials to bridge and seal air leakage pathways in the following conditions:
  - 1. Wall-to-roof connections and penetrations.
  - 2. Wall-to-foundation connections.
  - 3. Windows, curtain walls, storefronts, louvers and door penetrations.
  - 4. Expansion and control joints.
  - 5. Masonry ties.
  - 6. All other penetrations through the wall assembly.

#### 1.2 REFERENCES

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM E96 (Method B) - Standard Test Methods for Water Vapor Transmission of Materials.
- D. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- E. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
- F. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference.
- G. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials.
- H. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
- I. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing.
- J. GA-253-2018 – Application of Gypsum Sheathing.

### 1.3 DEFINITIONS

- A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air, water vapor and moisture.
- B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air, water vapor and moisture movement through the wall.

### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.
- B. Sustainable Design Submittals:
  - 1. Whole Building Life-Cycle Assessment (WBLCA) (MRc1):
    - a. Submit product data or other published information verifying that this product has a Product-Specific Type III EPD or an industry-wide EPD. Submit in accordance with Section 018113, 1.7 Action Submittals – MRc1 Option 2 – Whole Building Life-Cycle Assessment (WBLCA).
    - b. Include an updated Environmental Impact Calculator with submittal, which includes the following:
    - c. Estimated declared unit material quantity.
- C. Shop Drawings: For air-barrier assemblies.
  - 1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
  - 2. Include details of interfaces with other materials that form part of air barrier.
- D. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by the Installer, who work on Project.
- E. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

## 1.6 CLOSEOUT SUBMITTALS

- A. Warranties: Provide material and installation warranties as required in “Warranty” Article of this specification section.

## 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
  - 1. Air Barrier Installer shall be currently accredited under the Air Barrier Association of America and ensure applicators are certified in accordance with the ABAA Quality Assurance Program.
  - 2. Use an experienced installer and adequate number of skilled personnel who are thoroughly trained and experienced in the application of the air barrier.
    - a. Air Barrier Installer performing Work shall be approved by air barrier membrane manufacturer.
- B. Manufacturer: Obtain primary materials from a single manufacturer regularly engaged in manufacturing air and vapor barrier membranes. Obtain secondary materials from a source acceptable to the primary materials manufacturer.

## 1.8 PRECONSTRUCTION MEETINGS

- A. Preconstruction Meeting: Convene a minimum of two weeks prior to commencing Work of this Section. Agenda shall include, at a minimum, construction and testing of mock-up, sequence of construction, coordination with substrate preparation, materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction. Attendance is required by representatives of related trades including covering materials, substrate materials and adjacent materials.
  - 1. Conduct conference at Project site.
- B. Review air-barrier requirements and installation, special details, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

## 1.9 MOCK-UPS

- A. Prior to installation of air barrier, apply air barrier as follows to verify details under shop drawing submittals and to demonstrate tie-ins with adjoining construction, and other termination conditions, as well as qualities of materials and execution.
- B. Apply air barrier in field-constructed mock-ups of each type of assembly and ASTM C1280.
- C. Construct typical exterior wall panel, 8 feet (2.4 m) long by 8 feet (2.4 m) wide, incorporating back-up wall, cladding, window and doorframe and sill, insulation, flashing, building corner condition junction with roof system foundation wall and typical penetrations and gaps; illustrating materials interface and seals.

- D. Test mock-up in accordance with ASTM E783 and ASTM E1105 for air and water infiltration.
- E. Contractor to engage inspection and testing agency to ensure compliance with this specification section is met. Do not cover any installed air barrier membrane unless it has been inspected, tested, and approved.

#### 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.
- B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air and vapor barrier membrane manufacturer. Protect stored materials from direct sunlight.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Handle materials in accordance with manufacturer's recommendations.

#### 1.11 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.
  - 1. Protect substrates from environmental conditions that affect air-barrier performance.
  - 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

#### 1.12 WARRANTY

- A. Material Warranty: Provide manufacturer's standard product warranty, for a minimum 3 years from date of Substantial Completion.
- B. Installation Warranty: Provide installer's 2-year warranty from date of Substantial Completion, including all components of the air and vapor barrier assembly, against failures including loss of air tight seal, loss of watertight seal, loss of adhesion, loss of cohesion, failure to cure properly.

### PART 2 - PRODUCTS

#### 2.1 SUSTAINABLE DESIGN REQUIREMENTS

- A. Whole Building Life-Cycle Assessment (WBLCA) (MRc1):
  - 1. Preference should be given to materials/products that have a Product-Specific Type III Environmental Product Declaration (EPD).

## 2.2 MANUFACTURERS

- A. Manufacturers and Products: Subject to compliance with requirements, provide one of the following or equivalent:
1. W.R. Meadows; Air-Shield LSR (Basis-of-Design)
  2. Carlisle; Fire Resist Baritech NP, NP60, NP-LT
  3. GCP Applied Technologies; PERM-A-BARRIER NPL 10/NPL 10 LT
  4. Tremco; EXOAIR 130

## 2.3 MATERIALS, GENERAL

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

## 2.4 MATERIALS

- A. Liquid-Applied, Vapor-Retarding Air Barrier System: Single-component, liquid synthetic rubber, asphalt-free and vapor-retarding air barrier membrane with the following physical properties:
1. Color: Sprays pink and dries to desert tan.
  2. Minimum Application Temperature: 20 degrees F (-6.7 degrees C).
  3. Air Permeability, ASTM E2178: <0.004 cfm / ft2 @ 75 Pa (1.57 lbs. / ft2).
  4. Air Barrier Assembly, ASTM E2357: <0.04 cfm / ft2 @ 75 Pa (1.57 lbs. / ft2).
  5. Water Vapor Permeance, ASTM E96 (Method B): ≤ 0.1 perms.
  6. Elongation, ASTM D412: 700 %.
  7. Tensile Strength, ASTM D412: 250 psi.
  8. Nail Sealability, ASTM D1970: Pass.
  9. Maximum Service Temperature: 175 degrees F (80 degrees C).
  10. Flexibility at -15 degrees F (-26 degrees C) ASTM C836 2-inch mandrel: Pass.
  11. Flame Spread and Smoke Development, ASTM E84: Class A.
  12. Flame Propagation Testing, NFPA 285: Complies with various assemblies.
  13. VOC Content: 138 g/L.
- B. Basis of Design Product: AIR-SHIELD LSR by W. R. MEADOWS.

## 2.5 ACCESSORIES

- A. Transition Membrane and Flashing: 40-mil self-adhesive polymeric membrane for reinforcement of joints, inside and outside corners and dissimilar material connections.
1. Basis of Design: AIR-SHIELD by W. R. MEADOWS.
- B. Through-Wall Flashing: 40-mil self-adhesive polymeric sheet membrane.
1. Basis of Design: AIR-SHIELD THRU-WALL FLASHING by W. R. MEADOWS.

- C. Liquid Flashing: Fluid-applied, single-component, flashing membrane reinforcement of joints, inside and outside corners and dissimilar material connections.
  - 1. Basis of Design: AIR-SHIELD LIQUID FLASHING by W. R. MEADOWS.
- D. Alternate Flashing: 40-mil self-adhesive polymeric sheet flashing membrane with aluminum facer for use at door and window openings.
  - 1. Basis of Design: AIR-SHIELD ALUMINUM FLASHING.
- E. Joint Reinforcing Fabric: Spun-bonded polyester fabric for reinforcement of flat joints and corner conditions with primary fluid-applied membrane.
  - 1. Basis of Design: REINFORCING FABRIC HCR by W. R. MEADOWS.
- F. Membrane Adhesive/Primer:
  - 1. Temperatures above 40 F degrees F (4 degrees C): Water-Based Adhesive.
    - a. Basis of Design: MEL-PRIME™ W/B Water-Based Adhesive by W. R. MEADOWS.
  - 2. Temperatures below 30 degrees F (-1 degrees C): Solvent-Based Primer.
    - a. Basis of Design: MEL-PRIME VOC-Compliant Solvent-Base Adhesive or Standard Solvent-Base Adhesive by W. R. MEADOWS.
- G. Pointing Mastic: mastic for sealing penetrations and terminations of membrane.
  - 1. Basis of Design: POINTING MASTIC by W. R. MEADOWS.
- H. Termination Sealant: non-slump waterproofing material for joint detailing.
  - 1. Basis of Design: BEM by W. R. MEADOWS.
- I. Concrete Repair Materials: general purpose patching materials.
  - 1. Basis of Design: MEADOW-PATCH™ 5 and MEADOW-PATCH 20 Concrete Repair Mortars by W. R. MEADOWS.
- J. Termination Bar: optional termination for through-wall flashing membrane.
  - 1. Basis of Design: TERMINATION BAR by W. R. MEADOWS.

### PART 3 - EXECUTION

- A. Examine surfaces to receive membrane are deemed appropriate in accordance with air barrier manufacturer's current technical literature.

- B. Notify Contractor if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.
- C. Start of the Work shall construe installer acceptance of substrates and conditions.

### 3.2 SURFACE PREPARATION

- A. Protect adjacent surfaces not designated to receive air barrier.
- B. Clean and prepare surfaces to receive air barrier membrane in accordance with manufacturer's instructions.
- C. Ensure all areas to receive joint treatment, reinforcement and membrane application are clean, dry, smooth, and free from all bond-breaking contaminants. Remove and replace any damaged structural substrate components.
- D. Do not apply membrane system to surfaces unacceptable to manufacturer.
- E. All surfaces to receive fluid-applied membrane air barrier system must be clean, free of standing water, ice, snow, frost, dust, dirt, oil, curing compounds, or any other foreign material detrimental to proper adhesion of the membrane.
- F. Prefill all bug holes on concrete and masonry with appropriate cementitious patching mortar. Strike masonry joints flush.
- G. Patch all cracks, small voids, offsets, irregularities, and small deformities on concrete and masonry surfaces with appropriate cementitious patching mortar at least two hours before application. Eliminate all sharp protrusions and fins in cast-in-place concrete.

### 3.3 INSTALLATION

- A. Prime surfaces to receive self-adhering membranes within one working day with applicable primer. Areas not covered within one day shall be re-primed. Ensure primer extends a minimum of 1-inch (25.4 mm) beyond area to receive self-adhering membranes.
- B. Crack and Joint Treatment of Masonry:
  - 1. Prefill nonmoving 1/16 inch to 1/4-inch (1.6 mm – 3.2 mm) cracks and joints with termination sealant, mastic or liquid flashing and tool smooth, ensuring 1-inch coverage to both sides.
  - 2. Prefill nonmoving 1/4 inch to 1-inch (6.4 mm – 25.4 mm) cracks and joints with termination sealant, mastic or liquid flashing and allow to cure. Apply and tool smooth liquid flashing 3-inches (76.2 mm) band beyond both sides of the joint area. Alternatively, apply a 4-inch-wide (101.6 mm) section of self-adhered transition membrane, centered over joint.
- C. Dissimilar Material Connections:
  - 1. Connect joints between dissimilar building materials with a 6-inch-wide (152.4 mm) section of self-adhering transition membrane, centered over the dissimilar material joint.

2. Alternatively, apply an 8-inch-wide (203.2 mm) band of liquid flashing, centered over the joint between material joint.

D. Exterior Sheathing Panels:

1. Install and fasten exterior wood sheathing panels according to the sheathing manufacturer's instructions. Install and fasten exterior gypsum panels in accordance with manufacturer's instructions and ASTM C1280.
2. Cover all fastener heads and removed fastener holes with termination sealant, mastic or liquid flashing.
3. Joint Treatment with Termination Sealant:
4. Prefill flat joints up to ¼ inch (6.4 mm) with termination sealant and strike flush with both sides of the exterior sheathing panels.
5. Allow sealant to cure for a minimum of 24 hours prior to proceeding with full application of air barrier membrane.
6. Joint Treatment with Liquid Flashing
  - a. Prefill flat joints up to ¼ inch (6.4 mm) with liquid flashing and strike flush with both sides of the exterior sheathing panels.
  - b. Prefill joints greater than ¼ inch (6.4 mm) but not greater than ½ inch (12.8 mm) with liquid flashing and allow to become firm. Apply liquid flashing extending 3-inches (76.2 mm) from the center of the joint onto both sides of the exterior sheathing panels.
  - c. Run the spreader tool over the liquid flashing to remove inconsistencies.
7. Joint Treatment with Self-Adhesive Membrane
  - a. Prime both sides of the joint extending 3 inch (76.2 mm) from the center with the required primer/adhesive.
  - b. Apply a 4-inch (25.4 mm) wide strip of self-adhesive membrane centered over the joint and roll press firmly into place.
  - c. Fill all joints wider than ¼ inch (6.4 mm) with termination sealant prior to application of self-adhesive membrane.
  - d. Joint Treatment with Fluid-Applied Membrane
  - e. Fill joint area with fluid applied membrane using a spreader tool or putty knife.
  - f. Apply fluid applied membrane extending beyond the joint line 3-inch (76.2 mm) onto face of exterior sheathing.
  - g. Fully embed the reinforcing fabric 3-inch (76.2 mm) wide into the wet fluid applied membrane centered over the joint.
  - h. Run the spreader tool or putty knife over the embedded reinforcing fabric to remove any air bubbles.

E. Inside and Outside Corners:

1. Apply a 6-inch-wide (152.4 mm) section of self-adhering transition membrane flashing or liquid flashing onto properly prepared substrates at the center of inside and outside corners. Ensure a 2-inch (50.8 mm) overlap of successive sections.
2. Roll all areas of membrane with roller ensuring full adhesion. Eliminate all wrinkles and fish-mouths.
3. Alternatively, apply liquid flashing at the center of inside and outside corners, ensuring a minimum 3-inch (76.2 mm) lap onto each adjacent plane.



F. Through-Wall Flashing:

1. Apply self-adhering through-wall flashing a minimum 8 inches (203.2 mm) onto properly primed backup wall substrates. Ensure through-wall flashing is recessed ½-inch (12.7 mm) from exterior face of masonry cladding.
2. Overlap successive sections of through-wall flashing 4 inches (101.6 mm) and apply termination sealant or mastic to each lap. Seal overlapped seams with mastic.
3. Roll all areas of through-wall flashing to ensure full adhesion.
4. Apply a bead of termination sealant or mastic onto horizontal leading edges and tool smooth to permit water shedding.

G. Primary Fluid-Applied Membrane Air Barrier Installation:

1. Apply air barrier membrane in accordance with manufacturer's instructions.
2. Thoroughly mix membrane prior to application while avoiding air entrapment.
3. Apply membrane by spray or roller to provide a uniform thickness of 75 wet mils.
4. Overlap fluid-applied air barrier 2 inches (50.8 mm) onto the leading edges of transition membranes and flashings.
5. Regularly inspect surface area with a wet mil gauge to ensure consistent thickness.
6. Cured thickness of membrane should be 40 mils dry.
7. Allow 48 hours for full cure of the membrane.

3.4 PROTECTION

- A. Cover air barrier as soon as possible after application, as air barrier is not intended for permanent exposure.

END OF SECTION 072726

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## SECTION 075423 - THERMOPLASTIC-POLYOLEFIN ROOFING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Adhered thermoplastic-polyolefin (TPO) roofing system.
2. Substrate board.
3. Vapor retarder.
4. Roof insulation.
5. Cover board.
6. Protection mat.
7. Splash blocks.
8. Walkways.

#### 1.2 DEFINITIONS

- A. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.
- B. Compatible: Material will not adversely affect adjacent materials, is chemically compatible with adjacent materials, and where required for bond, achieves adhesive compatibility with adjacent materials.
1. Chemical Compatibility: Material will not breakdown, deteriorate, degrade, or prematurely fail when coming in contact with another material. Material will not cause chemical breakdown, deterioration, degradation, staining, or premature failure of another material.
  2. Adhesive Compatibility: Material will develop bond strength or provide suitable surface for another material to develop bond strength complying with requirements when coming in contact with another material.

#### 1.3 COORDINATION

- A. Coordinate materials used at interface with other portions of the Work to ensure compatibility of materials.
- B. Coordinate continuity of weather, air, and vapor barriers at interfaces with other portions of the Work.
- C. Confirm and coordinate compatibility of materials and coordinate warranty requirements for roof edge flashing systems.

## 1.4 PREINSTALLATION MEETINGS

- A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer(s), and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
  2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
  3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
    - a. Structural Decks. Review attachment requirements, curing methods, surface finishing, flatness, levelness, moisture and vapor control, and other requirements.
  5. Review structural loading limitations of roof deck during and after roofing.
  6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
    - a. Review minimum spacing requirements for base flashings at roof penetrations.
  7. Review governing regulations and requirements for insurance and certificates if applicable.
  8. Review temporary protection requirements for roofing system during and after installation.
  9. Review roof observation and repair procedures after roofing installation.
- B. Pre-installation Roofing Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer(s), and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
  2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
  3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and attachment.
  5. Review structural loading limitations of roof deck during and after roofing.
  6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
  7. Review governing regulations and requirements for insurance and certificates if applicable.
  8. Review temporary protection requirements for roofing system during and after installation.
  9. Review roof observation and repair procedures after roofing installation.
  10. Review roof testing and inspection requirements.
  11. Review delivery, storage, handling, and protection procedures.
  12. Review manufacturer's warranty requirements and installation instructions.

13. Review coordination requirements for other portions of the Work, including but not limited to the following:
  - a. Structural Decks. Review attachment requirements, curing methods, surface finishing, flatness, levelness, moisture and vapor control, and other requirements.
  - b. Other Building Exterior Envelope Systems. Review transitions, interfaces, material compatibility, and other requirements.

## 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include project-specific roof plans, sections, details, and attachments to other work, including the following:
  1. Base flashings and membrane termination details.
  2. Flashing details at penetrations.
  3. Flat and tapered insulation layout, thickness, and slopes. Indicate minimum and average R values.
  4. Attachment patterns for corner, perimeter, and field-of-roof locations.
  5. Drain and sump details.
  6. Temporary seal details.
  7. Flexible walkway layouts.
  8. Include coordination with roof-edge flashings.
  9. Include details indicating interface with adjoining air barrier and other exterior envelope systems.
  10. Include details at minimum drawing scale of 6 inch = 1 foot (1:2).
- C. Qualification Data: For Installer.
  1. Include letter from manufacturer certifying that Installer is authorized by manufacturer.
  2. Include list with minimum of 5 successfully completed projects in the last 12 months of similar size and type as this Project.
- D. Sample Warranties: For manufacturer's special warranties.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Manufacturer Certificates:
  1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
    - a. Submit evidence of compliance with performance requirements.
  2. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

- a. Submit FM Approvals “RoofNav” package including ‘Assembly Number’, ‘Scenario’, ‘Contractor Package’, and FM Form 2688 ‘Contractor’s Application for Acceptance of Roof’.
  - 3. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.
  - B. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.
  - C. Evaluation Reports: For components of roofing system, from ICC-ES or another code organization acceptable to authorities having jurisdiction.
  - D. Manufacturer’s installation instructions.
  - E. Field Quality-Control Reports: Test reports and manufacturer’s roof inspection reports.
- 1.7 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For roofing system to include in maintenance manuals.
  - B. Warranties: Special warranties specified in this Section.
- 1.8 QUALITY ASSURANCE
- A. Manufacturer Qualifications: A qualified manufacturer that is listed in FM Approvals' RoofNav for roofing system identical to that used for this Project, and with not less than 10 years history of producing types of products specified for this Project that have been successfully installed on similar projects.
  - B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
- 1.9 DELIVERY, STORAGE, AND HANDLING
- A. Comply with manufacturer’s written instructions for delivery, storage, and handling.
  - B. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
  - C. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
    - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

- D. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
  - 1. Immediately discard wet or damaged insulation.
- E. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

#### 1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
  - 1. Do not install roofing in adverse weather conditions.
  - 2. Do not install more roofing than can be sealed weather-tight at end of each workday.
  - 3. Do not install more roofing than can be sealed weather-tight prior to onset of adverse weather conditions.

#### 1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
  - 1. Special warranty includes roof membrane, base flashings, roof insulation, adhesives, fasteners, cover boards, vapor retarder, substrate board, roofing accessories, and other components of roofing system.
  - 2. Special warranty includes metal copings, metal roof-edge specialties, and other metal roof-edge items.
  - 3. Failures include, but are not limited to, the following:
    - a. Structural failures including but not limited to, tearing, rupturing, cracking, or puncturing of roofing membrane and other materials.
    - b. Failures from wind uplift pressures and other specified performance requirements.
    - c. Deterioration of roofing membrane and other materials beyond normal weathering.
    - d. Water penetration through roofing assembly areas.
  - 4. Warranty Period: 20 years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty, signed by Installer, covering roofing work, including all components of roofing system such as roof membrane, base flashing, roof insulation, adhesives, fasteners, cover boards, substrate boards, vapor retarders, walkway products, metal roof-edge items, and other roofing system components for the following warranty period:
  - 1. Warranty Period: Two years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.
  - 1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
  - 2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.
  - 1. Fire/Windstorm Classifications: Specifier to coordinate Class ratings below with a roofing manufacturer. Delete this note when completed.
    - a. Field: Class XX-XX
    - b. Perimeters: Class XX-XX
    - c. Corners: Class XX-XX
  - 2. Hail-Resistance Rating: MH.
- D. Energy Performance (Insulation): Provide roofing system with insulation in total thickness required to comply with indicated minimum thickness and drainage requirements.
  - 1. Minimum Thickness: Insulation thickness shall provide a continuous minimum R-30 insulating value.
- E. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.
  - 1. Fire-Rating: 1-hour.

### 2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

- A. TPO Sheet: ASTM D6878/D6878M, internally fabric- or scrim-reinforced, TPO sheet.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:



- a. Carlisle SynTec Incorporated.
  - b. Firestone Building Products.
  - c. Johns Manville; a Berkshire Hathaway company.
  - d. Versico Roofing Systems.
- 2. Source Limitations: Obtain components for roofing system including, but not limited to, roof insulation, adhesives, and fasteners for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.
  - a. Comply with roofing membrane manufacturer's warranty requirements.
- 3. Thickness: 60 mils, nominal.
- 4. Seams: Continuous, heat welded.
- 5. Exposed Face Color: Gray.

## 2.3 AUXILIARY MEMBRANE ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
  - 1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils thick, minimum, of same color as TPO sheet.
- C. Membrane-Coated Metal Flashing: TPO-coated, heat-weldable, Type 304 stainless steel or galvanized steel sheet metal flashing of same color as TPO sheet.
  - 1. Laminated Membrane Thickness: 34-35 mils thick.
  - 2. Sheet Metal Thickness: 0.022 inch to 0.025-inch nominal.
- D. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- E. Bonding Adhesive: Manufacturer's standard.
  - 1. Use waterborne adhesives unless environmental limitations require use of solvent-borne adhesives for compliance with manufacturer's written installation instructions.
- F. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.
- G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.
- H. Miscellaneous Accessories: Provide primers, pre-formed cone and vent sheet flashings, pre-formed inside and outside corner sheet flashings, T-joint covers, lap sealants, water cut-off mastic, termination reglets, and other accessories.
  - 1. Provide sheet flashing accessories of same color as TPO sheet.

## 2.4 SUBSTRATE BOARD

- A. Substrate Board: Subject to compliance with requirements provide one of the following:
  - 1. Substrate Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum board.
    - a. Products: Subject to compliance with requirements, provide TPO roofing manufacturer's recommended substrate board to achieve manufacturer's special warranty.
    - b. Thickness: Type X, 5/8 inch thick.
    - c. Surface Finish: Factory primed or unprimed.
      - 1) Include separate primers for unprimed boards where required to comply with requirements.
  - 2. Substrate Board: ASTM C 1278/C 1278M, cellulosic-fiber-reinforced, water-resistant gypsum board.
    - a. Products: Subject to compliance with requirements, provide TPO roofing manufacturer's recommended substrate board to achieve manufacturer's special warranty.
    - b. Thickness: Type X, 5/8 inch thick.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

## 2.5 VAPOR RETARDER

- A. Self-Adhering-Sheet Vapor Retarder: ASTM D1970/D1970M, polyethylene film laminated to layer of rubberized asphalt adhesive, minimum 30-mil (0.76-mm) total thickness; maximum permeance rating of 0.1 perm (6 ng/Pa x s x sq. m); cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor retarder manufacturer, or when recommended by roofing manufacturer, or where required to comply with FM Global requirements.

## 2.6 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by TPO roof membrane manufacturer, approved for use in FM Approvals' RoofNav-listed roof assemblies.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 2, Grade 2 or Grade 3, glass-fiber mat facer on both major surfaces.
  - 1. Compressive Strength: Minimum 20 psi (138 kPa).
- C. Tapered Insulation: Provide factory-tapered insulation boards.
  - 1. Material: Match roof insulation.
  - 2. Minimum Thickness: 1/4 inch (6.35 mm).
  - 3. Slope: 1/4 inch per foot (1:48) unless otherwise indicated on Drawings.

- a. 1/2 inch per foot (1:24) for saddles, crickets, tapered edge strips, and where indicated on Drawings.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated or where not indicated as required for positive drainage toward drains.

## 2.7 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- C. Cover Board Adhesive: Cover board and roofing manufacturer's recommended low-VOC cold fluid-applied adhesive formulated to attach cover board to substrate.
- D. Cover Board: Subject to compliance with requirements, provide one of the following for cover board:
  - 1. Cover Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum board.
    - a. Products: Subject to compliance with requirements, provide TPO roofing manufacturer's recommended cover board to achieve manufacturer's special warranty.
    - b. Thickness: 5/8 inch.
    - c. Surface Finish: Factory primed or unprimed.
      - 1) Include separate primers for unprimed boards where required to comply with requirements.
  - 2. Cover Board: ASTM C 1278/C 1278M, cellulosic-fiber-reinforced, water-resistant gypsum board.
    - a. Products: Subject to compliance with requirements, provide TPO roofing manufacturer's recommended cover board to achieve manufacturer's special warranty.
    - b. Thickness: 5/8 inch.

## 2.8 PROTECTION COURSES

- A. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric; water permeable and resistant to UV degradation; type and weight as recommended by roofing system manufacturer for application.
- B. Splash Blocks: Heavyweight or lightweight, concrete units; grooved back, with four-way drainage capability; absorption not greater than 5 percent, ASTM C140/C 140M; no breakage and

maximum 1 percent mass loss when tested for freeze-thaw resistance, ASTM C 67; and as follows:

1. Size: Between 12 by 12 inches and 24 by 24 inches.
2. Compressive Strength: 2500 psi, minimum.

## 2.9 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, minimum 90 mils thick and acceptable to TPO roofing system manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
  1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
  2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
  3. Verify that surface plane flatness and attachment of steel roof deck complies with structural requirements for structural metal decks.
  4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
  5. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than 75 percent, or as recommended by roofing system manufacturer, when tested according to ASTM F2170.
    - a. Test Frequency: One test probe per each 1000 sq. ft. (93 sq. m), or portion thereof, of roof deck, with not less than three tests probes.
    - b. Submit test reports within 24 hours after performing tests.
  6. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.

- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

### 3.3 INSTALLATION OF ROOFING, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions, NRCA's "The NRCA Roofing Manual", FM Approvals' RoofNav assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.

### 3.4 INSTALLATION OF SUBSTRATE BOARD

- A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches in adjacent rows.
  - 1. At steel roof decks, install substrate board at right angle to flutes of deck.
    - a. Locate end joints over crests of steel roof deck.
  - 2. Tightly butt substrate boards together.
  - 3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
  - 4. Mechanically-fasten substrate board to top flanges of steel deck according to recommendations in FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.

### 3.5 INSTALLATION OF VAPOR RETARDER

- A. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 and 6 inches, respectively.
  - 1. Extend vertically up parapet walls, curbs, and projections to a minimum height required to maintain continuity of air barrier and vapor retarder.
  - 2. Seal laps by rolling.
- B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.
  - 1. Seal roofing vapor retarders to exterior wall vapor barriers.

### 3.6 INSTALLATION OF INSULATION

- A. Coordinate installing membrane roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated or where not indicated as required to provide positive drainage to drains.
- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
  - 1. Install insulation in minimum thickness indicated on Drawings, but in no case less than required to achieve indicated minimum thickness listed under 'Performance Requirements' Article.
  - 2. Install insulation at drain low points in minimum thickness 1 inch less than indicated minimum thickness required under 'Performance Requirements' article.
- E. Installation Over Metal Decking:
  - 1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.
    - a. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    - b. Make joints between adjacent insulation boards not more than 1/4 inch in width.
    - c. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
      - 1) Trim insulation so that water flow is unrestricted.
    - d. Fill gaps exceeding 1/4 inch with insulation.
    - e. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
  - 2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
    - a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
    - b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    - c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
    - d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).
      - 1) Trim insulation so that water flow is unrestricted.
    - e. Fill gaps exceeding 1/4 inch with insulation.
    - f. Cut and fill insulation with 1/4 inch of nailers projections, and penetrations.

3. Mechanically-attach layers of insulation using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.
  - a. Fasten insulation according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.

F. Installation Over Concrete Decks:

1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.
  - a. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
  - b. Make joints between adjacent insulation boards not more than 1/4 inch in width.
  - c. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
    - 1) Trim insulation so that water flow is unrestricted.
  - d. Fill gaps exceeding 1/4 inch with insulation.
  - e. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
  - a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
  - b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
  - c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
  - d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
    - 1) Trim insulation so that water flow is unrestricted.
  - e. Fill gaps exceeding 1/4 inch with insulation.
  - f. Cut and fill insulation with 1/4 inch of nailers projections, and penetrations.
3. Mechanically-attach layers of insulation using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.
  - a. Fasten insulation according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.

### 3.7 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
  1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.

2. At internal roof drains, conform to slope of drain sump.
  - a. Trim cover board so that water flow is unrestricted.
3. Cut and fit cover board tight to nailers, projections, and penetrations.
4. Adhere cover board to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.

### 3.8 INSTALLATION OF ADHERED ROOFING

- A. Prime cover board if required by roofing membrane manufacturer, if cover board was not factory-primed, or if required to resist wind uplift pressures according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
- B. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- C. Unroll roof membrane and allow to relax before installing.
- D. Start installation of roofing in presence of roofing system manufacturer's technical personnel, and in presence of Owner's testing and inspection agency.
- E. Accurately align roof membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- F. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.
- G. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.
- H. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- I. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, to ensure a watertight seam installation.
  1. Allow welds to cool and test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
  2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
  3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
    - a. Repair deficiencies on same day they are discovered.
  4. Spread water cut-off mastic over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.



### 3.9 INSTALLATION OF BASE FLASHING

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to roofing system manufacturer's written instructions.
  - 1. Use membrane-coated metal flashing at the following locations:
    - a. Where recommended or required by roofing system manufacturer.
    - b. Where flashings span unsupported.
    - c. Where indicated reference standards require metal flashing and flashing is required to be welded to roofing membrane.
    - d. At welded flashing for transitioning between roofing membrane and metal components,
    - e. Where indicated on Drawings.
    - f. Other locations where welding roofing membrane to metal flashings.
- B. Extend base flashing up walls, parapets, curbs, and penetrations to height as shown on drawings but in no case less than a minimum of 8 inches (200 mm) above roofing membrane top surface.
- C. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.
- D. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
  - 1. Do not use pitch pockets.
- E. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- F. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

### 3.10 PROTECTION COURSE INSTALLATION

- A. Protection Mat: Install protection mat where required by roofing manufacturer and at the following locations:
  - 1. Underneath metal roof step assembly support stands.
  - 2. Bottom of alternating-tread-devices for access to gratings.
  - 3. Top and bottom of alternating-tread-devices for access to roof areas.
  - 4. Underneath splash blocks.
  - 5. Where higher roof level drainage spills onto lower roof levels.
  - 6. Other locations indicated on Drawings.
  - 7. Other locations as required by roof membrane manufacturer's warranty requirements.
- B. Splash Blocks: Install splash blocks where required by roofing manufacturer and at the following locations:
  - 1. Where higher roof level drainage spills onto lower roof levels.

2. Other locations indicated on Drawings.
3. Other locations as required by roof membrane manufacturer's warranty requirements.

### 3.11 INSTALLATION OF WALKWAYS

#### A. Flexible Walkways:

1. Install flexible walkways at the following locations:
  - a. Top and bottom of each alternating-tread-device.
  - b. Between each alternating-tread-device and each rooftop unit location or path connecting rooftop unit locations.
  - c. Between each alternating-tread-device and exhaust stacks location.
  - d. Between each roof access door, and walkway paths.
  - e. Other locations indicated on Drawings.
  - f. Other locations as required by roof membrane manufacturer's warranty requirements.
2. Provide 6-inch clearance between adjoining pads.
3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

### 3.12 FIELD QUALITY CONTROL

#### A. Testing Agency: Engage a qualified testing agency to perform tests and to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports.

#### B. Contractor's Testing Agency: In addition to tests required by roofing manufacturer, Contractor shall engage a qualified testing agency to perform the following tests and to furnish reports:

1. Infrared Thermography: Testing agency shall survey entire roof area using infrared color thermography according to ASTM C1153.
  - a. Perform tests before overlying construction is placed.
  - b. After infrared scan, locate specific areas of leaks by electrical capacitance/impedance testing or nuclear hydrogen detection tests.
  - c. After testing, repair leaks, repeat tests, and make further repairs until roofing and flashing installations are watertight.
    - 1) Cost of retesting is Contractor's responsibility.
  - d. Testing agency shall prepare survey report of initial scan indicating locations of entrapped moisture, if any.
2. High-Voltage Electrical Conductance Testing (EFVM): Testing agency shall survey entire roof area and flashings to locate discontinuity in the roof membrane using an electrode brush with conductive metal bristles according to ASTM D7877.
  - a. Perform tests before overlying construction is placed.

- b. After testing, repair areas of discontinuities, repeat tests, and make further repairs until roofing and flashing installations are contiguous.
      - 1) Cost of retesting is Contractor's responsibility.
    - c. Testing agency shall prepare survey report indicating locations of initial discontinuities, if any.
  - 3. Roof wind-uplift resistance testing in accordance with FM Global Loss Prevention Data Sheet 1-52.
  - 4. Adhesion Testing: Vapor retarder assemblies will be tested for minimum vapor retarder adhesion of 16 lbf/sq. in. according to ASTM D 4541.
  - 5. Drain Localized Flood Testing: Flood test each roof drain area for leaks, according to recommendations in ASTM D 5957, after completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
    - a. Perform tests before overlying construction is placed.
    - b. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of base flashing.
    - c. Flood each area for minimum 24 hours.
    - d. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight.
      - 1) Cost of retesting is Contractor's responsibility.
    - e. Testing agency shall prepare survey report indicating locations of initial leaks, if any, and final survey report.
- C. Manufacturer Required Testing: Perform tests required by roofing manufacturer, including but not limited to, the following:
  - 1. Fastener pull-out testing.
  - 2. Membrane machine-weld testing.
  - 3. Membrane seam probing.
  - 4. Test cuts.
- D. Manufacturer Roof Inspections: At a minimum, arrange for roofing system manufacturer's technical personnel to inspect roofing installation at start of roofing, at least weekly during roofing progress, and on completion.
  - 1. Provide additional inspections if required for roofing system manufacturer's warranty.
- E. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or corrected work complies with specified requirements.

### 3.13 PROTECTING AND CLEANING

- A. Comply with roofing membrane manufacturer's written instructions for protection and cleaning.
- B. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report.
- C. Protect roofing membranes from coming into contact with incompatible materials. If such contact occurs, remove damaged roofing and reapply roofing to comply with requirements.
- D. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- E. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075423

## SECTION 077200 - ROOF ACCESSORIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Roof Hatch
  - 2. Safety Railing System
  - 3. Ladder-Assist Post

#### 1.3 ACTION SUBMITTALS

- A. Product Data: Manufacturer's technical data for roof hatch assembly, safety railing system, ladder-assist post, latching or locking provisions, and other pertinent data.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Operation and maintenance manuals with submission of O&M manuals.
- B. Warranties: Provide manufacturer warranties with requirements specified in "Warranties" article with submission of O&M manuals.

#### 1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Provide hatch safety railing system as required by OSHA Standard 1910.23 and 1910.27 and as specified in this section.

#### 1.6 WARRANTY

- A. Provide manufacturer's written five (5) year warranty.
  - 1. Warrant materials and workmanship against defects.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site ready use.

- B. Exercise proper care in handling of Work so as not to damage finished surfaces. Protect Work from damage after it is in place.
- C. Store materials under cover in a dry and clean location off the ground. Replace materials that are damaged or otherwise not suitable for use.

## PART 2 - PRODUCTS

### 2.1 ROOF HATCH

#### A. Manufacturer:

- 1. Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to following basis-of-design manufacturer and product:
  - a. Manufacturer: Babcock-Davis; a Cierra Products Inc. Company
  - b. Product: Personnel II Single-leaf metal lid for ladder, BG3636,

#### B. Characteristics:

- 1. Roof Hatch Type: Single-leaf metal lid for fixed ladder access.
- 2. Size: 36x36 inches (900x900 mm)
- 3. Loads: Fabricate roof hatches to withstand 40-lbf/sq. ft. (1.9-kPa) external live load with a maximum deflection of 1/150 of the span and 20-lbf/sq. ft. (0.95-kPa) internal uplift loads.

#### C. Construction:

- 1. Cover: 0.0785-inch (1.9 mm) galvaneal steel cover.
- 2. Cover Insulation: 1-inch (25 mm) rigid board insulation.
- 3. Curb: 0.0785-inch (1.9 mm) galvaneal steel with a double wall curb/liner with integral railing ready counterflashing. Mounting flange continuous around base of frame.
  - a. Fabricate curbs to minimum height of 12 inches (305 mm) above roofing surface unless otherwise indicated.
- 4. Curb Insulation: 1-inch (25 mm) rigid board insulation.
- 5. Finish: Powder coat paint.
- 6. Color: White.
- 7. Hardware: Zinc plated steel.
- 8. Hinge Assembly: Pintle hinge with stainless steel hinge pin.
- 9. Spring: Gas spring with integrated damper.
- 10. Hold Open Device: Automatic zinc plated steel hold open arm with red vinyl grip handle.
- 11. Latch: Zinc plated steel spring-type slam latch with inside and outside operating turn handles and padlock hasp provisions.
- 12. Pull Handle: Interior pull down handle, powder coated safety yellow.
- 13. Gasket: Extruded EPDM adhesive back seal, continuous around cover.

## 2.2 SAFETY RAILINGS

### A. Manufacturer:

1. Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to following basis-of-design manufacturer and product:
  - a. Manufacturer: Babcock-Davis; a Cierra Products Inc. Company
  - b. Product: BSR CAY 36X36FG,

### B. Characteristics:

1. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.

### C. Construction:

1. Galvanized-steel pipe, 1-1/4 inch (31 mm), 1.66 inch (42 mm) outside diameter, schedule 40 pipe.
2. Fittings: Cast aluminum alloy with set screw hold.
3. Mounting Brackets: 3/16-inch (4.75 mm) steel, zinc plated with nut backing plate.
4. Height: 42 inches (1060 mm) above finished roof deck.

### D. Exit: Self-closing gate, galvanized steel 1-1/4 inch (32 mm) tubular steel self-closing with coil spring.

### E. Finish:

1. Finish: Manufacturer's standard baked enamel or powder coat.
2. Color: Safety Yellow

## 2.3 SAFETY POST FOR FIXED LADDERS (LADDER-ASSIST POST)

### A. Manufacturer:

1. Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to following basis-of-design manufacturer and product:
  - a. Manufacturer: Babcock-Davis; a Cierra Products Inc. Company
  - b. Product: BSPY

### B. Characteristics:

1. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.
2. Operation: Post locks in place on full extension; release mechanism returns post to closed position.

3. Height: 42 inches (1060 mm) above finished roof deck.
4. Material: Steel tube.
5. Post: 1-1/2 inch (38.1mm) x 1-1/2 inch (38.1mm) x 1/8 inch (3.2mm) diameter high strength square.
6. Finish: Manufacturer's standard baked enamel or powder coat.
7. Color: Safety Yellow

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.
- B. Verify that deck, curbs, roof membrane, base flashing, and other items affecting Work of this Section are in place and positioned correctly.
- C. Verify tolerances and correct improper conditions.
- D. Do not proceed until unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install roof accessory items and components per manufacturer's instructions.
- B. Coordinate installation of components of this Section with installation of roof deck, roof structure, roofing membrane, and base flashing.
- C. Coordinate installation of sealant and roofing cement with Work of this Section to ensure water tightness.
- D. Coordinate installation of flashing flanges into reglets, if applicable.
- E. Separate metal from incompatible metal or corrosive substrates, including wood, by coating concealed surfaces, at locations of contact, with bituminous coating or providing other permanent separation.
- F. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.

### 3.3 ADJUSTING

- A. Adjust movable parts for smooth operation.
- B. Operational Units: Test-operate units with operable components. . Clean and lubricate joints and hardware. Adjust for proper operation.



### 3.4 CLEANING

- A. Clean exposed surfaces per manufacturer's written instructions. Touch up damaged metal coatings.

END OF SECTION 077200

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## Section 078400 - Firestopping

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

#### 1.2 RELATED REQUIREMENTS

- A. Section 070553 - Fire and Smoke Assembly Identification.
- B. Section 078100 - Applied Fire Protection.
- C. Section 092116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

#### 1.3 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.
- B. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2024.
- C. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems; 2024.
- D. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2024.
- E. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Test Apparatus; 2025.
- F. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2023a, with Editorial Revision (2024).
- G. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- H. ITS (DIR) - Directory of Listed Products; Current Edition.
- I. FM (AG) - FM Approval Guide; Current Edition.
- J. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.
- K. UL (FRD) - Fire Resistance Directory; Current Edition.

#### 1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.

- B. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- C. Certificate from authority having jurisdiction indicating approval of materials used.

## 1.5 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
  - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
  - 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at [www.icc-es.org](http://www.icc-es.org) will be considered as constituting an acceptable test report.
  - 3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

## 1.6 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

# PART 2 PRODUCTS

## 2.1 MANUFACTURERS

- A. Firestopping Manufacturers:
  - 1. Hilti, Inc: [www.hilti.com/#sle](http://www.hilti.com/#sle).
  - 2. MarinoWARE: [www.marinoware.com/#sle](http://www.marinoware.com/#sle).
  - 3. Tremco Commercial Sealants & Waterproofing; TREMstop Acrylic: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
  - 4. Substitutions: See Section 016000 - Product Requirements.

## 2.2 MATERIALS

- A. Firestopping Materials: Any materials meeting requirements.
- B. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.
- C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

## 2.3 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.

- B. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.
- C. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
- D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

## 2.4 FIRESTOPPING FOR FLOOR-TO-FLOOR, FLOOR-TO-WALL, HEAD-OF-WALL, AND WALL-TO-WALL JOINTS

- A. Concrete and Concrete Masonry Walls and Floors:
- B. Gypsum Board Walls:
  - 1. Head-of-Wall Joints at Underside of Flat Concrete:
    - a. 2 Hour Construction: UL System HW-D-0757; Hilti CFS-TTS Top Track Seal.
    - b. 2 Hour Construction: UL System HW-D-0016; Tremco, TREMstop Acrylic Firestop Sealant.
    - c. 1 Hour Construction: UL System HW-D-0757; Hilti CFS-TTS Top Track Seal.
    - d. 1 Hour Construction: UL System HW-D-0016; Tremco, TREMstop Acrylic Firestop Sealant.
  - 2. Head-of-Wall Joints at Concrete Over Metal Deck:
    - a. 2 Hour Construction: UL System HW-D-0256; Tremco, TREMstop Acrylic Firestop Sealant.
    - b. 1 Hour Construction: UL System HW-D-0256; Tremco, TREMstop Acrylic Firestop Sealant.

## 2.5 FIRESTOPPING SYSTEMS

- A. Firestopping: Any material meeting requirements.
  - 1. Fire Ratings: See drawings for required systems and ratings.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

### 3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to prevent liquid material from leakage.

### 3.3 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by Owner's Independent Testing Agency.
- C. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- D. Install labeling required by code.

### 3.4 FIELD QUALITY CONTROL

- A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174 and ASTM E2393.
- B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

### 3.5 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

### 3.6 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

## Section 079200 - Joint Sealants

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

#### 1.2 REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).
- B. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).
- C. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2024.
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).
- E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.
- F. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.
- G. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Nonsag Sealants:
  - 1. Dow; \_\_\_\_\_: [www.dow.com/#sle](http://www.dow.com/#sle).
  - 2. Hilti, Inc; \_\_\_\_\_: [www.hilti.com/#sle](http://www.hilti.com/#sle).

#### 2.2 JOINT SEALANT APPLICATIONS

- A. Scope:
  - 1. Exterior Joints:
    - a. Do not seal exterior joints unless indicated on drawings as sealed.
    - b. Seal open joints except open joints indicated on drawings as not sealed.
    - c. Seal the following joints:
      - 1) Wall expansion and control joints.
      - 2) Joints between doors, windows, and other frames or adjacent construction.
      - 3) Joints between different exposed materials.
  - 2. Interior Joints:
    - a. Do not seal interior joints indicated on drawings as not sealed.
    - b. Do not seal gaps and openings in gypsum board and suspended ceilings

- c. Do not seal through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
  - d. Seal open joints except specific open joints indicated on drawings as not sealed.
  - e. Seal the following joints:
    - 1) Joints between door frames and window frames and adjacent construction.
    - 2) In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, and piping penetrations.
- 3. Do Not Seal:
  - a. Intentional weep holes in masonry.
  - b. Joints indicated to be covered with expansion joint cover assemblies.
  - c. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.
  - d. Joints where sealant installation is specified in other sections.
  - e. Joints between suspended ceilings and walls.
- B. Exterior Joints: Use nonsag nonstaining silicone sealant, unless otherwise indicated.
- C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
  - 1. Wall and Ceiling Joints in Nonwet Areas: Acrylic emulsion latex sealant.
  - 2. Wall and Ceiling Joints in Wet Areas: Nonsag polyurethane sealant for continuous liquid immersion.
  - 3. Floor Joints in Wet Areas: Nonsag polyurethane non-traffic-grade sealant suitable for continuous liquid immersion.
  - 4. Wall, Ceiling, and Floor Joints Where Tamper-Resistance is Required: Non-sag tamper-resistant polyurethane sealant.
  - 5. Type \_\_\_\_ - Joints between Tile in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; clear.
- D. Interior Wet Areas: restrooms; fixtures in wet areas include plumbing fixtures, countertops, cabinets, and other similar items.
- E. Areas Where Tamper-Resistance is Required: As indicated on drawings.

## 2.3 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

## 2.4 NONSAG JOINT SEALANTS

- A. Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M, A, G, and O; not expected to withstand continuous water immersion or traffic.
  - 1. Movement Capability: Plus and minus 50 percent, minimum.
  - 2. Nonstaining to Porous Stone: Nonstaining to light-colored \_\_\_\_\_ when tested in accordance with ASTM C1248.
  - 3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
  - 4. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
  - 5. Color: Match adjacent finished surfaces.
  - 6. Products:
    - a. Dow; DOWSIL 791 Silicone Weatherproofing Sealant: [www.dow.com/#sle](http://www.dow.com/#sle).



- b. Sika Corporation; Sikasil WS-290: [usa.sika.com/#sle](http://usa.sika.com/#sle).
  - c. Tremco Commercial Sealants & Waterproofing; Tremsil 200: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
- B. Type \_\_\_\_ - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
  - 1. Color: White.
- C. Type \_\_\_\_ - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
  - 1. Movement Capability: Plus and minus \_\_\_\_ percent, minimum.
- D. Type \_\_\_\_ - Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multicomponent; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface.
  - 1. Movement Capability: Plus and minus 35 percent, minimum.
- E. Type \_\_\_\_ - Tamper-Resistant Polyurethane Sealant: ASTM C920, Grade NS, Uses M, G, and A; single or multicomponent; not expected to withstand continuous water immersion or traffic.
  - 1. Movement Capability: Plus and minus 12-1/2 percent, minimum.
  - 2. Hardness Range: 50 to 60, Shore A, when tested in accordance with ASTM C661.
- F. Type \_\_\_\_ - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use.

## 2.5 SELF-LEVELING JOINT SEALANTS

## 2.6 ACCESSORIES

- A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.
- B. Sealant Backing Rod, Open-Cell Type:
  - 1. Size: 25 to 50 percent larger in diameter than joint width.
  - 2. Products:
    - a. Nomaco, Inc; OC Foam: [www.nomaco.com/#sle](http://www.nomaco.com/#sle).
    - b. Substitutions: See Section 016000 - Product Requirements.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.

- D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
  - 1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
  - 2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
  - 3. Record each test on Preinstallation Adhesion Test Log as indicated.
  - 4. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
  - 5. After completion of tests, remove remaining sample material and prepare joints for new sealant installation.

### 3.2 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
- E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

### 3.3 INSTALLATION

- A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Install acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- E. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
  - 1. Width/depth ratio of 2:1.
  - 2. Neck dimension no greater than 1/3 of the joint width.
  - 3. Surface bond area on each side not less than 75 percent of joint width.
- F. Install bond breaker backing tape where backer rod cannot be used.
- G. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- H. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

- I. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- J. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

#### 3.4 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

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## SECTION 079219 - ACOUSTICAL JOINT SEALANTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Acoustical joint sealants.

##### B. Related Requirements:

1. Section 079200 "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for nonacoustical applications.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data:

1. Acoustical joint sealants.

##### B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants, showing full range of available colors for each product exposed to view.

#### 1.3 INFORMATIONAL SUBMITTALS

#### 1.4 CLOSEOUT SUBMITTALS

#### 1.5 WARRANTY

##### A. Installer's Special Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 ACOUSTICAL JOINT SEALANTS

##### A. Acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies in accordance with ASTM E90.

1. Verify sealant has a VOC content of 250 g/L or less.
- B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C834.
  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. GE Construction Sealants; Momentive Performance Materials Inc.
    - b. Hilti, Inc.
    - c. Pecora Corporation.
  2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors .

## 2.2 MISCELLANEOUS MATERIALS

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

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where recommended by acoustical joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

- A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.
- B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C919, ASTM C1193, and manufacturer's written instructions for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.
- C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

### 3.4 CLEANING

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

### 3.5 PROTECTION

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

END OF SECTION 079219

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## SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Interior standard steel doors and frames.
2. Exterior standard steel doors and frames.

B. Related Requirements:

1. Section 081119 "Stainless-Steel Doors and Frames" for hollow-metal doors and frames manufactured from stainless steel.
2. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

#### 1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings in accordance with NAAMM-HMMA 803 or ANSI/SDI A250.8.

#### 1.3 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

#### 1.4 ACTION SUBMITTALS

A. Product Data:

1. Interior standard steel doors and frames.
2. Exterior standard steel doors and frames.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.

C. Sustainable Design Submittals:

1. Whole Building Life-Cycle Assessment (WBLCA) (MRc1):

- a. Submit product data or other published information verifying that this product has a Product-Specific Type III EPD or an industry-wide EPD. Submit in accordance with Section 018113, 1.7 Action Submittals – MRc1 Option 2 – Whole Building Life-Cycle Assessment (WBLCA).
    - b. Include an updated Environmental Impact Calculator with submittal, which includes the following:
      - 1) Estimated declared unit material quantity.
  - 2. Environmental Product Declarations (MRc2): Option 1 Environmental Product Declaration (EPD)
    - a. Submit product data or other published information verifying that this product has an EPD. Submit in accordance with Section 018113, LEED Submittals – MRc2 - Environmental Product Declarations.
    - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
  - 3. Sourcing of Raw Materials (MRc3): Recycled content
    - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).
    - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
  - 4. Low Emitting Materials (EQc2): Ceilings, walls, thermal and acoustic insulation
    - a. Submit product data or other published information verifying compliance with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Manufacturer's claims of compliance must also state the range of total VOCs after 14 days.
    - b. Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.
- D. Shop Drawings: Include the following:
- 1. Elevations of each door type.
  - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
  - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  - 4. Locations of reinforcement and preparations for hardware.
  - 5. Details of each different wall opening condition.
  - 6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
  - 7. Details of anchorages, joints, field splices, and connections.
  - 8. Details of accessories.
  - 9. Details of moldings, removable stops, and glazing.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
  - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

## PART 2 - PRODUCTS

### 2.1 HOLLOW METAL DOORS AND FRAMES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Ceco Door; AADG, Inc.; ASSA ABLOY.
  - 2. Curries, AADG, Inc.; ASSA ABLOY Group.
  - 3. Deansteel Manufacturing Company, Inc.
  - 4. Mesker Door; Mesker Openings Group.
  - 5. Pioneer Industries; AADG, Inc.; ASSA ABLOY.
  - 6. Republic Doors and Frames; a Allegion brand.
  - 7. Security Metal Products; a brand of ASSA ABLOY.

### 2.2 SUSTAINABLE DESIGN REQUIREMENTS

- A. Whole Building Life-Cycle Assessment (WBLCA) (MRc1): Preference should be given to materials/products that have a Product-Specific Type III Environmental Product Declaration (EPD).
- B. Environmental Product Declarations (MRc2): Preference should be given to materials/products that meet the requirements for the LEED credit MRc2, Environmental Product Declarations.
- C. Sourcing of Raw Materials (MRc3), Recycled Content: Preference should be given to materials/products that have post- and/or pre-consumer recycled content by weight of total product.
- D. Low-Emitting Materials (EQc2): Ceilings, walls, thermal and acoustic insulation
  - 1. Ceilings, walls, thermal and acoustic insulation installed within the weather proofing system in this section must comply with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Refer to Sustainable Design Requirements Section 018113 for specific VOC requirements.

## 2.3 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
  - 1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.
  - 2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
- B. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.50 deg Btu/F x h x sq. ft. when tested in accordance with ASTM C1363 or ASTM E1423.

## 2.4 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B. At locations indicated in the Door and Frame Schedule on Drawings.
  - 1. Doors:
    - a. Type: As indicated in the Door and Frame Schedule on Drawings.
    - b. Thickness: 1-3/4 inches.
    - c. Face: Uncoated steel sheet, minimum thickness of 0.042 inch.
    - d. Edge Construction: Model 1, Full Flush.
    - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
    - f. Core: Manufacturer's standard.
    - g. Fire-Rated Core: Manufacturer's standard vertical steel stiffener core for fire-rated doors.
  - 2. Frames:
    - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
    - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
    - c. Construction: Full profile welded.
  - 3. Exposed Finish: Prime.

## 2.5 EXTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A. At locations indicated in the Door and Frame Schedule on Drawings.
  - 1. Doors:
    - a. Type: As indicated in the Door and Frame Schedule on Drawings.
    - b. Thickness: 1-3/4 inches.
    - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
    - d. Edge Construction: Model 2, Seamless.
    - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
    - f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
    - g. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
    - h. Core: Polystyrene.
  - 2. Frames:
    - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
    - b. Construction: Full profile welded.
  - 3. Exposed Finish: Prime.

## 2.6 BORROWED LITES

- A. Fabricate of uncoated steel sheet, minimum thickness of 0.053 inch.
- B. Construction: Full profile welded.
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

## 2.7 HOLLOW-METAL PANELS

- A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

## 2.8 FRAME ANCHORS

- A. Jamb Anchors:
  - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
  - 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
  - 3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.
- C. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
  - 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized in accordance with ASTM A153/A153M, Class B.

## 2.9 MATERIALS

- A. Minimum of 50% total recycled content required.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized in accordance with ASTM A153/A153M.
- E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- F. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.
- G. Glazing: Comply with requirements in Section 088000 "Glazing."

## 2.10 FABRICATION

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
  - 1. Sidelite and Transom Bar 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 welding, or by rigid mechanical anchors.
  - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  - 3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with ANSI/SDI A250.6, the Door Hardware Schedule on Drawings, and templates.
  - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
  - 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
  - 1. Provide stops and moldings flush with face of door, and with beveled square stops unless otherwise indicated.
  - 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. Provide loose stops and moldings on inside of hollow-metal doors and frames.
  - 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
  - 5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

## 2.11 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

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

## PART 3 - EXECUTION

### 3.1 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. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

### 3.2 INSTALLATION

- A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: 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 without damage to completed Work.
    - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
    - b. Install frames with removable stops located on secure side of opening.
  2. Fire-Rated Openings: Install frames in accordance with NFPA 80.
  3. Floor Anchors: Secure with postinstalled expansion anchors.
    - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
  4. Solidly pack mineral-fiber insulation inside frames.
  5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
  6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
  7. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
    - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.



- c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
  - 1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
  - 2. Fire-Rated Doors: Install doors with clearances in accordance with NFPA 80.
  - 3. Smoke-Control Doors: Install doors in accordance with NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

### 3.3 REPAIR

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint in accordance with manufacturer's written instructions.
- C. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish in accordance with manufacturer's written instructions.
- D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

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## SECTION 081416 - FLUSH WOOD DOORS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Standard Specifications, Proposal Documents, Special Provisions, Supplemental Specifications, Bid Item Manual and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Flush wood veneer doors.
  - 2. Flush fire rated wood doors.
  - 3. Factory Finishing

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door indicated. Include factory-finishing specifications.
- B. Sustainable Design Submittals:
  - 1. Environmental Product Declarations (MRc2): Option 1 Environmental Product Declaration (EPD)
    - a. Submit product data or other published information verifying that this product has an EPD. Submit in accordance with Section 018113, LEED Submittals – MRc2 - Environmental Product Declarations.
    - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
  - 2. Sourcing of Raw Materials (MRc3): Recycled content
    - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).
    - b. Provide submittals indicating recycled content for core materials and composite materials.
    - c. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
  - 3. Sourcing of Raw Materials (MRc3): Wood products
    - a. Forest Stewardship Council (FSC): Provide letter of certification signed by vendor. Indicate compliance with FSC "Principles for Natural Forest Management" and identify certifying organization.

- 1) Submit copies of invoices identifying cost of each FSC certified product on a line-item basis, vendor's FSC chain-of-custody certificate code, and verification of if the product is "FSC 100%," "FSC Mix Credit," or "FSC Mix [NN]%"
    - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
  4. Material Ingredients (MRc4): Option 1 Material Ingredient Reporting
    - a. Submit product data or other published information verifying product uses any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm): Manufacturer inventory of all ingredients or Health Product Declaration, Declare, Living Product Challenge, Cradle to Cradle v2 Basic or v3 Bronze, Product Lens Certification, Facts - NSF/ANSI 336, ANSI/BIFMA e3 Furniture Sustainability Standard; or other USGBC approved program, if applicable.
    - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
  5. Low Emitting Materials (EQc2): Ceilings, walls, thermal and acoustic insulation
    - a. Submit product data or other published information verifying compliance with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Manufacturer's claims of compliance must also state the range of total VOCs after 14 days.
    - b. Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.
- C. 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.
- D. Samples for verification: For factory-finished doors.

#### 1.4 QUALITY ASSURANCE

- A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."

#### 1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

## 1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
    - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
  - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
  - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

- A. Manufacturers: Subject to compliance with requirements, provide named product or a comparable product by one of the following:
  - 1. Basis of Design: Flush Wood Doors as manufactured by VT Industries
  - 2. Algoma Hardwoods, Inc.
  - 3. Graham Manufacturing Group
  - 4. Marshfield Door Systems, Inc.
  - 5. Mohawk Flush Doors, Inc.

### 2.2 SUSTAINABLE DESIGN REQUIREMENTS

- A. Environmental Product Declarations (MRc2): Preference should be given to materials/products that meet the requirements for the LEED credit MRc2, Environmental Product Declarations.
- B. Sourcing of Raw Materials (MRc3), Recycled Content: Preference should be given to materials/products that have post- and/or pre-consumer recycled content by weight of total product.
- C. Sourcing of Raw Materials (MRc3), Wood Products: Preference should be given to materials/products that meet the LEED requirements for FSC certified wood.
- D. Material Ingredients (MRc4): Preference should be given to materials/products that meet the LEED requirements for MRc4, Material Ingredient Reporting.
- E. Low-Emitting Materials (EQc2): Ceilings, walls, thermal and acoustic insulation
  - 1. Ceilings, walls, thermal and acoustic insulation installed within the weather proofing system in this section must comply with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Refer to Sustainable Design Requirements Section 018113 for specific VOC requirements.

## 2.3 DOOR CONSTRUCTION, GENERAL

### A. WDMA I.S.1-A Performance Grade:

1. Extra Heavy Duty unless otherwise indicated.

## 2.4 FLUSH WOOD VENEER DOORS

### A. Wood veneers must be Certified Wood Products with associated documentation.

### B. Five-ply flush bonded doors: Heritage Collection (VT Industries) or equivalent

1. Model: 5502H, PC-5, PC-20-5, and PC-20PP-5, particleboard core, non-rated and 20-minute rated, positive pressure.
2. Compliance: WDMA I.S. 1-A
  - a. Aesthetic Grade: Custom
  - b. Duty Level: Extra Heavy Duty
  - c. Type: PC-5
3. Seven-Ply and Non-Bonded Core Construction: Not acceptable
4. Door Thickness 1-3/4"
5. STC Rating: Minimum STC 30
6. Stiles
  - a. Inner Stiles 1-3/8 inches wide before prefitting.
  - b. Structural Composite Lumber (SCL) with Outer Stile: Same species as face veneer.
  - c. Outer Stile: Apply after beveling and before face application
7. Rails:
  - a. Structural composite lumber (SCL)
8. Core:
  - a. Material: Particleboard
  - b. Particleboard compliance: ANSI A208.1, Grade 1-LD-2
  - c. Stave Lumber Core Compliance: Blocks and strips not more than 2-1/2 inches wide, once species of wood.
9. Door assembly
  - a. Stiles and Rails: Bonded to core.
  - b. Sand entire assembly flat as a unit to ensure minimal telegraphing of core components through face veneers.
10. Composite Crossbands
  - a. Apply to core in hot press using Type 1, exterior, water-resistant adhesive, before application of hardwood edges
11. Veneers
  - a. Apply to crossbanded core in hot press using Type 1, exterior, water-resistant adhesive.
  - b. Species: Red Oak, Plain Sliced.
  - c. Cut: Quarter, vertical grain
  - d. Match: Book
  - e. Assembly: Center Balanced
  - f. Minimum Thickness Before Sanding: 1/42"
12. Positive Pressure:

- a. Where UBC 7-2-19997/UL 10C standards for positive pressure apply, doors shall be constructed in accordance with Category A guidelines as published by Intertek/Warnock Hersey.

## 2.5 FLUSH FIRE-RATED WOOD DOORS

### A. Flush Fire-Rated Wood Doors; Heritage Collection (VT Industries) or equivalent

- 1. Compliance: WDMA I.S. 1-A
  - a. Aesthetic Grade: Custom
  - b. Type: FD-5
- 2. Door Thickness 1-3/4"
- 3. STC Rating: STC 35
- 4. Outer Edges: Same species as face veneer
- 5. Inner Stiles: Noncombustible Material
- 6. Rails: Noncombustible Material
- 7. Core: Fire-Rated Mineral Core: Does not contain asbestos or added urea formaldehyde.
- 8. Composite Crossbands
  - a. Apply to core in hot press using Type 1, exterior, water-resistant adhesive.
- 9. Veneers
  - a. Apply to crossbanded core in hot press using Type 1, exterior, water-resistant adhesive.
  - b. Species: Red Oak, Plain Sliced.
  - c. Cut: Quarter, vertical grain
  - d. Match: Book
  - e. Assembly: Center Balanced
  - f. Minimum Thickness Before Sanding: 1/42"
- 10. Positive Pressure:
  - a. Where UBC 7-2-19997/UL 10C standards for positive pressure apply, doors shall be constructed in accordance with Category A guidelines as published by Intertek/Warnock Hersey.

## 2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
  - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Finish doors at factory that are indicated to receive transparent finish.
- C. Finish:
  - 1. Finish: WDMA TR-8, UV cured urethane, premium grade.
    - a. Stain coat. Selection by architect.
    - b. Sealer: 3 coats.
    - c. Sanding: Sand.

- d. Topcoat: 2 coats.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
  - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Hardware: For installation, see Division 08 Section "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions, WDMA I.S.1-A, 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 is required at Project site.

### 3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.



END OF SECTION 081416

## SECTION 083113 - ACCESS DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Access doors and frames for walls and ceilings.

B. Related Requirements:

1. Applicable Division 21 Sections for behind wall/ceiling fire suppression access doors.
2. Applicable Division 22 Sections for behind wall/ceiling plumbing access doors.
3. Applicable Division 23 Sections for behind wall/ceiling HVAC access doors.
4. Applicable Division 26 Sections for behind wall/ceiling electrical access doors.
5. Applicable Division 27 Sections for behind wall/ceiling communication access doors.
6. Applicable Division 28 Sections for behind wall/ceiling electronic safety and security access doors.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product including construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples: Submit samples for each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches (150 by 150 mm) in size.

C. Product Schedule: For access doors and frames.

D. Sustainable Design Submittals:

1. Environmental Product Declarations (MRc2): Option 1 Environmental Product Declaration (EPD)
  - a. Submit product data or other published information verifying that this product has an EPD. Submit in accordance with Section 018113, LEED Submittals – MRc2 - Environmental Product Declarations.
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
2. Sourcing of Raw Materials (MRc3): Recycled content
  - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
3. Low Emitting Materials (EQc2): Ceilings, walls, thermal and acoustic insulation

- a. Submit product data or other published information verifying compliance with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Manufacturer's claims of compliance must also state the range of total VOCs after 14 days.
- b. Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.

### 1.3 CLOSEOUT SUBMITTALS

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

### 1.4 QUALITY ASSURANCE

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

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

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

### 2.2 SUSTAINABLE DESIGN REQUIREMENTS

- A. Environmental Product Declarations (MRc2): Preference should be given to materials/products that meet the requirements for the LEED credit MRc2, Environmental Product Declarations.
- B. Sourcing of Raw Materials (MRc3), Recycled Content: Preference should be given to materials/products that have post- and/or pre-consumer recycled content by weight of total product.
- C. Low-Emitting Materials (EQc2): Ceilings, walls, thermal and acoustic insulation
  - 1. Ceilings, walls, thermal and acoustic insulation installed within the weather proofing system in this section must comply with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Refer to Sustainable Design Requirements Section 018113 for specific VOC requirements.

## 2.3 ACCESS DOORS AND FRAMES

### A. Flush Access Doors with Exposed Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Acudor Products, Inc.
  - b. JL Industries, Inc.; a division of the Activar Construction Products Group.
  - c. Larsens Manufacturing Company.
  - d. Milcor; Commercial Products Group of Hart & Cooley, Inc.
  - e. Nystrom, Inc.
  - f. Williams Bros. Corporation of America (The).
2. Description: Face of door flush with frame, with concealed hinge and exposed flange for installation in masonry, tiled, and paneled walls.
3. Locations: Wall.
4. Door Size: Refer to Schedule at the end of PART 3.
5. Metallic Coated Steel Sheet for Door: Nominal thickness of 0.067-inch (1.7 mm), (formerly "14 gage"), factory primed.
6. Stainless Steel Sheet for Door: Nominal 0.076-inch (1.9 mm), (formerly "16 gage"), No. 4 finish.
7. Frame Material: Same material, thickness, and finish as door.
  - a. Provide masonry anchors for doors built into masonry walls.
8. Latch and Lock: Cam latch, screwdriver operated.

### B. Flush Access Doors with Concealed Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Acudor Products, Inc.
  - b. JL Industries, Inc.; a division of the Activar Construction Products Group.
  - c. Larsens Manufacturing Company.
  - d. Milcor; Commercial Products Group of Hart & Cooley, Inc.
  - e. Nystrom, Inc.
  - f. Williams Bros. Corporation of America (The).
2. Description: Face of door flush with frame, with concealed hinge and concealed flange for gypsum board installation.
3. Locations: Wall and ceiling.
4. Door Size: Refer to Schedule at the end of PART 3.
5. Metallic Coated Steel Sheet for Door: Nominal thickness of 0.067-inch (1.7 mm), (formerly "14 gage"), factory primed.
6. Stainless Steel Sheet for Door: Nominal 0.076-inch (1.9 mm), (formerly "16 gage"), No. 4 finish.
7. Frame Material: Same material, thickness, and finish as door.
8. Latch and Lock: Cam latch, screwdriver operated.

### C. Exterior Flush Access Doors:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Babcock-Davis.
  - b. JL Industries, Inc.; a division of the Activar Construction Products Group.

- c. Larsens Manufacturing Company.
- d. Maxam Metal Products Limited.
- e. MIFAB, Inc.
- f. Nystrom, Inc.
- g. Williams Bros. Corporation of America (The).
- 2. Description: Weatherproof assembly, with face of door fit flush with frame and with exposed frame. Include extruded door gaskets and minimum 2-inch thick (50 mm thick) fiberglass insulation.
- 3. Locations: Wall.
- 4. Door Size: Refer to Schedule at the end of PART 3.
- 5. Stainless Steel Sheet for Door: Nominal thickness of 0.075-inch (1.9 mm), (formerly "16 gage"), No. 2b finish.
- 6. Frame Material: Same material, thickness, and finish as door.
- 7. Latch and Lock: Cam latch operated by handle, with separate mortise lock keyed to building keying system.

## 2.4 FIRE RATED ACCESS DOORS AND FRAMES

### A. Fire Rated, Flush Access Doors with Exposed Flanges:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Babcock-Davis
  - b. JL Industries, Inc.; a division of the Activar Construction Products Group.
  - c. Larsens Manufacturing Company.
  - d. Milcor; Commercial Products Group of Hart & Cooley, Inc.
  - e. Nystrom, Inc.
  - f. Williams Bros. Corporation of America (The).
- 2. Description: Door face flush with frame, with a core of mineral fiber insulation enclosed in sheet metal; with exposed flange, self-closing door, and concealed hinge, for installation in masonry, tiled, and paneled walls.
- 3. Locations: Wall.
- 4. Door Size: Refer to Schedule at the end of PART 3.
- 5. Fire Resistance Rating: Not less than that of adjacent construction.
- 6. Metallic Coated Steel Sheet for Door: Nominal thickness of 0.053-inch (1.3 mm), (formerly "16 gage"), factory primed.
- 7. Stainless Steel Sheet for Door: Nominal 0.048-inch (1.22 mm), (formerly "18 gage"), No. 4 finish.
- 8. Frame Material: Same material, thickness, and finish as door.
  - a. Provide masonry anchors for doors built into masonry walls.
- 9. Latch and Lock: Self closing, self-latching door hardware, operated by knurled knob.

### B. Fire Rated, Flush Access Doors with Concealed Flanges:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Babcock-Davis.
  - b. JL Industries, Inc.; a division of the Activar Construction Products Group.
  - c. Larsens Manufacturing Company.
  - d. Milcor; Commercial Products Group of Hart & Cooley, Inc.

- e. Nystrom, Inc.
- f. Williams Bros. Corporation of America (The).
- 2. Description: Door face flush with frame, with a core of miner fiber insulation enclosed in sheet metal; with concealed flange for gypsum board installation, self-closing door, and concealed hinge.
- 3. Locations: Wall and ceiling.
- 4. Door Size: Refer to Schedule at the end of PART 3.
- 5. Fire Resistance Rating: Not less than that of adjacent construction.
- 6. Metallic Coated Steel Sheet for Door: Nominal thickness of 0.053-inch (1.3 mm), (formerly "16 gage"), factory primed.
- 7. Stainless Steel Sheet for Door: Nominal 0.048-inch (1.22 mm), (formerly "18 gage"), No. 4 finish.
- 8. Frame Material: Same material, thickness, and finish as door.
- 9. Latch and Lock: Self closing, self-latching door hardware, operated by knurled knob.

## 2.5 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Metallic Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS, Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304, Remove tool and die marks and stretch lines, or blend into finish.
- D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

## 2.6 FABRICATION

- A. Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
  - 1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.
  - 2. For concealed flanges with plaster bead for full bed plaster applications, provide zinc coated expanded metal lath and exposed casing bead welded to perimeter of frames.
- D. Latch and Lock Hardware:
  - 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
  - 2. Keys: Furnish two keys per lock and key all locks alike.

3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in Section 087100.

## 2.7 FINISHES

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

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

### 3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

### 3.4 SCHEDULE

#### A. Wall and Ceiling Access Doors Locations

- 1. Where specifically scheduled or noted on Drawings.
- 2. Where service access is required by Code or Authorities Having Jurisdiction.
- 3. Where service access is required for serviceable, operable, adjustable, or resettable fire suppression, plumbing, HVAC electrical, life safety, security, and communications systems items.
- 4. Doors shall be installed as close as possible to serviceable, operable, adjustable, or resettable items, but in no case further than 12 inches away from item.
- 5. All door locations shall be reviewed and coordinated with Owner prior to installation.

#### B. Sizes: Provide the following unless otherwise indicated:

- 1. Ceilings, Soffits, and Other Applications Requiring Personnel Access:
  - a. 24 inches by 24 inches.
  - b. Refer to access requirements in Applicable Divisions 21 through 28 Sections.
- 2. Ceilings, Soffits, and Other Applications Not Requiring Personnel Access:
  - a. 14 inches by 14 inches.
  - b. Refer to access requirements in Applicable Divisions 21 through 28 Sections.
- 3. Plumbing Chase Walls: Minimum 14 inches by 14 inches at fixtures chase wall.
  - a. Refer to access requirements in Applicable Divisions 21 through 28 Sections.
- 4. Exterior Walls: Minimum 14 inches by 14 inches.
- 5. All Other Locations: Size as required to facilitate adequate access to equipment being serviced, adjusted, or maintained, but not less than 14 inches by 14 inches.
  - a. Refer to access requirements in Applicable Divisions 21 through 28 Sections.

#### C. Finish:

- 1. For access doors in painted walls and ceilings: Provide metallic coated steel sheet with factory primed finish for field painting.
- 2. For access doors in restroom, toilet room, locker room, and sterile or food service area walls scheduled to receive tile finish, epoxy finish, or wall protection panels; provide stainless steel.
- 3. For access doors in Exterior Walls: Provide stainless steel.

END OF SECTION 083113



## Section 083323 - Overhead Coiling Doors - Rytec

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Overhead high-speed coiling doors, operating hardware.
- B. Wiring from electric circuit disconnect to operator to control station.

#### 1.2 RELATED REQUIREMENTS

- A. Section 260583 - Wiring Connections: Power to disconnect.

#### 1.3 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- B. ITS (DIR) - Directory of Listed Products; Current Edition.
- C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).
- E. NEMA MG 00001 - Motors and Generators; 2024.
- F. UL (DIR) - Online Certifications Directory; Current Edition.
- G. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

#### 1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general construction, electrical equipment, and component connections and details.
- C. Samples: Submit two pieces of fabric curtain, 6 inches by 6 inches inches (\_\_\_ by \_\_\_ mm) in size illustrating shape, color and finish texture.
- D. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

## 1.5 QUALITY ASSURANCE

## 1.6 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide seven year manufacturer limited warranty for polycarbonate vision panes against breaks, coating failure, excessive increased haze, excessive yellowing, or loss of light transmission.
- C. Provide five year manufacturer limited warranty for three-ply multifilament polyester fabric curtain.
- D. Provide five year manufacturer limited warranty for mechanical components, including motor assembly.
- E. Provide lifetime manufacturer limited warranty for counterweights and tension springs.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis of Design, Overhead Rapid Coiling Fabric Doors:
  - 1. Rytec Corporation; Fast-Seal: [www.rytecdoors.com/#sle](http://www.rytecdoors.com/#sle).
- B. Substitutions: Not permitted.
  - 1. Products other than basis of design are subject to compliance with specified requirements and prior approval of Architect. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

### 2.2 RAPID COILING DOORS

- A. Non-Fire-Rated Exterior High-Speed Coiling Fabric Doors: Reinforced, puncture-resistant, polymer-impregnated monofilament polyester curtain.
  - 1. Door Opening Speed: Variable, adjustable, up to 50 inches (1250 mm) per second.
  - 2. Door Closing Speed: 30 inches (750 mm) per second.
  - 3. Flexibility: Provide curtain that is stiff in the horizontal direction and flexible in the vertical direction.
  - 4. Two-ply door curtain fabric, 71 ounces per square yard (2400 g/sq m) nominal.
  - 5. Fabric Color: As selected by Architect from manufacturers standard colors.
  - 6. Side Frames: Reinforced side frames with front and rear wind bar guides and front and rear full-height weather seals. Provide two sets of factory-installed through-beam safety photo eyes.
  - 7. Side Frame Covers, Formed Sheet Metal: Galvanized steel.
  - 8. Hood Enclosure: Manufacturer's standard.
  - 9. Electric operation.
  - 10. Mounting: Surface mounted.
  - 11. Window Openings: As indicated on drawings.
    - a. Size: 24 by 24 inch (610 by 610 mm) individual windows.

- b. Material: Clear PVC.

## 2.3 MATERIALS AND COMPONENTS

- A. Fabric Curtain Construction: Manufacturer's standard fabric for door type and model selected.
  - 1. Hard Break-Away Bottom for Fabric Curtains: One-piece extruded aluminum bar designed to release door from guide without damaging the door when impacted from either direction.
    - a. Standard Edge: Manufacturer's standard motor-stopping assembly.
    - b. Pneumatic Edge: Manufacturer's standard auto-reversing assembly.
  - 2. Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
  - 3. Seals for Interior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of insulated curtain doors.
- B. Coiling Door Guide Construction: Continuous sheet metal, of profile to retain door in place with snap-on trim, mounting brackets of same metal.
  - 1. Hot-Dip Galvanizing: Minimum G90 (Z275) coating, in compliance with ASTM A653/A653M.
- C. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
- D. Side Column Metal Curtain Counterbalance: Extension springs located in each side column, designed to assist the motor in opening the door. Provide a mechanical release lever on each column to release door in the event of power failure.
- E. Fabric Tensioning System: Manufacturer's standard; separate from counterbalance system.

## 2.4 ELECTRIC OPERATION

- A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
  - 1. Provide interlock switches on motor operated units.
- B. Electric Operators:
  - 1. Mounting: Side mounted.
  - 2. Motor Enclosure:
    - a. Interior Coiling Doors: NEMA MG 00001, Type 1; open drip proof.
  - 3. Motor Rating: 1/3 HP (250 W); continuous duty.
  - 4. Motor Voltage: 120 volts, single phase, 60 Hz.
  - 5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
  - 6. Controller Enclosure: NEMA EN 10250, Type 4.
  - 7. Opening Speed: 12 inches per second (300 mm/sec).
  - 8. Brake: Manufacturer's standard type, activated by motor controller.
  - 9. Manual override in case of power failure.
  - 10. Refer to Section 260583 for electrical connections.
- C. Control Station: Provide standard three button (Open-Close-Stop) momentary-contact control device for each operator complying with UL 325.
  - 1. 24 volt circuit.
  - 2. Surface mounted, at interior door jamb.

3. Programmable Inputs and Outputs: Design to accommodate special control applications such as traffic lights, horns, actuation devices, timing sequences, and others).
  4. Display Type: Self-diagnostic scrolling two-line fluorescent.
  5. Door Travel Limit Regulation: Self adjusting, not requiring use of tools.
  6. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
    - a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.
- D. Fabric Curtain Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, with internal wireless transmitter signaling controller to stop and reverse door direction upon striking object.
- E. Threshold Warning System: Manufacturer's standard set of warning lights mounted above door opening
1. Functionality: Designed to indicate status of doorway passability on door columns and floor on either side of opening; visible when approaching door from either side and either direction (left or right).
  2. Type: Multi-LED element with precision-shaped lens projecting 6 to 10 inches (150 to 250 mm) wide stripes along width of door openings.
  3. Light Fixture Length: Manufacturer's standard.
  4. Triggering Events: Program to respond to the following conditions:
    - a. Door is about to close.
    - b. Pathway is not clear to pass.
    - c. Door is in automatic/faulted mode.
    - d. Door is closing.
  5. Display: Steady, slow-flashing, and fast-flashing modes.
  6. Programmable Features: Include the following signaling flexibility:
    - a. Adjustable timing.
    - b. Variable flashing rates.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that opening sizes, tolerances and conditions are acceptable.

### 3.2 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Complete wiring from disconnect to unit components.

- F. Install enclosure and perimeter trim.

### 3.3 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch (1.6 mm).
- C. Maximum Variation From Level: 1/16 inch (1.6 mm).
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet (3.2 mm per 3 m) straight edge.

### 3.4 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.

### 3.5 CLEANING

- A. Clean installed components.
- B. Remove labels and visible markings.

END OF SECTION

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## PART 1 GENERAL

### 1.1 SECTION INCLUDES

- A. Fiberglass reinforced plastic (FRP) sandwich panel system and accessories.
  - 1. Wall panel system.

### 1.2 RELATED REQUIREMENTS

- A. Section 072500 - Weather Barriers: Sealing perimeter frame to weather barrier installed on adjacent construction.
- B. Section 079200 - Joint Sealants: Sealing joints between perimeter frame and adjacent construction.

### 1.3 REFERENCE STANDARDS

- A. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2025.
- B. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.
- C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- F. ASTM C297/C297M - Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions; 2016 (Reapproved 2024).
- G. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.
- H. ASTM D1002 - Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal); 2010 (Reapproved 2019).
- I. ASTM D1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials; 2012 (Reapproved 2020).
- J. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates; 2025.

- K. ASTM E72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction; 2025.
  - L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
  - M. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
  - N. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).
  - O. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).
  - P. ASTM E972 - Standard Test Method for Solar Photometric Transmittance of Sheet Materials Using Sunlight; 1996 (Reapproved 2021).
  - Q. ASTM E2707 - Standard Test Method for Determining Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure; 2015.
  - R. ICC-ES AC05 - Acceptance Criteria for Sandwich Panel Adhesives; 2009, with Editorial Revision (2020).
  - S. ICC-ES AC177 - Acceptance Criteria for Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems; 2014, with Editorial Revision (2018).
  - T. ISO/IEC 17065 - Conformity Assessment - Requirements for Bodies Certifying Products, Processes and Services; 2012.
  - U. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.
  - V. NFRC 201 - Procedure for Interim Standard Test Method for Measuring the Solar Heat Gain Coefficient of Fenestration Systems Using Calorimetry Hot Box Methods; Current Edition.
  - W. NFRC 202 - Procedure for Determining Translucent Fenestration Product Visible Transmittance at Normal Incidence; Current Edition.
  - X. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.
  - Y. UL 972 - Standard for Burglary Resisting Glazing Material; Current Edition, Including All Revisions.
- 1.4 SUBMITTALS
- A. Product Data: Include construction details, material descriptions, profiles, span analysis data, and component finishes.
  - B. Shop Drawings: Include plans, elevations, and details.
  - C. Samples:



- D. Test Reports: Include the following product test reports from qualified independent testing agency indicating that each type and class of panel system complies with performance requirements indicated, based on comprehensive testing of these products. Reports completed for previous projects are also acceptable when for current manufacturer and relating to products used on this project.
1. ICC-ES Acceptance Criteria; ICC-ES AC177.
  2. Flame Spread and Smoke Developed Index; UL 723.
  3. Rate and/or Extent and Time of Burning; ASTM D635.
  4. Color Difference; ASTM D2244.
  5. Burglary Resisting Glazing; UL 972.
  6. Bond Tensile Strength of Sandwich Construction; ASTM C297/C297M.
  7. Bond Shear Strength; ASTM D1002.
  8. Panel Beam Bending Strength; ASTM E72.
  9. Panel U-factor; NFRC 100.
  10. Visible Light Transmittance (VLT), Translucent; NFRC 202 or ASTM E972.
  11. Solar Heat Gain Coefficient (SHGC); NFRC 201 calculation.
  12. Condensation Resistance Factor; AAMA 1503.
  13. Air Leakage; ASTM E283/E283M.
  14. Structural Performance; ASTM E330/E330M.
  15. Water Penetration; ASTM E331.
  16. Fire Penetration of Exterior Wall Assemblies; ASTM E2707.
  17. Daylight Modeling Report.
- E. Installation Instructions: Special installation requirements.
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.
- H. Warranty Documentation: Manufacturer's sample warranty.

## 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufactured material and products by company continuously and regularly employed in manufacture of specified materials for period of at least ten consecutive years, and with documented evidence of those materials being satisfactorily used on at least six projects of similar size, scope, and location, and at least three of these projects having been in successful use for ten years or longer.
1. Listed panel system by certification agency complying with ISO/IEC 17065, that requires quality control inspections and fire, structural, and water infiltration testing of sandwich panel systems by accredited testing agency.
  2. Conduct quality control inspections at least once each year that include manufacturing facilities, sandwich panel components, and production sandwich panels to ensure product complies with ICC-ES AC177 requirements.
- B. Installer Qualifications: Experienced installer that has been installing Kalwall panel systems for at least two consecutive years and that also provides documented evidence of satisfactory completion of projects of similar size, scope, and type.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver panel system, components and materials in manufacturer's standard protective packaging.
- B. Store panels on long edge above ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.
- C. Handle products in accordance with manufacturer's written instructions.

## 1.7 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide manufacturer's and installer's written warranties agreeing to repair or replace panel system that fails in material or workmanship within one-year after Date of Delivery. Failure of material or workmanship includes deterioration of finish on metal in excess of normal weathering; defects in accessories, insulated and translucent sandwich panels, and other components of this work.
- C. Extended Panel Warranty:
  - 1. Provide 10-year limited warranty from Date of Delivery covering delamination affecting structural strength, noticeable surface fiber exposure of exterior panel face, and abnormal color change of exterior face sheet.
- D. Extended Manufacturer's Factory-Applied Finish Warranty: 10 years from Date of Delivery.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. This specification is based on products manufactured by Kalwall Corporation. Other manufacturers may bid this project subject to compliance with performance requirements as indicated and required submittals. Listing other manufacturer's names in this specification does not constitute approval of their products or relieve them of compliance with performance requirements as indicated.
  - 1. Kalwall Corporation:
    - a. Telephone: (800) 258-9777.
    - b. Fax: (603) 627-7905.
    - c. Email: [info@kalwall.com](mailto:info@kalwall.com).
- B. Fiberglass-Sandwich-Panel Assemblies Manufacturers:
  - 1. Kalwall Corporation; Facades - Translucent Wall Systems: [www.kalwall.com/#sle](http://www.kalwall.com/#sle).
  - 2. Substitutions: Not permitted.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Manufacturer responsible for configuration and fabrication of complete panel system.
- B. Air Leakage: Limit to allowable air leakage through panel system assembly with pressure difference across assembly at 6.24 psf (300 Pa) in accordance with ASTM E283/E283M.

- C. Water Leakage: None, when measured in accordance with ASTM E331 at test-pressure difference of 15 psf (730 Pa).
- D. Structural Performance Testing by Uniform Static Air Pressure Difference: Comply with ASTM E330/E330M.
- E. Panel Beam Bending Strength: Less than 1.9 inch (48.3 mm) deflection at 30 psf (1.44 kPa) loading and 10 ft (3.05 m) span without supporting frame in accordance with ASTM E72 test method.
- F. Exterior Face Sheet Strength: Uniform in strength and impenetrable by handheld pencil and as follows:
  - 1. Ball Impact Test: Pass, based on repelling impact without fracture or tear by at least 70 ft lbf (95 Nm) from 3-1/4 inch (82.6 mm) diameter 5 lb (2.3 kg) free-falling ball in accordance with UL 972 testing.
- G. Fire Penetration Resistance of Wall Assembly: Panels comply with conditions of acceptance in accordance with ASTM E2707.
  - 1. Absence of flame penetration through wall assembly at any time.
  - 2. Absence of glowing combustion on interior surface of assembly at end of 60-minute observation period.
  - 3. Absence of flame, glow, and smoke when test is terminated prior to completion of 60-minute observation period.
- H. Condensation Resistance Factor (CRF): Minimum of 80 when measured in accordance with AAMA 1503 on bond line of thermally broken panels with translucent insulation.
- I. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 110 degrees F (43 degrees C) over 12-hour period without causing detrimental effect to system components.

## 2.3 COMPONENTS

- A. Wall System: Sandwich panels of fiberglass-reinforced-plastic (FRP), translucent face sheets laminated to grid core with mechanically interlocking I-beams and straight adhesive bonding line that covers entire width of I-beam having neat, sharp edge, and protection of exterior face sheet provided with integral, embedded-glass erosion barrier.
  - 1. Panel Width: As indicated on drawings.
  - 2. Panel Length: As indicated on drawings.
  - 3. 2-3/4 inches (70 mm) Thick, Thermally Broken Composite I-Beam Grid Core:
 

Thermoset fiberglass composite having I-beam grid core of 6063-T6 or 6005-T5 alloy and temper complying with ASTM B221 (ASTM B221M), with provisions for mechanical interlocking of muntin-mullion and perimeter, with minimum I-beam width of 1/2 inch (12.7 mm) and minimum I-beam thermal break of 1 inch (25.4 mm); poured and debridged thermal break is not permitted.

    - a. Panel Type: Flat.
    - b. Panel Fill Insulation:
      - 1) Air gap only.
    - c. Thermal Transmittance (U-factor) of FRP Sandwich Panel: 0.53 (3.01), when tested in accordance with NFRC 100.
    - d. FRP Face Sheet Color: Exterior - Crystal/Interior - Crystal.

- e. Visible Light Transmission (VLT): For face sheet combination indicated and the following panel fill material, when tested in accordance with NFRC 202 or ASTM E972.
    - 1) Air Gap: 58 percent.
  - f. Solar Heat Gain Coefficient (SHGC): When tested in accordance with NFRC 201 at 0 degrees F (minus 18 degrees C) on cold side for face sheet combination indicated and following panel fill material.
    - 1) Air Gap: 0.60, nominal.
- B. Face Sheets:
- 1. Translucent Face Sheets: Fabricated using glass fiber reinforced thermoset resins, and formulated specifically for architectural use.
    - a. Use of thermoplastic, e.g., polycarbonate and acrylic, for face sheets is not permitted.
    - b. Deformation, deflection, or dripping of face sheets upon exposure to fire is not permitted.
  - 2. Exterior Face Sheet:
    - a. Thickness: As required for system characteristics indicated; 0.070 inch (1.778 mm), minimum.
    - b. Color as indicated under system description.
    - c. Color Stability: Color of exterior face sheet to not change color more than three CIE Units DELTA E in accordance with ASTM D2244 after 5 years outdoors in South Florida weathering facing south; color stability not affected by abrasion or scratching.
  - 3. Interior Face Sheet:
    - a. Thickness: As required for system characteristics indicated; 0.045 inch (1.143 mm), minimum.
    - b. Provide exposed surface of interior face sheets with following flame spread index (FSI) and smoke developed index (SDI) in compliance with ASTM E84 or UL 723.
    - c. Provide Class CC1 face sheets with burning extent of 1 inch (25.4 mm) or less when tested in accordance with ASTM D635.
- C. Laminate Adhesive: Provided for adhering translucent panel face sheets to grid core; heat and pressure resistant resin-type adhesive for use with structural sandwich panels and designed for at least 25 years of field use, and complying with testing requirements of ICC-ES AC05.
- 1. Tensile Strength: At least 750 psi (5.17 MPa) when panel assembly is tested in accordance with ASTM C297/C297M test method after two exposures to six cycles each of accelerated aging conditions complying with ASTM D1037.
  - 2. Shear Strength: Panel adhesive complying with ASTM D1002 upon exposure to the following conditions:
    - a. Exposed to 50 percent Relative Humidity (RH) at 68 degrees F (20 degrees C), minimum shear strength of 540 psi (3,723 kPa).
    - b. Exposed to temperature of 182 degrees F (83 degrees C), minimum shear strength of 100 psi (689 kPa).
    - c. Exposed to accelerated aging complying with ASTM D1037, minimum shear strength of 800 psi (5.52 MPa), tested at room temperature.
    - d. Exposed to accelerated aging complying with ASTM D1037, minimum shear strength of 250 psi (1.72 MPa), tested at 182 degrees F (83 degrees C).

## 2.4 PERIMETER CLOSURE SYSTEM

- A. Closure Aluminum Clamp-Tite Installation System:
  - 1. Standard wall system consisting of extruded aluminum having 6063-T5 or 6063-T6 alloy and temper in compliance with ASTM B221 (ASTM B221M), and clamp-tite screw type closure system.
  - 2. Thermally broken 'poured and debridged' structural polyurethane system consisting of extruded aluminum having 6063-T5 or 6063-T6 alloy and temper in compliance with ASTM B221 (ASTM B221M), and clamp-tite screw type closure system.
- B. Water-Resistive Barriers: To suit application, nonbleeding and nonstaining; see Section 072500.
- C. Sealant for Within Translucent Assembly: As required by manufacturer; see Section 079200.
- D. Sealing Tape: Manufacturer's standard; factory applied to closure system under controlled conditions.
- E. Fasteners: Stainless steel 300 Series screws for aluminum closures; excluding final fasteners to building.
- F. Sill Flashing Sealant: Elastomeric, silicone, or polyurethane and compatible with flashing material; see Section 079200.

## 2.5 FINISHES

- A. High-Performance Organic Coatings: Manufacturer's factory-applied finish that complies with performance requirements of AAMA 2604; multiple coats, thermally cured fluoropolymer system.
  - 1. Color: As selected by Architect from manufacturer's standard line.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify substrates, supporting structure, and installation conditions.
- B. Verify dimensions, tolerances, and method of attachment with other work.
- C. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Metal Protection:
  - 1. At locations where aluminum contacts dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape as recommended by manufacturer for this purpose.
  - 2. At locations where aluminum contacts concrete, masonry, or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.

### 3.3 INSTALLATION

- A. Install panels within assembly in accordance with manufacturer's fabrication drawings and written installation instructions.
  - 1. Anchor component parts securely in place using permanent mechanical attachment system.
  - 2. Allow for thermal and mechanical movement of assembly components.
  - 3. Seal aluminum clamp-tite installation system as indicated on manufacturer's fabrication drawings and written installation instructions.
- B. Install joint sealants at perimeter joints and within panel assembly in accordance with manufacturer's fabrication drawings and written installation instructions; see Section 079200.

### 3.4 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Water Leakage Test: Test representative section of installed assembly in accordance with AAMA 501.2.
  - 1. Test area location as indicated on drawings.
  - 2. Repair or replace work that does not pass testing or that is damaged by testing and retest work.

### 3.5 CLEANING

- A. Remove protective material from prefinished aluminum surfaces.
- B. Wash down interior and exterior surfaces with solution of mild detergent in warm water, applied with soft, clean wiping cloths; remove dirt from corners and wipe surfaces clean.

### 3.6 PROTECTION

- A. Protect finished work from damage until Date of Substantial Completion.

END OF SECTION

## SECTION 087100 - DOOR HARDWARE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
  - 1. Swinging doors.
  - 2. Sliding doors.
  - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
  - 1. Mechanical door hardware.
  - 2. Electromechanical door hardware.
  - 3. Automatic operators.
  - 4. Cylinders specified for doors in other sections.
- C. Related Sections:
  - 1. Division 08 Section "Hollow Metal Doors and Frames".
  - 2. Division 08 Section "Flush Wood Doors".
  - 3. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
  - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
  - 2. ICC/IBC - International Building Code.
  - 3. NFPA 70 - National Electrical Code.
  - 4. NFPA 80 - Fire Doors and Windows.
  - 5. NFPA 101 - Life Safety Code.
  - 6. NFPA 105 - Installation of Smoke Door Assemblies.
  - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
  - 1. ANSI/BHMA Certified Product Standards - A156 Series.
  - 2. UL10C - Positive Pressure Fire Tests of Door Assemblies.

3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

### 1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
  2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
  3. Content: Include the following information:
    - a. Type, style, function, size, label, hand, and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
    - h. Warranty information for each product.
  4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
  1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:



- a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
  - b. Complete (risers, point-to-point) access control system block wiring diagrams.
  - c. Wiring instructions for each electronic component scheduled herein.
- 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
  - 1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.
- B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to

consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
  - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
  - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
  - 1. Function of building, purpose of each area and degree of security required.
  - 2. Plans for existing and future key system expansion.
  - 3. Requirements for key control storage and software.
  - 4. Installation of permanent keys, cylinder cores and software.
  - 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
  - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
  - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
  - 3. Review sequence of operation narratives for each unique access controlled opening.
  - 4. Review and finalize construction schedule and verify availability of materials.
  - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
  - 1. Structural failures including excessive deflection, cracking, or breakage.
  - 2. Faulty operation of the hardware.
  - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 4. Electrical component defects and failures within the systems operation.
- C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Hardware shall not have any visible manufacturer names on exposed materials, except cylinders, when the door is in a closed position.

### 2.2 BUTT HINGES

- A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:
  - a. Two Hinges: For doors with heights up to 60 inches.
  - b. Three Hinges: For doors with heights 61 to 90 inches.
  - c. Four Hinges: For doors with heights 91 to 120 inches.
  - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
  - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
  - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
  - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
  - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
4. Hinge Options: Comply with the following:
  - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.
5. Manufacturers:
  - a. McKinney (MK) - TA/T4A Series, 5-knuckle.

### 2.3 POWER TRANSFER DEVICES

- A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug

directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

- a. Securitron (SU) - EL-CEPT Series.

- B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

- a. McKinney (MK) - Electrical Connecting Kit: QC-R001.  
b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

- a. McKinney (MK) - QC-C Series.

2.4 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:

- a. Rockwood (RO).

- B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.

3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls shall be provided with a 10" clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:
  - a. Rockwood (RO).

## 2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
  1. Manufacturers:
    - a. Schlage (SC).
- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
  1. Threaded mortise cylinders with rings and cams to suit hardware application.
  2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
  4. Tubular deadlocks and other auxiliary locks.
  5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
  6. Keyway: Match Facility Restricted Keyway.
- C. Security Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed security cylinders and keys able to be used together under the same facility master or grandmaster key system.
  1. New security key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.
  2. Manufacturers:
    - a. Schlage (SC) - Primus Everest.
- D. Keying System: Each type of lock and cylinders to be factory keyed.
  1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
  2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.

3. Existing System: Field verify and key cylinders to match Owner's existing system.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

F. Construction Keying: Provide construction master keyed cylinders.

G. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

## 2.6 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:
  - a. Sargent Manufacturing (SA) - 8200 Series.

## 2.7 DEADLOCKS AND LATCHES

A. Mortise Deadlocks, Small Case: ANSI/BHMA A156.36, Grade 1, small case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. Steel or stainless steel bolts with a 1" throw and hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other specified locksets.

1. Manufacturers:
  - a. Sargent Manufacturing (SA) - 4870 Series.

## 2.8 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.

4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.9 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
  - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
  - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.



1. Electromechanical exit devices shall have the following functions and features:
  - a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
  - b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
  - c. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.
  - d. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.
  - e. Five-year limited warranty for electromechanical features.
2. Manufacturers:
  - a. Sargent Manufacturing (SA) - 80 Series.

## 2.10 SURFACE DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
  1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
  2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
  3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
  4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
  5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
  6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
  1. Heavy duty surface mounted door closers shall have a 30-year warranty.
  2. Manufacturers:

- a. Norton Rixson (NO) - 7500 Series.
- C. Door Closers, Surface Mounted (Cam Action): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, high efficiency door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be of the cam and roller design, one piece cast aluminum silicon alloy body with adjustable backcheck and independently controlled valves for closing sweep and latch speed.

1. Manufacturers:

- a. Norton Rixson (NO) - 2800ST Series.

2.11 SURFACE MOUNTED CLOSER HOLDERS

- A. Electromagnetic Door Holders: ANSI A156.15, Grade 1 electromagnetic door holder/releases with a minimum 25 to 40 pounds holding power and fail-safe operation; power failure releases door to close.

1. Manufacturers:

- a. Norton Rixson (RF) - 900 Series.

2.12 ARCHITECTURAL TRIM AND ACCESSORIES

- A. Door Protective Trim:

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
  - a. Stainless Steel: 300 grade, .050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
  - a. Rockwood (RO).

## 2.13 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
  - 1. Manufacturers:
    - a. Rockwood (RO).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
  - 1. Manufacturers:
    - a. Norton Rixson (RF).

## 2.14 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
  - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
  - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

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- 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. Manufacturers:

- 1. Pemko (PE).

## 2.15 ELECTRONIC ACCESSORIES

- A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

- 1. Manufacturers:

- a. Alarm Controls (AK) - CP1-1026 Series.
    - b. Securitron (SU) - DPS Series.

## 2.16 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

## 2.17 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

### 3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

### 3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
  - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
  - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  - 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
  - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
  - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

### 3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
  - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

### 3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

### 3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

### 3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

### 3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
  - 1. Quantities listed are for each pair of doors, or for each single door.
  - 2. The supplier is responsible for handling and sizing all products.

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3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer's Abbreviations:

1. MK - McKinney
2. SU - Securitron
3. RO - Rockwood
4. SA - SARGENT
5. HS - HES
6. RF - Rixson
7. NO - Norton
8. PE - Pemko
9. HD - HID
10. OT - Other

**Hardware Sets**

**Set: 14.0**

Doors: 126, 127, 131, 132, 134, 135, 137, 138, 139, 310.2, 311, 312, 313, 314, 322, 325, 326

Description: Card Reader x Elec Lever Lock, Closer

|                           |                                  |       |    |
|---------------------------|----------------------------------|-------|----|
| 3 Hinge (heavy weight)    | T4A3786 (NRP)                    | US26D | MK |
| 1 Electric Power Transfer | EL-CEPT                          | 630   | SU |
| 1 Fail Secure Lock, RX    | LC RX 8271 LNL                   | US26D | SA |
| 1 Cylinder                | Mortise / Rim (as req'd)         | US32D |    |
| 1 Closer                  | PR7500 / Reg 7500 (as req'd)     | 689   | NO |
| 1 Kick Plate              | K1050 10" 4BE CSK                | US32D | RO |
| 1 Wall Stop               | 402 / 405 (as req'd)             | US26D | RO |
| 1 Perimeter Gasketing     | S88BL (head & jambs)             |       | PE |
| 1 E-Lynx Harness (Frame)  | QC-C3000P                        |       | MK |
| 1 E-Lynx Harness (Door)   | QC-C*** (length / type as req'd) |       | MK |
| 1 Card Reader             | By Security Vendor               | BLK   | HD |
| 1 Wiring Diagram          | Elevation & Point to Point       |       | OT |
| 1 Door Position Switch    | DPS-M / W-GY (as req'd)          |       | SU |

Notes:

Door normally closed and locked.

Valid card unlocks outside lever for entry.

Key override available.

Door position switch indicates door status.

Inside lever has request to exit, signalling valid egress.

Free egress at all times.

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**Set: 15.0**

Doors: 121, 136

Description: Card Reader x Elec Lever Lock, Closer/Stop

|                           |                                  |       |    |
|---------------------------|----------------------------------|-------|----|
| 3 Hinge (heavy weight)    | T4A3786 (NRP)                    | US26D | MK |
| 1 Electric Power Transfer | EL-CEPT                          | 630   | SU |
| 1 Fail Secure Lock, RX    | LC RX 8271 LNL                   | US26D | SA |
| 1 Cylinder                | Mortise / Rim (as req'd)         | US32D |    |
| 1 Closer x Stop           | CLP7500                          | 689   | NO |
| 1 Kick Plate              | K1050 10" 4BE CSK                | US32D | RO |
| 1 Perimeter Gasketing     | S88BL (head & jambs)             |       | PE |
| 1 Door Bottom             | STC411APK36                      |       | PE |
| 1 E-Lynx Harness (Frame)  | QC-C3000P                        |       | MK |
| 1 E-Lynx Harness (Door)   | QC-C*** (length / type as req'd) |       | MK |
| 1 Card Reader             | By Security Vendor               | BLK   | HD |
| 1 Wiring Diagram          | Elevation & Point to Point       |       | OT |
| 1 Door Position Switch    | DPS-M / W-GY (as req'd)          |       | SU |

Notes:

Door normally closed and locked.

Valid card unlocks outside lever for entry.

Key override available.

Door position switch indicates door status.

Inside lever has request to exit, signalling valid egress.

Free egress at all times.

**Set: 20.0**

Doors: 312A, 312B, 313A, 313B, 314A, 314B, 322A, 322B, 325A, 325B, 326A, 326B

Description: Office

|                        |                          |       |    |
|------------------------|--------------------------|-------|----|
| 3 Hinge (heavy weight) | T4A3786 (NRP)            | US26D | MK |
| 1 Office Lock          | 8205 LNL                 | US26D | SA |
| 1 Cylinder             | Mortise / Rim (as req'd) | US32D |    |
| 1 Wall Stop            | 402 / 405 (as req'd)     | US26D | RO |

**Set: 29.0**

Doors: 323, 324

Description: Passage

|                        |                      |       |    |
|------------------------|----------------------|-------|----|
| 3 Hinge (heavy weight) | T4A3786 (NRP)        | US26D | MK |
| 1 Passage Set          | 8215 LNL             | US26D | SA |
| 1 Wall Stop            | 402 / 405 (as req'd) | US26D | RO |

END OF SECTION 087100



## SECTION 088000 - GLAZING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. All glass and glazing window units not indicated as “preglazed”.

#### 1.2 QUALITY ASSURANCE

##### A. Performance Standards

1. Watertight and airtight installation of each glass product is required, except as otherwise shown. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating sash and doors), without failure including loss or breakage of glass, failure of sealants or gaskets to remain airtight and watertight, deterioration of glazing materials and other defects in the work.
2. Comply with combined recommendations and technical reports by manufacturers of glass and glazing products as used in each glazing channel and with recommendations of Flat Glass Marketing Association, "Glazing Manual", except where more stringent requirements are indicated.
3. Install insulating glass units to comply with recommendations by Sealed Insulating Glass Manufacturer's Association, except as otherwise specifically indicated or recommended by glass and sealant manufacturers.
4. Verify and provide glazing thickness required for given sizes and project design loads, subject to minimum thicknesses indicated.

#### 1.3 ACTION SUBMITTALS

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

##### B. Sustainable Design Submittals:

1. Environmental Product Declarations (MRc2): Option 1 Environmental Product Declaration (EPD)
  - a. Submit product data or other published information verifying that this product has an EPD. Submit in accordance with Section 018113, LEED Submittals – MRc2 - Environmental Product Declarations.
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
2. Sourcing of Raw Materials (MRc3): Recycled content

- a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
- 3. Low Emitting Materials (EQc2): Ceilings, walls, thermal and acoustic insulation
  - a. Submit product data or other published information verifying compliance with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Manufacturer's claims of compliance must also state the range of total VOCs after 14 days.
  - b. Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.
- 4. Enhanced Energy Performance (EA c2)
  - a. U-value (winter and summer), exterior reflectance, solar heat gain coefficient, and visible light transmittance.

C. Glass Samples: Submit 8-inch x 8-inch sample of each glazing in color as specified.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

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

#### 1.5 FIELD CONDITIONS

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

#### 1.6 WARRANTY

- A. 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 MANUFACTURERS

- A. Subject to compliance with requirements, provide product indicated in glass schedule or comparable products by one of the following:
  1. Cardinal Glass Industries
  2. Guardian Industries Corp
  3. Oldcastle Building Envelope
  4. Saint Gobain Corp
  5. Viracon, Inc.

### 2.2 SUSTAINABLE DESIGN REQUIREMENTS

- A. Environmental Product Declarations (MRc2): Preference should be given to materials/products that meet the requirements for the LEED credit MRc2, Environmental Product Declarations.
- B. Sourcing of Raw Materials (MRc3), Recycled Content: Preference should be given to materials/products that have post- and/or pre-consumer recycled content by weight of total product.
- C. Low-Emitting Materials (EQc2): Ceilings, walls, thermal and acoustic insulation
  1. Ceilings, walls, thermal and acoustic insulation installed within the weather proofing system in this section must comply with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Refer to Sustainable Design Requirements Section 018113 for specific VOC requirements.
- D. Consider glazing with following properties.
  2. U-value (winter) <0.31
  3. Exterior reflectance <0.15
  4. Solar heat gain coefficient <0.3
  5. Visible light transmittance>0.30 and <0.40 for view glazing
  6. Visible light transmittance >0.40 and <0.70 for daylight glazing or glazing in public areas
- E. For EQc8 Views: View glazing must provide a clear image of the exterior, not obstructed by frit, fibers, patterned glazing, or added tints that distort color balance.

## 2.3 GLAZING SCHEDULE

### A. GL-1A

1. Insulated Tempered Glass (Exterior Storefronts and Curtain Walls):
2. Low-E-Coated Insulating Glass: Provide 2 sheets of glass and a desiccant dehydrated Argon gas filled space (1/2" unless otherwise noted) with -20-degree F (29 degrees C) dewpoint, with Class A sealant type edge construction to maintain a hermetic seal; fabricated to provide the following overall performance characteristics:
  - a. Basis of Design: PPG Solarban 70XL, insulating glass, max 54% VLT, Exterior Reflectance 10%, SC 0.29, SHGC 0.25, solar factor 0.28, U winter 0.28, U summer 0.26, U EN 1.50, LSG 2.16.
  - b. Outboard Glass Units: PPG Solarban, "Atlantica" float glass, Quality q3, 1/4" thick.
  - c. Inboard Glass: Clear, tempered glass, 1/4" thick.
  - d. Edge Construction: Twin primary seals of polyisobutylene; tubular aluminum or galvanized steel spacer bar frame with welded or soldered sealed corners and filled with desiccant; and secondary seal outside of bar, bonded to both sheets of glass and bar, of polysulfide, silicone or hot-melt butyl elastomeric sealant (fabricator's option).
  - e. Provide low-e coating: Pyrolytic on third surface.
  - f. Warranty: Provide manufacturer's standard 10-year product warranty on maintained hermetic seal.

### B. GL-1B

1. Insulated Glass (Exterior Storefronts and Curtain Walls):
2. Low-E-Coated Insulating Glass: Provide 2 sheets of glass and a desiccant dehydrated Argon gas filled space (1/2" unless otherwise noted) with -20-degree F (29 degrees C) dewpoint, with Class A sealant type edge construction to maintain a hermetic seal; fabricated to provide the following overall performance characteristics:
  - a. Basis of Design: PPG Solarban 70XL, insulating glass, max 54% VLT, Exterior Reflectance 10%, SC 0.29, SHGC 0.25, solar factor 0.28, U winter 0.28, U summer 0.26, U EN 1.50, LSG 2.16.
  - b. Outboard Glass Units: PPG Solarban, "Atlantica" tempered glass, Quality q3, 1/4" thick.
  - c. Inboard Glass: Clear, tempered, 1/4" thick.
  - d. Edge Construction: Twin primary seals of polyisobutylene; tubular aluminum or galvanized steel spacer bar frame with welded or soldered sealed corners and filled with desiccant; and secondary seal outside of bar, bonded to both sheets of glass and bar, of polysulfide, silicone or hot-melt butyl elastomeric sealant (fabricator's option).
  - e. Provide low-e coating: Pyrolytic on third surface.
  - f. Warranty: Provide manufacturer's standard 10-year product warranty on maintained hermetic seal.

### C. GL-2A

1. Frosted Insulated Tempered Glass (Exterior Storefronts and Curtain Walls):

2. Low-E-Coated Insulating Glass: Provide 2 sheets of glass and a desiccant dehydrated Argon gas filled space (1/2" unless otherwise noted) with -20-degree F (29 degrees C) dewpoint, with Class A sealant type edge construction to maintain a hermetic seal; fabricated to provide the following overall performance characteristics:
  - a. Basis of Design: PPG Solarban 70XL, insulating glass, max 54% VLT, Exterior Reflectance 10%, SC 0.29, SHGC 0.25, solar factor 0.28, U winter 0.28, U summer 0.26, U EN 1.50, LSG 2.16.
  - b. Outboard Glass Units: PPG Solarban, "Atlantica" float glass, Quality q3, 1/4" thick.
  - c. Inboard Glass: Etch/Sandblast, tempered glass, 1/4" thick.
  - d. Edge Construction: Twin primary seals of polyisobutylene; tubular aluminum or galvanized steel spacer bar frame with welded or soldered sealed corners and filled with desiccant; and secondary seal outside of bar, bonded to both sheets of glass and bar, of polysulfide, silicone, or hot-melt butyl elastomeric sealant (fabricator's option).
  - e. Provide low-e coating: Pyrolytic on third surface.
  - f. Warranty: Provide manufacturer's standard 10-year product warranty on maintained hermetic seal.

D. GL-3A

1. Non-Insulated Glass (Interior Storefronts and Windows)
2. PPG Clear float glass, Quality q3, 1/4" thick.

E. GL-3B

1. Non-Insulated Tempered Glass (Interior Storefronts and Windows)
2. Tempered Glass: (Heat-treated float glass), ASTM C1048; Type I; Quality Q3; Class I (clear) unless indicated otherwise; minimum 1/4" thick, horizontally temper without tong marks and with roll-wave distortion parallel to bottom edge of glass as installed.

F. GL-4A

1. Laminated Glass System (Glazed Guardrail at Exterior Patio)
2. See specification section 057313 – Glazed Decorative Metal Railings for glazed panel requirements.
  - a. Glazing to be provided by Glazed Decorative Metal Railing manufacturer and installed by Glazed Decorative Metal Railing installer.

G. GL-5

1. Electrochromic Glazing
  - a. See specification section 088800 – Electrochromic Glazing for requirements.

## 2.4 GLAZING SEALANTS AND COMPONENTS

- A. Comply with manufacturer's recommendations for selection of hardness, depending upon the location of each application, conditions at time of installation, and performance requirements as indicated. Select materials (and variation or modifications) carefully for compatibility with surfaces contacted in the installation.

## 2.5 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
  - 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  - 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
  - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
  - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.6 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Verify prepared openings and frames are in accordance with recommendations of glazing manufacturer.
- B. Verify that openings are correctly sized and within recommended tolerances.
- C. Verify that surfaces of glazing channels and recesses are clean, free of obstructions and ready to receive glazing materials.
- D. Beginning of installation constitutes acceptance of substrate.

### 3.2 INSTALLATION

- A. Clean glazing channel and other framing members to receive glass immediately before glazing. Remove coatings which are not firmly bonded to substrate. Remove lacquer from metal surfaces where elastomeric sealants are used.
- B. Apply primer or sealant to joint surfaces where recommended by sealant manufacturer.
- C. Install setting block of proper size in sill rabbet, located 1/4 of glass width from each corner. Set blocks in thin course of heel-bead compound, if any.
- D. Provide spacers inside and out, of proper size and spacing, for glass sizes larger than 50 united inches, except where gaskets or preshimmed tapes are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.
- E. Set units of glass in each series with uniformity of pattern, draw, bow, and similar characteristics.
- F. Voids and Filler Rods: Prevent exudation of sealant or compound by forming voids or installing filler rods in channel at heel of jambs and head (do not leave voids in still channels),

except as otherwise indicated and depending on light size, thickness, and type of glass and complying with manufacture's recommendations.

- G. Force sealants into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.
- H. Tool exposed surfaces of glazing liquids and compounds to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.
- I. Clean and trim excess glazing materials from glass and stops or frames promptly after installation to eliminate stains and discolorations.
- J. Where wedge shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement. Anchor gasket to stop with matching ribs or by proven adhesives, including embedment of gasket tail in cured heel bead.
- K. Gasket Glazing: Miter cut and bond ends together at corners where gaskets are used for channel glazing, so that gaskets will not pull away from corners and result in voids or leaks in glazing system.
- L. Structural Gasket Glazing: Cut zipper strips slightly long, to ensure tight closure. Lubricate zipper strip and use special tool to install zipper. Do not lubricate glazing channel or anchorage rabbet. Comply with details as shown and manufacturer's instructions, including the possible use of liquid sealants and weep holes.

### 3.3 ADJUST AND CLEAN

- A. Protect exterior glass from breakage immediately upon installation, by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces. Cure sealants for high early strength and durability.
- B. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.
- C. Wash and polish glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Comply with glass product manufacturer's recommendations for final cleaning.
- D. Clean premises of all litter, dirt, and debris created by work of this Section. Leave premises broom clean.

END OF SECTION 088000



## SECTION 092216 - NON-STRUCTURAL METAL FRAMING

### 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. Non-load-bearing steel framing systems for interior partitions.
  - 2. Back-up framing systems for exterior facades.
  - 3. Suspension systems for interior ceilings and soffits.
  - 4. Grid suspension systems for gypsum board ceilings.
  - 5. Bridging, bracing and attachments to structure.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Cold-Formed Steel (CFS) Framing, General: Design and provide in accordance with 2015 International Building Code (IBC) with State of Wisconsin Amendments, and AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and referenced supplements.
  - 1. Design for all Code required loads and load cases including Dead, Live, Wind, and Earthquake.
  - 2. Design non-load-bearing framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
  - 3. Design for support of openings and components that cover openings, including but not limited to: doors, windows, other glazing systems, and louvers. Reinforce opening framing, jambs, heads and sills, to resist tributary loads from components that cover openings.
  - 4. Design attachments to structure.
  - 5. Design wall bridging, bracing and attachments to structure.
  - 6. Include elements indicated on drawings as "Cold Formed Steel" or "CFS".
  - 7. Design partial height freestanding walls to resist "Guard" horizontal loads as defined in Building Code.
  - 8. Design backup system for exterior façade to resist all components and cladding wind loading.
  - 9. Design for 5 psf horizontal load (service level) in each direction, and proportion members for L/240 maximum deflection.

#### 1.4 DEFINITIONS

- A. CFS: Cold Formed Steel

- B. SSE: Specialty Structural Engineer. Qualified Engineer licensed in the State of Wisconsin to design CFS elements and system.

## 1.5 ACTION SUBMITTALS

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

- A. Sustainable Design Submittals:

1. Whole Building Life-Cycle Assessment (WBLCA) (MRc1):
  - a. Submit product data or other published information verifying that this product has a Product-Specific Type III EPD or an industry-wide EPD. Submit in accordance with Section 018113, 1.7 Action Submittals – MRc1 Option 2 – Whole Building Life-Cycle Assessment (WBLCA).
  - b. Include an updated Environmental Impact Calculator with submittal, which includes the following:
    - 1) Estimated declared unit material quantity.
2. Environmental Product Declarations (MRc2): Option 1 Environmental Product Declaration (EPD)
  - a. Submit product data or other published information verifying that this product has an EPD. Submit in accordance with Section 018113, LEED Submittals – MRc2 - Environmental Product Declarations.
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
3. Sourcing of Raw Materials (MRc3): Recycled content
  - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
4. Material Ingredients (MRc4): Option 1 Material Ingredient Reporting
  - a. Submit product data or other published information verifying product uses any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm): Manufacturer inventory of all ingredients or Health Product Declaration, Declare, Living Product Challenge, Cradle to Cradle v2 Basic or v3 Bronze, Product Lens Certification, Facts - NSF/ANSI 336, ANSI/BIFMA e3 Furniture Sustainability Standard; or other USGBC approved program, if applicable.
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
5. Low Emitting Materials (EQc2): Ceilings, walls, thermal and acoustic insulation

- a. Submit product data or other published information verifying compliance with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Manufacturer's claims of compliance must also state the range of total VOCs after 14 days.
  - b. Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.
- B. Shop Drawings. Include materials, sizes, dimensions, details, connections necessary to indicate and construct CFS system and interface with main structure and related components. Prepared under the supervision of CFS SSE and signed and sealed by CFS SSE.
- C. Structural Design Calculations. Performed, signed and sealed by the CFS SSE.

## 1.2 DELIVERY, STORAGE AND HANDLING

- A. Delivery: In original unopened packaging or bundles, with manufacturer's labels intact and legible.
- B. Storage: For metal studs, in enclosed shelter providing protection from damage and exposure to weather, elevated above soil and concrete on wood sleepers.
- C. Handling: Promptly remove damaged or deteriorated products from site.

## 1.3 PROJECT CONDITIONS

- A. Environmental Conditions: In cold weather and during gypsum board application and finishing, maintain temperature within building between 55 degrees F and 70 degrees F.

# PART 2 - PRODUCTS

## 2.1 SUSTAINABLE DESIGN REQUIREMENTS

- A. Whole Building Life-Cycle Assessment (WBLCA) (MRc1):
  - 1. Preference should be given to materials/products that have a Product-Specific Type III Environmental Product Declaration (EPD).
- B. Environmental Product Declarations (MRc2): Preference should be given to materials/products that meet the requirements for the LEED credit MRc2, Environmental Product Declarations.
- B. Sourcing of Raw Materials (MRc3), Recycled Content: Provide steel materials/products that have at least 25 percent post- and/or pre-consumer recycled content by weight of total product.
- C. Material Ingredients (MRc4): Preference should be given to materials/products that meet the LEED requirements for MRc4, Material Ingredient Reporting.
- D. Low-Emitting Materials (EQc2): Ceilings, walls, thermal and acoustic insulation

1. Ceilings, walls, thermal and acoustic insulation installed within the weather proofing system in this section must comply with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Refer to Sustainable Design Requirements Section 018113 for specific VOC requirements.

## 1.6 NON-LOAD-BEARING STEEL FRAMING, GENERAL

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
  1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
  2. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized, unless otherwise indicated.

## 1.7 SUSPENSION SYSTEM COMPONENTS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch-diameter wire. B. Hanger Attachments to Concrete:
  1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
    - a. Type: Cast-in-place anchor, designed for attachment to concrete forms.
- B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
- C. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.
- D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum ½-inch-wide flanges.
  1. Depth: As indicated on Drawings or 2½ inches.
- E. Furring Channels (Furring Members):
  1. Cold-Rolled Channels: 0.0538-inch bare-steel thickness, with minimum ½-inch- wide flanges, ¾ inch deep.
  2. Steel Studs: ASTM C 645.
    - a. Minimum Base-Metal Thickness: 0.0179 inch.
    - b. Depth: As indicated on Drawings.
  3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
    - a. Minimum Base Metal Thickness: As indicated on Drawings or 0.0179 inch.
  4. Resilient Furring Channels: ½-inch-deep members designed to reduce sound transmission.

- a. Configuration: Asymmetrical or hat shaped.
- F. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

## 1.8 STEEL FRAMING FOR FRAMED ASSEMBLIES

- A. Steel Studs and Runners: ASTM C 645.
  - 1. Minimum Base-Metal Thickness: 0.0179 inch or to suite size per manufacturer standard.
  - 2. Depth: As indicated on Drawings.
- B. Slip-Type Head Joints: Where indicated, provide one of the following:
  - 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
  - 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
  - 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- C. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
  - 1. Minimum Base-Metal Thickness: 0.0179 inch.
- E. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum ½-inch- wide flanges.
  - 1. Depth: As indicated on Drawings.
  - 2. Clip Angle: Not less than 1½ by 1½ inches, 0.068-inch- thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
  - 1. Minimum Base Metal Thickness: 0.0179 inch.
  - 2. Depth: As indicated on Drawings.
- G. Resilient Furring Channels: ½-inch-deep, steel sheet members designed to reduce sound transmission.
  - 1. Configuration: Asymmetrical or hat shaped.

- H. Cold-Rolled Furring Channels: 0.0538-inch bare-steel thickness, with minimum ½-inch- wide flanges.
  - 1. Depth: As indicated on Drawings.
  - 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0312 inch.
  - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch- diameter wire.
- I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1¼ inches, wall attachment flange of 7/8 inch, minimum bare-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

## 1.9 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
  - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates. B. Isolation Strip at Exterior Walls: Provide one of the following:
  - 2. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
  - 3. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

## PART 2 - EXECUTION

### 2.1 EXAMINATION

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

### 2.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
  - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (610 mm) o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

## 2.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
  1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

## 2.4 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
  1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

- a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
- 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
- 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
- 5. Do not attach hangers to steel roof deck.
- 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
- 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
- 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

## 2.5 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
  - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs at each jamb, unless otherwise indicated.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum ½-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
  - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.



4. Curved Partitions:

- a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
- b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.

D. Z-Furring Members:

1. Erect insulation (specified in Division 07 Section "Thermal Insulation") vertically and hold in place with Z-furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

- E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 092216

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## SECTION 092900 - GYPSUM BOARD

### 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. Interior gypsum board.
2. Exterior gypsum board for ceilings and soffits.
3. Tile backing panels.

- B. Related Requirements:

1. Division 8, specification section "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
2. Division 9, specification section "Tiling" for cementitious backer units installed as substrates for ceramic tile.

#### 1.3 ACTION SUBMITTALS

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

- B. Sustainable Design Submittals.

1. Whole Building Life-Cycle Assessment (WBLCA) (MRc1):
  - a. Submit product data or other published information verifying that this product has a Product-Specific Type III EPD or an industry-wide EPD. Submit in accordance with Section 018113, 1.7 Action Submittals – MRc1 Option 2 – Whole Building Life-Cycle Assessment (WBLCA).
  - b. Include an updated Environmental Impact Calculator with submittal, which includes the following:
    - 1) Estimated declared unit material quantity.
2. Environmental Product Declarations (MRc2): Option 1 Environmental Product Declaration (EPD)
  - a. Submit product data or other published information verifying that this product has an EPD. Submit in accordance with Section 018113, LEED Submittals – MRc2 - Environmental Product Declarations.
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.

3. Sourcing of Raw Materials (MRc3): Recycled content
  - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
4. Material Ingredients (MRc4): Option 1 Material Ingredient Reporting
  - a. Submit product data or other published information verifying product uses any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm): Manufacturer inventory of all ingredients or Health Product Declaration, Declare, Living Product Challenge, Cradle to Cradle v2 Basic or v3 Bronze, Product Lens Certification, Facts - NSF/ANSI 336, ANSI/BIFMA e3 Furniture Sustainability Standard; or other USGBC approved program, if applicable.
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
5. Procurement of Low Carbon Construction Materials (MRpc132)
  - a. Submit product data or other published information verifying that this product has a Product-Specific Type III EPD or an industry-wide EPD. Submit in accordance with Section 018113, 1.7 Action Submittals – MRpc132: Procurement of Low Carbon Construction Materials.
  - b. Include an updated embodied carbon calculator with submittal, which includes the following:
    - 1) Declared unit material quantity.
    - 2) Required baseline or project threshold as indicated in applicable Section.
    - 3) Realized carbon emissions (declared unit quantity x kgCO<sub>2</sub>e/declared unit)
    - 4) Verification that product GWP does not exceed the project GWP threshold as stated in the applicable specification Section.
6. Low Emitting Materials (EQc2): Ceilings, walls, thermal and acoustic insulation (only applies to products on interior of building within the weatherproofing membrane)
  - a. Submit product data or other published information verifying compliance with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Manufacturer's claims of compliance must also state the range of total VOCs after 14 days.
  - b. Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.
1. Location Valuation Factor
  - a. Submit product data or other published information verifying the location of manufacturing facility including name, address, and distance between manufacturing facility and the project site. Provide manufacturer's documentation indicating location where the base materials were extracted, mined, quarried,

harvested, etc. and the distance between this location and the project site. Also include material cost (excluding costs of installation).

- b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.

#### 1.4 DELIVERY, STORAGE AND HANDLING

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

#### 1.5 FIELD CONDITIONS

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

### PART 2 - PRODUCTS

#### 2.1 SUSTAINABLE DESIGN REQUIREMENTS

- A. Whole Building Life-Cycle Assessment (WBLCA) (MRc1):
  - 1. Preference should be given to materials/products that have a Product-Specific Type III Environmental Product Declaration (EPD).
- B. Environmental Product Declarations (MRc2): Preference should be given to materials/products that meet the requirements for the LEED credit MRc2, Environmental Product Declarations.
- C. Sourcing of Raw Materials (MRc3), Recycled Content: Preference should be given to materials/products that have post- and/or pre-consumer recycled content by weight of total product.
- D. Material Ingredients (MRc4): Preference should be given to materials/products that meet the LEED requirements for MRc4, Material Ingredient Reporting.
- B. Procurement of Low Carbon Construction Materials (MRpc132): Preference should be given to materials/products that have a Product-Specific Type III EPD, and the product reported GWP is equal or lower than the project GWP threshold of 4.75 kgCO<sub>2</sub>e/m<sup>2</sup>.

- E. Low-Emitting Materials (EQc2): Ceilings, walls, thermal and acoustic insulation
  - 1. Ceilings, walls, thermal and acoustic insulation installed within the weather proofing system in this section must comply with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Refer to Sustainable Design Requirements Section 018113 for specific VOC requirements.
- C. Location Valuation Factor: Preference should be given to building materials that are extracted, harvested or recovered, and manufactured and assembled within hundred (100) miles of the jobsite.

## 2.2 PERFORMANCE REQUIREMENTS

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

## 2.3 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.
- B. Recycled Content:
  - 1. Minimum 3 percent recycled content. If purchasing from within Colorado.
  - 2. Minimum 95 percent recycled content. If purchasing outside of Colorado.

## 2.4 INTERIOR GYPSUM BOARD

- A. Gypsum Wallboard: ASTM C 1396/C 1396M.
  - 1. Thickness: 5/8 inch (15.9 mm).
  - 2. Long Edges: Tapered.
- B. Flexible Gypsum Board: ASTM C 1396/C 1396M. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
  - 1. Thickness: 1/4 inch (6.4 mm).
  - 2. Long Edges: Tapered.

- C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
  - 1. Thickness: 5/8 inch (15.9 mm).
  - 2. Long Edges: Tapered.
- D. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
  - 1. Core: 5/8 inch (15.9 mm), Type X.
  - 2. Long Edges: Tapered.
  - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

## 2.5 SPECIALTY GYPSUM BOARD

- A. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistive capability.
  - 1. Thickness: As required by fire-resistance-rated assembly.
  - 2. Long Edges: Tapered.
- B. Glass-Mat Interior Gypsum Board: ASTM C 1658/C 1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use.
  - 1. Core: 5/8 inch (15.9 mm), Type X.
  - 2. Long Edges: Tapered.
  - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

## 2.6 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

- A. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M, with fiberglass mat laminated to both sides and with manufacturer's standard edges.
  - 1. Core: 5/8 inch (15.9 mm), Type X.

## 2.7 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
  - 1. Core: 5/8 inch (15.9 mm), Type X.
  - 2. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- B. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.
  - 1. Thickness: 5/8 inch (15.9 mm).
  - 2. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

- C. Water-Resistant Gypsum Backing Board: ASTM C 1396/C 1396M, with manufacturer's standard edges. Water-resistant gypsum backing board is not permitted for use as a backing board for tile in tub and shower areas or as wall board or ceiling panels in shower areas.
  - 1. Core: 5/8 inch (15.9 mm), Type X or Type C as required by fire-resistance-rated assembly indicated on Drawings.

## 2.8 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
  - 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. U-Bead: J-shaped; exposed short flange does not receive joint compound.
    - e. Expansion (control) joint.
    - f. Curved-Edge Cornerbead: With notched or flexible flanges.
- B. Exterior Trim: ASTM C 1047.
  - 1. Material: Hot-dip galvanized-steel sheet, plastic, or rolled zinc.
  - 2. Shapes:
    - a. Cornerbead.
    - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.
- C. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
  - 1. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
  - 2. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

## 2.9 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  - 1. Interior Gypsum Board: Paper.
  - 2. Exterior Gypsum Soffit Board: Paper.
  - 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
  - 4. 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.
  - 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.
- D. Joint Compound for Exterior Applications:
  - 1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
- E. 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.
  - 3. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

## 2.10 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
  - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
  - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
  - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- D. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- E. Thermal Insulation and Vapor Retarders: As specified in Section 072100 "Thermal Insulation."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

- I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

### 3.3 APPLYING INTERIOR GYPSUM BOARD

#### A. Install interior gypsum board in the following locations:

- 1. Wallboard Type: Vertical surfaces unless otherwise indicated.
- 2. Type X: Where required for fire-resistance-rated assembly.
- 3. Flexible Type: Apply in double layer at curved assemblies.
- 4. Ceiling Type: Ceiling surfaces.
- 5. Moisture- and Mold-Resistant Type: As indicated on Drawings.
- 6. Type C: Where required for specific fire-resistance-rated assembly indicated.
- 7. Glass-Mat Interior Type: As indicated on Drawings.

#### B. Single-Layer Application:

- 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
- 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
  - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
- 3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
- 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

#### C. Multilayer Application:

- 1. On ceilings, apply gypsum board indicated for base layers before applying face layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
- 2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- (300-mm-) long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches (400 mm) o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches (300 mm) o.c.

3.4 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

3.5 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at showers, tubs, and where indicated. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- B. Cementitious Backer Units: ANSI A108.11, at showers, tubs, and where indicated.
- C. Water-Resistant Backing Board: Install where indicated with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- D. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.6 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings.
- C. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners.
  2. LC-Bead: Use at exposed panel edges.
  3. L-Bead: Use where indicated.
  4. U-Bead: Use at exposed panel edges.
  5. Curved-Edge Cornerbead: Use at curved openings.
- D. Exterior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

### 3.7 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  2. Level 2: Panels that are substrate for tile Panels that are substrate for acoustical tile.
  3. Level 3: Not Used.
  4. Level 4: At locations receiving light-textured finishes, wallcoverings, and flat paints.
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
  5. Level 5: At locations receiving gloss and semigloss enamel paints.
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
- E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.
- G. Cementitious Backer Units: Finish according to manufacturer's written instructions.

### 3.8 APPLYING 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.
- B. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written instructions.

### 3.9 PROTECTION

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

END OF SECTION 092900

## SECTION 093033 - STONE TILING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Stone veneer wall tile.
  - a. Stacked stone veneer.
  - b. Stone slab veneer.
2. Tile backing panels.
3. Metal edge strips.

##### B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in stone tile surfaces.
2. Section 092900 "Gypsum Board" for cementitious backer units.

#### 1.2 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Dimension Stone Tile: Modular stone units less than 3/4 inch thick.
- D. Module Size: Actual tile size plus joint width.
- E. Polished Finish: Smooth surface that produces sharp, mirrorlike reflections. Reflected images of overhead fluorescent tubes have straight lines without visible distortion when viewed at arm's length.
- F. Honed Finish: Smooth, nonreflective surface similar to that produced by grinding with a 400- to 1200-grit abrasive; with a gap not exceeding 0.005 inch when faces are tested for flatness with a 24-inch straightedge.
- G. Sand-Rubbed Finish: Uniform, fine-textured surface similar to that produced by grinding with a 40-grit abrasive; with a gap not exceeding 1/32 inch when faces are tested for flatness with a 24-inch straightedge.
- H. Thermal Finish: Uniform, coarse-textured surface produced by thermal shock; with a gap not exceeding 3/16 inch when faces are tested for flatness with a 24-inch straightedge.

- I. Natural-Cleft Finish: Uneven surface produced by splitting stone along a natural cleavage plane; without visible tool marks and with a gap not exceeding 3/16 inch when faces are tested for flatness with a 24- inch straightedge.

### 1.3 SEQUENCING AND SCHEDULING

- A. Sequence stone veneer installation with other work to minimize possibility of damage and soiling during remainder of construction period.
- B. Install stone veneer and accessories only after other finishing operations, including painting, are completed.

### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals
  - 1. Low Emitting Materials (EQc2) Walls:
    - a. Submit product data or other published information verifying compliance with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Manufacturer's claims of compliance must also state the range of total VOCs after 14 days.
    - b. Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.
- C. Shop Drawings: Where required provide shop drawings that show locations of each type of stone veneer and veneer pattern (if a pattern is shown on the construction drawings). Show widths, details, and locations of expansion, contraction, control, and isolation joints in substrates and finished stone veneer surfaces.
- D. Samples for Initial Selection: For tile, grout, and accessories involving color selection.
- E. Samples for Verification:
  - 1. Full-size units of each type of stone tile in each finish required.
  - 2. Assembled Samples with grouted joints for each type of stone tile, at least 36 inches square and mounted on a rigid panel. Use grout of type and in color(s) approved for completed Work.
  - 3. Range Samples consisting of at least three full-size units of each type of stone tile, exhibiting extremes of the full range of color and other visual characteristics expected. Range Samples establish the standard by which individual stone tiles are judged.
  - 4. Metal edge strips in 6-inch lengths.

### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For stone tile veneer to include in maintenance manuals.



## 1.6 QUALITY ASSURANCE

### A. Installer Qualifications:

1. Installer employs only Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers for Project.

### 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 stone wall tile installation.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

### C. Dry-Laid Mockups: Lay out tiles in dry-laid mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Lay out mockup of stone wall tile installation.
2. Maintain dry-laid mockups in an undisturbed condition until equivalent areas of the completed Work are approved to serve as mockups.

## 1.7 DELIVERY, STORAGE, AND HANDLING

### A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.

### B. Store stone tile and cementitious materials on elevated platforms, under cover, and in a dry location.

### C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

### D. Store liquid materials in unopened containers and protected from freezing.

## 1.8 FIELD CONDITIONS

### A. Environmental Limitations: Do not install stone tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

#### A. Source Limitations for Stone Tile: Obtain each stone product type from single source from single producer.

1. For each stone product type, provide one stone variety.
  2. Where two or more stone product types are identical, except for size or finish, provide same variety for each type.
  3. Where threshold types are identical to stone tile types, except for size or finish, provide same variety.
  4. Obtain each variety of stone from same location in a single quarry with resources to provide materials of consistent quality in appearance and physical properties.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.

## 2.2 STONE PRODUCTS

- A. Varieties and Sources: Subject to compliance with requirements, provide those indicated.
- B. Provide stone products that are free of defects impairing their function for use indicated, including cracks, seams, and starts.
- C. Stone Tile Types:
1. STN-1
    - a. Finish Description: Stacked Stone
    - b. Manufacturer: Fond Du Lac Stone
    - c. Style: Stone Veneer
    - d. Color: Silver Ledgestone
    - 1) Equivalent Manufacturer; Product: Eden Valders Stone; Eden Ledgestone
  2. STN-2
    - a. Finish Description: Stone
    - b. Manufacturer: Valders Stone & Marble, Inc.
    - c. Style: Custom Cut Limestone Panel
    - d. Size: 18" x 36"
  3. STN-3
    - a. Finish Description: Stone
    - b. Manufacturer: Valders Stone & Marble, Inc.
    - c. Style: Custom Cut Limestone Panel
    - d. Size: 24" x 24"

## 2.3 SETTING MATERIALS

- A. Medium-Bed, Modified Dry-Set Mortar: Comply with requirements in ANSI A118.4. Provide product that is approved by manufacturer for application thickness of 5/8 inch.
  - 1. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
  - 2. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
- B. Improved Modified Dry-Set Mortar (Thinset): ANSI A118.15.
  - 1. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
  - 2. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
  - 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.15.

## 2.4 MISCELLANEOUS MATERIALS

- A. Trowelable Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shaped, height to match stone tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless steel, ASTM A276/A276M or ASTM A666, 300 Series exposed-edge material.
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming stone tile and grout surfaces, specifically approved for materials and installations indicated by stone tile producers and grout manufacturers.

## 2.5 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

## 2.6 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 or ASTM C1325, Type A.
  - 1. Thickness: 5/8 inch.

2. Emissions: Comply with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario.

## 2.7 SETTING MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
- B. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3.

## 2.8 GROUT MATERIALS

- A. Standard Cement Grout: ANSI A118.6.

## 2.9 FABRICATION

- A. Facial Dimensions of Stone Veneer Tile with Polished or Honed Faces: Do not vary facial dimensions from specified dimensions by more than plus or minus 1/64 inch.
- B. Facial Dimensions of Stone Veneer Tile with Sand-Rubbed Natural-Cleft or Thermal-Finished Faces: Do not vary facial dimensions from specified dimensions by more than plus or minus 1/32 inch.
- C. Thickness of Stone Veneer Tile with Natural-Cleft or Thermal Finish: Do not vary average thickness of each stone tile from specified thickness by more than plus or minus 1/16 inch.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where stone veneer 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 stone veneer 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 installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind stone tile has been completed.
  3. Verify that joints and cracks in stone veneer tile substrates are coordinated with stone tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- B. Lay out stone veneer tile patterns by marking joint lines on substrates to verify joint placement at edges, corners, doors, and other critical elements.
  - 1. Notify Architect seven days in advance of dates and times when layout will be done.
  - 2. Obtain Architect's approval of layout before starting stone tile installation.
- C. Lay out stone tiles on substrates or on an adjacent surface to establish placement of individual stone tiles for balance of color and pattern variations.
  - 1. Notify Architect seven days in advance of dates and times when layout will be done.
  - 2. Architect may relocate specific stone tiles with other stone tiles of same type and will determine final location of each stone tile within indicated patterns.
  - 3. Identify each stone tile with a temporary number marked on face of stone tile that corresponds with an identical number marked on a layout drawing and obtain Architect's approval before starting stone tile installation.
- D. Field-Applied Temporary Protective Coating: If indicated under stone tile type or needed to prevent grout from staining or adhering to exposed stone tile surfaces, precoat stone tiles with continuous film of temporary protective coating, taking care not to coat unexposed stone tile surfaces.

### 3.3 INSTALLATION OF STONE TILE

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in stone 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 stone 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:
- B. Wipe backs of stone tiles with a damp cloth to remove dirt and dust before units are installed.
- C. Extend stone 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.
- D. Accurately form intersections and returns. Perform cutting and drilling of stone tile without marring visible surfaces. Carefully grind cut edges of stone tile abutting trim, finish, or built-in items for straight aligned joints. Fit stone tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap stone tile.
- E. Finish cut stone tile edges that will not be concealed by other construction by grinding and honing cut surfaces to match factory-fabricated edges.

- F. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- G. Jointing Pattern: Lay stone tile in grid pattern unless otherwise indicated. Lay out stone tile work and center stone tile fields in both directions in each space or on each wall area. Lay out stone tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
  - 1. Where adjoining stone tiles on walls, or trim are specified or indicated to be same size, align joints.
  - 2. Where stone tiles are specified or indicated to be whole integer multiples of adjoining stone tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- H. Lay out stone tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- I. Match stone tiles within each space by selecting tiles to achieve uniformity of color and pattern. Reject or relocate stone tiles that do not match color and pattern of adjacent tiles.
- J. Mix stone tiles to achieve a uniformly random distribution of color shadings and patterns.
- K. Pattern Orientation: For stone varieties with directional pattern, orient pattern as indicated.
- L. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and stone tile. Do not saw-cut joints after installing stone tiles.
  - 1. Where joints occur in concrete substrates, locate joints in stone tile surfaces directly above them.
- M. Metal Edge Strips: Install at locations indicated.

### 3.4 INSTALLATION OF TILE BACKING PANELS

- A. Install panels and treat joints in accordance with ANSI A108.11 and manufacturer's written instructions for type of application indicated.

### 3.5 INSTALLATION TOLERANCES

- A. Variation from Plumb: For vertical joints, external corners, and other conspicuous lines, do not exceed 1/8 inch in 8 ft.
- B. Variation in Level: For horizontal joints and other conspicuous lines, do not exceed 1/8 inch in 10 ft., or 1/2 inch.
- C. Variation in Plane between Adjacent Units (Lipping): Do not exceed the following differences between faces of adjacent units as measured from a straightedge parallel to stone tiled surface:
  - 1. Units with Polished Faces: 1/64 inch.
  - 2. Units with Honed Faces: 1/64 inch.

- D. Variation in Joint Width: Do not vary joint thickness more than 1/16 inch or one-fourth of nominal joint width, whichever is less.
- E. Hand-Tight Joints: Do not exceed 1/64 inch.

### 3.6 ADJUSTING AND CLEANING

- A. Remove and replace stone veneer tile that is damaged or that does not match adjoining stone veneer tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean stone tile surfaces so they are free of foreign matter.
  - 1. Remove grout residue from stone veneer tile as soon as possible.
  - 2. Clean grout smears and haze from stone tile according to stone tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by stone tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of stone tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
  - 3. Remove temporary protective coating by method recommended by coating manufacturer and acceptable to stone tile and grout manufacturer. Trap and remove coating to prevent drain clogging. Do not remove floor sealer if used as protective coating.

END OF SECTION 093033

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## SECTION 095113 - ACOUSTICAL PANEL CEILINGS

### PART 1 - SUMMARY

#### 1.1 Section Includes:

- A. Acoustical panels, and exposed systems for ceilings.

#### 1.2 DEFINITIONS

- A. CAC: Ceiling Attenuation Class.
- B. LR: Light Reflectance Coefficient.
- C. NRC: Noise Reduction Coefficient.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below:
  - 1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
  - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- long Samples of each type, finish, and color.
- C. Delegated-Design Submittal: For design of attachment devices.
- D. Sustainable Design Submittals:
  - 1. Environmental Product Declarations (MRc2): Option 1 Environmental Product Declaration (EPD)
    - a. Submit product data or other published information verifying that this product has an EPD. Submit in accordance with Section 018113, LEED Submittals – MRc2 - Environmental Product Declarations.
    - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
  - 2. Sourcing of Raw Materials (MRc3): Recycled content
    - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).
    - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
  - 3. Sourcing of Raw Materials (MRc3): Extended producer responsibility

- a. Submit product data or other published information indicating that product manufacturer (producer) that participates in an extended producer responsibility program or is directly responsible for extended producer responsibility.
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
- 4. Material Ingredients (MRc4): Option 1 Material Ingredient Reporting
  - a. Submit product data or other published information verifying product uses any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm): Manufacturer inventory of all ingredients or Health Product Declaration, Declare, Living Product Challenge, Cradle to Cradle v2 Basic or v3 Bronze, Product Lens Certification, Facts - NSF/ANSI 336, ANSI/BIFMA e3 Furniture Sustainability Standard; or other USGBC approved program, if applicable.
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
- 5. Low Emitting Materials (EQc2): Ceilings, walls, thermal and acoustic insulation
  - a. Submit product data or other published information verifying compliance with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Manufacturer's claims of compliance must also state the range of total VOCs after 14 days.
  - b. Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.

#### 1.4 CLOSEOUT SUBMITTALS

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

#### 1.5 QUALITY ASSURANCE

- A. Acoustical Testing Agency Qualifications:
- B. An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.
- C. Source Limitations:
  - 1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
  - 2. Suspension System: Obtain each type through one source from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
  - 1. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.

## 1.6 DELIVERY, STORAGE, AND HANDLING

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

## 1.7 PROJECT CONDITIONS

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

## 1.8 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

## 1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Acoustical ceiling panels: Quantity of each ceiling panel equal to 3 percent of quantity installed; not less than one full box.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design attachment devices.

### 2.2 SUSTAINABLE DESIGN REQUIREMENTS

- A. Environmental Product Declarations (MRc2): Preference should be given to materials/products that meet the requirements for the LEED credit MRc2, Environmental Product Declarations.

- B. Sourcing of Raw Materials (MRc3), Recycled Content: Preference should be given to materials/products that have post- and/or pre-consumer recycled content by weight of total product.
- C. Sourcing of Raw Materials (MRc3), Extended producer responsibility: Preference should be given to materials/products that meet the LEED requirements for extended producer responsibility.
- D. Material Ingredients (MRc4): Preference should be given to materials/products that meet the LEED requirements for MRc4, Material Ingredient Reporting.
- E. Low-Emitting Materials (EQc2): Ceilings, walls, thermal and acoustic insulation
  - 1. Ceilings, walls, thermal and acoustic insulation installed within the weather proofing system in this section must comply with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Refer to Sustainable Design Requirements Section 018113 for specific VOC requirements.

### 2.3 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance, unless otherwise indicated.
  - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
  - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

### 2.4 ACOUSTICAL PANELS

- A. Acoustical Panel Product (ACP-1); Armstrong; Calla Vector, Item 2814.
  - 1. Classification: Provide panels complying with ASTM E 1264 for type IV, Form 2, Pattern E; Fire Class A.
    - a. Color: White.
  - 2. LR: 0.85.
  - 3. NRC: 0.80
  - 4. Edge Profile:
  - 5. Thickness 1" inch.
  - 6. Size: 24 x 24 inches.

7. General Emissions Evaluation Documentation: Products must be compliant CDPH Standard Method v1.2-2017 comply with the VOC limits in Table 4-1 of the method. Products must be evaluated using the default private office scenario.
8. Grid System: Prelude XL 15/16-inch Exposed Tee.

B. Acoustical Panel Product (ACP-2); Armstrong Lyra PB Vector

1. Classification: Provide panels complying with ASTM E 1264 for type XII, Form 2, Pattern E; Fire Class A.
  - a. Color: White.
2. LR: 0.88.
3. NRC: Not applicable.
4. Edge Profile: Non-support Edge.
5. Thickness 7/8 inches.
6. Size: 18 x 48 inches.
7. General Emissions Evaluation Documentation: Products must be compliant CDPH Standard Method v1.2-2017 comply with the VOC limits in Table 4-1 of the method. Products must be evaluated using the default private office scenario.
8. Grid System: Prelude XL 15/16 inch.

C. Ceiling Panel Product (ACP-4); White Aluminum Egg Crate

1. Surface Texture: Open Cell
2. Composition: Aluminum
3. Color: White
4. Perforation Option: 1/2" x 1/2" openings
5. Thickness: 1/2 inches.
6. Size: 24 x 48 inches.
7. Grid System: Prelude XL 15/16 inch. Perimeter trim only.
8. Minimum of 30% recycled content required for aluminum products.

D. Acoustical Panel Product (MP-2) Arktura

1. Product: Arktura Vapor; with integrated lighting
2. Pattern: Bloom
3. Color: Refer to the Finish Types schedule.
4. Thickness: 1-1/2 inches
5. Size: 24 x 48 inches.
6. Suspension: Manufacturer's complete system, including but not limited to, adjustable quick connect fasteners, stainless steel cable, hanging brackets and joining brackets.
7. Minimum of 30% recycled content required for aluminum products.

## 1.2 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 634.

- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- D. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.
  - 1. 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 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.
- E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
  - 1. Zin-Coated Carbon-Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.
  - 2. 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 diameter wire.

### 1.3 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL

- A. Grid System Product (ACP-01)
  - 1. Manufacturer: Armstrong World Industries, Inc.
  - 2. Prelude XL HD 15/16"; color White

### 1.4 METAL EDGE MOLDINGS, TRIM AND ACCESSORIES

- A. Manufacturers:
  - 1. Armstrong World Industries, Inc.
  - 2. Celotex Corporation; Architectural Ceilings Marketing Dept.
  - 3. Chicago Metallic Corporation.
  - 4. Fry Reglet Corporation.
  - 5. Gordon, Inc.
  - 6. MM Systems, Inc.
  - 7. USG Interiors, Inc.
- B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements.

1. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils (0.04 mm). Comply with ASTM C635/C635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

## PART 2 - EXECUTION

### 2.1 EXAMINATION

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

### 2.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders and comply with layout shown on reflected ceiling plans.

### 2.3 INSTALLATION, GENERAL

- 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. Suspended ceiling hangers from building's structural members and as follows:
  1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or equally effective means.
  3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
  4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post installed mechanical or adhesive anchors, or power actuated fasteners that extend through forms into concrete.

6. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
  1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
  2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
  1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
  2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
  3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

## 2.4 CLEANING

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

END OF SECTION 095113



## SECTION 095456 - WOOD PLANK CEILINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Solid-wood, plank ceilings.

#### 1.2 COORDINATION

- A. Coordinate layout and installation of wood ceilings with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

#### 1.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver ceiling components and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they are protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
1. Store materials flat and level, raised from the floor.
- B. Handle ceiling components and accessories in a manner that prevents damage.

#### 1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install interior ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
1. Store and acclimatize wood products in the spaces where they will be installed for a minimum of 72 hours immediately before ceiling installation.

### PART 2 - PRODUCTS

#### 2.1 SOLID-WOOD, PLANK CEILINGS

- A. Solid-Wood Linear Ceiling Panels: Manufacturer's standard linear panels fabricated from kiln-dried solid-wood planks free of knots and without finger joints, cracks, checks, or warp. Planks run perpendicular to furring strips.

1. Plank Species: Spruce.
2. Plank Width: 5-1/4 inches.
3. Plank Depth: 3/4 inch.
4. Plank Length: 96 inches.
5. Plank Edges: Square.
6. Substrate: Gypsum board subceiling attached to wood furring strips spaced 16inches o.c.
  - a. Plank Stain: Field finished, match CLT ceiling.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing and substrates to which suspended wood ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and with requirements for installation tolerances and other conditions affecting performance of suspended wood ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 CLEANING

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

END OF SECTION 095456

## SECTION 096513 - RESILIENT BASE AND ACCESSORIES

### 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. Resilient wall base.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each type of product indicated, in manufacturer's standard-size.
- C. Sustainable Design Submittals:
  - 1. Environmental Product Declarations (MRc2): Option 1 Environmental Product Declaration (EPD)
    - a. Submit product data or other published information verifying that this product has an EPD. Submit in accordance with Section 018113, LEED Submittals – MRc2 - Environmental Product Declarations.
    - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
  - 2. Sourcing of Raw Materials (MRc3): Recycled content
    - a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding costs of installation).
    - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
  - 3. Sourcing of Raw Materials (MRc3): Extended producer responsibility
    - a. Submit product data or other published information indicating that product manufacturer (producer) that participates in an extended producer responsibility program or is directly responsible for extended producer responsibility.
    - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
  - 4. Material Ingredients (MRc4): Option 1 Material Ingredient Reporting
    - a. Submit product data or other published information verifying product uses any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm): Manufacturer inventory of all ingredients or Health

Product Declaration, Declare, Living Product Challenge, Cradle to Cradle v2 Basic or v3 Bronze, Product Lens Certification, Facts - NSF/ANSI 336, ANSI/BIFMA e3 Furniture Sustainability Standard; or other USGBC approved program, if applicable.

- b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
- 5. Low Emitting Materials (EQc2): Flooring
  - a. Submit product data or other published information verifying compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Manufacturer's claims of compliance must also state the range of total VOCs after 14 days.
  - b. Submit product data or other published information verifying that hard surface flooring meets testing and product requirements of FloorScore. Flooring products covered by FloorScore include vinyl, linoleum, laminate flooring, wood flooring, ceramic flooring, rubber flooring, and wall base.
  - c. Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.

#### 1.4 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
- C. Install resilient products after other finishing operations, including painting, have been completed.

### PART 2 - PRODUCTS

#### 2.1 SUSTAINABLE DESIGN REQUIREMENTS

- A. Environmental Product Declarations (MRc2): Preference should be given to materials/products that meet the requirements for the LEED credit MRc2, Environmental Product Declarations.
- B. Sourcing of Raw Materials (MRc3), Recycled Content: Preference should be given to materials/products that have post- and/or pre-consumer recycled content by weight of total product.
- C. Sourcing of Raw Materials (MRc3), Extended producer responsibility: Preference should be given to materials/products that meet the LEED requirements for extended producer responsibility.
- D. Material Ingredients (MRc4): Preference should be given to materials/products that meet the LEED requirements for MRc4, Material Ingredient Reporting.

- E. Low-Emitting Materials (EQc2): Flooring: All hard surface flooring must meet testing and product requirements of FloorScore.

## 2.2 RESILIENT BASE

- A. Resilient Base:
  - 1. Manufacturer and Product:
    - a. See Architectural Finishes Schedule.
- B. Resilient Base Standard: ASTM F 1861.
  - 1. Material Requirement: Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic).
  - 2. Style: Cove (base with toe).
- C. Minimum Thickness: 3 mm (0.125 inch).
- D. Height: 102 mm (4 inches).
- E. Lengths: Cut lengths 1219 mm (48 inches) long or coils in manufacturer's standard length.
- F. Outside Corners: Job formed or preformed.
- G. Inside Corners: Job formed or preformed.
- H. Colors and Patterns: As indicated in the Architectural Finishes Schedule.
- I. Minimum 10% pre-consumer recycled content required.

## 2.3 INSTALLATION MATERIALS

- A. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
  - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    - a. Cove Base Adhesives: Not more than 50 g/L.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Do not install resilient products until they are same temperature as the space where they are to be installed.

### 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 practicable 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.

### 3.3 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

END OF SECTION 096513

## **SECTION 096519 - RESILIENT TILE FLOORING**

### **PART 1 – GENERAL**

#### **1.1 SUMMARY**

A. Section includes:

1. Rubber floor tile.

#### **1.2 ACTION SUBMITTALS**

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Samples: Units not less than 6-by-6 inch of each color and pattern of floor tile required.
- C. Installer's Qualifications: Provide letter from tile manufacturer confirming the tile installer meets the requirements provided in the "Quality Assurance" Article.

#### **1.3 CLOSEOUT SUBMITTALS**

- A. Provide manufacturer's requirement for maintenance of resilient sheet flooring as part of the Operation and Maintenance Manual as specified in Section 017823.
- B. Provide manufacturer's standard warranty for requirements listed in the "Warranty" article of this section for carpeting as part of the Operation and Maintenance Manual as specified in Section 017823.

#### **1.4 QUALITY ASSURANCE**

- A. Manufacturer: Provide resilient flooring manufactured by a firm with a minimum of 10 years' experience with resilient flooring of types specified.
1. Color Matching: Provide resilient flooring products, including wall base and accessories, from one manufacturer to ensure color matching.
  2. Manufacturer capable of providing technical training and field service representation.
- B. Installer Qualifications: Installer shall be manufacturer approved for the requirements of the project or INSTALL (International Standards & Training Alliance) resilient certified for the requirements of the project.

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

- A. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer's recommendations. Protect from damage due to weather, excessive temperatures, and construction operations.

- B. Deliver materials sufficiently in advance of installation to condition materials to the required temperature prior to installation.

#### 1.6 PROJECT CONDITIONS

- A. Maintain temperature and humidity at service levels or 20° C (68° F),  $\pm 3^{\circ}$  C (5° F), and 50% RH  $\pm 10\%$  in areas to receive resilient flooring. Specified temperature shall be maintained at least 48 hours before, during, and 72 hours after installation.

#### 1.7 WARRANTY

- A. Provide manufacturer's standard one-year warranty against defects in manufacturing and workmanship of all flooring products. Provide manufacturer's warranty as specified under each product as applicable, including limited wear, defect and conductivity.

### **PART 2 – PRODUCTS**

#### 2.1 GENERAL

- A. Performance Requirements:
  - 1. FloorScore Compliance: Resilient tile flooring shall comply with requirements of FloorScore Standard.

#### 2.2 RUBBER FLOOR TILE FOR COMMERCIAL TRAFFIC

- A. Manufacturer and Products: (No Substitution):
  - 1. See Architectural Finishes Schedule.

#### 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.

### **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 F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.



2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
  3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing.
  4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
    - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate required by the resilient floor manufacturer in a 24 hour time period.
    - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum relative humidity level percentage required by the resilient floor manufacturer.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
- E. 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.
- 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 running in one direction.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Adhere floor tiles to flooring 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.

### **3.3 CLEANING AND PROTECTION**

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.
  - 1. Apply number of coats recommended by manufacturer.
- E. Cover floor tile until Substantial Completion.

**END OF SECTION 096519**

## SECTION 096623.16 - EPOXY-RESIN TERRAZZO FLOORING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Thin-set, 3/8-inch-thick Epoxy-Resin Matrix Terrazzo flooring, base dividers and accessory strips.
  - 2. Precast Terrazzo Stair Treads.
  - 3. Related accessories and Epoxy-Sand Floor Fill.

#### 1.3 DEFINITIONS

- A. Aggregate: Marble chips, or other types of chips, along with other types of aggregate added to Mix Design to achieve desired colors, texture, and overall desired physical properties.
- B. Color Pigments: Added to Mix Design to achieve desired colors.
- C. Mix Design: A mix design is a combination of aggregates mixed with color pigments, and an epoxy color to produce desired proportions of the complete product.
- D. NTMA: National Terrazzo and Mosaic Association, Inc.
- E. Epoxy-Sand Fill Underbed: Mixture of Iron Silicate Copper Slag (Kleen Blast which is silica free), Water & Epoxy Resin to a fierily dry consistency, spread, compacted and screeded over Structural Concrete on Metal Deck Substrate to provide a flat and level surface to receive final flooring installation.

#### 1.4 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: The contractor shall conduct a conference at Project site before installation.
  - 1. Review methods and procedures related to terrazzo including, but not limited to, the following:
    - a. Inspect and discuss conditions of substrate and other preparatory work performed by other trades.

- b. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
- c. Review terrazzo mixes and patterns.
- d. Review custom terrazzo mixes, designs and patterns.
- e. Coordination with the work of other installers.

## 1.5 ACTION SUBMITTALS

- A. Product Data: Submit product data for each type of product required for installation including:
  - 1. Strip materials.
  - 2. Epoxy Fill materials and mixing ratio's.
  - 3. Sealer.
- B. Sustainable Design Submittals
  - 1. Low Emitting Materials (EQc2):
    - a. Paints and Coatings:
      - 1) For paints and coatings applied on site and inside the weatherproofing system, submit product data or other published information verifying the VOC (Volatile Organic Compound) content is less than or equal to the allowable VOC content established by the governing standards.
      - 2) For paints and coatings applied on site and inside the weatherproofing system, submit product data or other published information verifying compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Manufacturer's claims of compliance must also state the range of total VOCs after 14 days.
      - 3) Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.
- C. Shop Drawings: Prepare and submit shop drawings that include plans, elevations, sections, component details, and attachments to other work. Include terrazzo installation requirements. Show layout of the following:
  - 1. Divider strips including width of face.
  - 2. Control and expansion joint strips including width of face.
  - 3. Base and border strips including width of face.
  - 4. Accessory strips.
  - 5. Abrasive strips.
  - 6. Terrazzo patterns.
- D. Samples: Installer shall prepare and submit a maximum of four (4) samples, 6 x 6 inches in size for each color and type of terrazzo specified and indicated on the Architectural Finishes List.
- E. Samples for Verification: For each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected. Label each terrazzo sample to identify manufacturer's matrix color and aggregate types, sizes, and

proportions. Prepare Samples of same thickness and from same material to be used for the Work, in size indicated below:

1. Terrazzo: 6 x 6 square Samples.
2. Accessories: 6-inch-long Samples of each exposed strip item required.

F. Material Certificates: For each type of terrazzo material or product, from manufacturer.

#### 1.6 INFORMATIONAL SUBMITTAL

A. Qualification Data for Installer:

1. Include list of projects indicating name and location of project, name of Owner including contact information for Owner.
2. Include letter from NTMA with the name of the project and name of member stating current member status.

B. Material Certificates:

1. Epoxy Resin: For each type of resin required indicating that materials meet specification requirements by manufacturer.
2. Aggregate: For each type of aggregate required indicating compatibility with terrazzo mix, signed by aggregate supplier.
3. Epoxy Sand Fill setting bed Material.

C. Material Test Reports: For moisture and / or relative humidity of substrate.

D. Installer Certificate: Signed by manufacturer certifying that installer complies with requirements.

#### 1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: Installer shall provide General Contractor with maintenance recommendations for NTMA. General Contractor shall include documentation with the O&M Manuals.

#### 1.8 QUALITY ASSURANCE

A. Epoxy-Resin Terrazzo Standards: Installer shall furnish materials and install Epoxy-Resin Terrazzo Flooring System according to NTMA'S "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.

B. Source Limitations: Obtain primary terrazzo materials from single source from single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.

- C. Source Limitations for Aggregates: Obtain each color, grade, type, and variety of granular materials from single source with resources to provide materials of consistent quality in appearance and physical properties.
- D. Epoxy-Resin Terrazzo Flooring System Manufacturer's Qualifications:
  - 1. An Associate Member of the NTMA, experienced in manufacturing Epoxy-Resin Terrazzo Flooring Systems in accordance with NTMA standards and with a record of successful in-service performance, as well as sufficient production capacity to produce required materials.
  - 2. Engage an installer who is certified in writing by terrazzo manufacturer as qualified to install manufacturer's products.
- E. Epoxy-Resin Terrazzo Flooring System Installer's Qualifications:
  - 1. Engage an installer who is a contractor member of NTMA.
  - 2. Engage an installer who is certified in writing by terrazzo manufacturer as qualified to install manufacturer's products.
  - 3. Minimum requirements for the installation contractor are as follows. Completed three or more projects of similar size, scope and complexity within the last two years. Submit documentation listing location of work, point of contact at job site, total square footage of applied materials, and listing of both materials and equipment used.
    - a. The epoxy-resin terrazzo flooring installer's qualifications must include successful completion of the following work performed on the resinous flooring installations.
      - 1) Prepping the concrete floor surface via diamond grinding. Shot blasting is not permitted.
      - 2) Routing out joints as required by the material manufacture including repair of floor joints, cracks, and spalling.
      - 3) Application of the entire resinous floor system.
      - 4) Installation of all joint sealants.
- F. Mockups: Build mockups to verify selections made under Sample submittals and to verify the graphic design as approved by owner, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  - 1. Mock-ups will be used to verify graphic design options.
    - a. Refer to the Graphic Design Concepts and the terrazzo Floor plans. Regions are identified as Areas identifiers and are shown on the drawings. Each area will get a graphic design that needs to be approved by the owner.
      - 1) Areas A1, A2, and A4, will have an insitu-mock-up.
      - 2) These areas will be identified with 8 colors and the divider strips as indicated on the drawings.
  - 2. Build mockups for each type as indicated of terrazzo including accessories.
    - a. Size: Minimum 100 sq. ft. (9 sq. m) of typical poured-in-place flooring condition for each color and pattern in locations indicated.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.
- B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, direct sunlight, and humidity.
  1. Epoxy components shall be stored in a space where the ambient temperature can be maintained 60 and 90 deg. F. before use.

#### 1.10 FIELD CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo installation.
- B. Field Measurements: Verify actual dimensions of construction contiguous with terrazzo by field measurements before fabrication.
- C. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.
- D. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.
- E. Control and collect water and dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.

#### 1.11 GRAPHIC DESIGN AND OWNER SELECTION

- A. The Design team will create 2-3 options to be presented to the owner for the custom graphic logo areas. The Installer/Contractor is required to provide input - collaboration to the design team for the presentation to the owner. Installer/Contractor is required to attend a maximum of 4 meetings in consultation with designing the custom graphic logos areas. Meeting may be in person on-site, or Tele/Video conference call.

#### 1.12 WAARRANTY

- A. One (1) year from date of substantial completion of the Project.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations for Aggregates: Obtain each color, grade, type, and variety of granular materials from single source with resources to provide materials of consistent quality in appearance and physical properties.

### 2.2 PERFORMANCE REQUIREMENTS

- A. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.
- B. Low-Emitting Materials (EQc2):
  - 1. Paints & Coatings:
    - a. Paints and coatings applied on site within the weather proofing system in this section must comply with South Coast Air Quality Management District Rule 1113 effective February 5, 2016, OR California Air Resource Board (CARB) 2007 - Suggested Control Measures (SCM) for Architectural Coatings. Products must also comply with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Refer to Sustainable Design Requirements Section 018113 for specific VOC requirements.
- C. Ensure all floor penetrations are curbed or booted with a positive edge to ensure leak-proof solution.

### 2.3 EPOXY-RESIN TERRAZZO

- A. Manufacturers: Epoxy Matrix Terrazzo: Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrix and aggregate proportions and mixing.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Basis of Design: Crossfield Products Corp., Dex-O-Tex Division; Cheminert Terrazzo.
    - b. Terrazzo & Marble Supply Companies; Terroxy Resin System's Epoxy Matrix.
    - c. General Polymers Corporation; Terrazzo 1100.
    - d. Key Resin Company; Key Epoxy Terrazzo.
    - e. Master Terrazzo Technologies; Morricite System
  - 2. Thickness: 3/8 inch (9.525 mm) as indicated, nominal.
  - 3. Formulated Mix Designs and Logo Patterns:
    - a. Base Floor (Not areas with Graphics or Logos)



- 1) Ten (10) Colors (Mix Designs) as selected by Architect from manufacturer's full range of colors.

b. Graphics and Logos

- 1) Additional (to Base Floor Colors) Ten (10) Colors (Mix Designs) as selected by Architect from manufacturer's full range of colors.
- 2) Custom Logos and Custom Graphics are to be installed in five (5) areas on the Concourse Level.
  - a) See Drawings for graphics and the size (square footage) of each.

B. Materials:

1. Flexible Reinforcing Membrane: Manufacturer's resinous membrane for substrate-crack preparation and reflective-crack reduction. Membrane shall be installed cont. at all locations where Terrazzo Flooring is installed. "Basis-of-Design" for Crack Isolation Membrane is "Iso-Crack Epoxy Membrane by Terroxy Resin Systems", 30 mils thick, a 100 percent solid and flexible epoxy membrane in white or gray, Contractors option on color. Install per manufacturer's recommendations. Owner shows the Membrane directly under the Terrazzo Flooring at all conditions. This membrane will also roll up the walls 6" high behind the 6" high coved Terrazzo Base.
  - a. Reinforcement: Fiberglass Scrim continuous.
2. Waterproofing Membrane: Manufacturer's resinous membrane for a continuous water proofing membrane below the Crack Isolation Membrane for a complete waterproof seal above the Epoxy Sand Fill. This material will be rolled down into the area drains to provide a path for any water to be removed from that level. Membrane shall be installed cont. at all locations where Terrazzo Flooring is installed including rolled up behind the 6" Terrazzo Base along all walls. "Basis-of-Design" for the Waterproofing Membrane is the same "Iso-Crack Epoxy Membrane by Terroxy Resin Systems as installed above. Material will be the first coat of this system. d Provide a 30-mil thickness of this material, a 100 percent solid and flexible epoxy membrane in white or gray, Contractors option on color. Install per manufacturer's recommendations.
3. Primer: Manufacturer's product recommended for substrate and use indicated. "Basis of Design" for this Project is Terroxy Primer by Terroxy Resin Systems, Part A & B.
4. Epoxy-Resin Matrix: Manufacturer's standard recommended for use indicated and in color required for mix indicated.
  - a. Physical Properties without Aggregates:
    - 1) Hardness: 60 to 85 per ASTM D 2240, Shore D.
    - 2) Minimum Tensile Strength: 3000 psi per ASTM D 638 for a 2-inchspecimen made using a "C" die per ASTM D 412.
    - 3) Minimum Compressive Strength: 10,000 psiper ASTM D 695, Specimen B cylinder.
    - 4) Chemical Resistance: No deleterious effects by contaminants listed below after seven-day immersion at room temperature per ASTM D1308.
      - a) Distilled water.

- b) Mineral water.
  - c) Isopropanol.
  - d) Ethanol.
  - e) 0.025 percent detergent solution.
  - f) 10 percent sodium hydroxide.
  - g) 10 percent hydrochloric acid.
  - h) 30 percent sulfuric acid.
  - i) 5 percent acetic acid.
- b. Physical Properties with Glass Chips, Mirror Chips, Marble Chips and Aggregates, (no Mother of Pearl is allowed in the Matrix): For resin blended with Georgia white marble, ground, grouted, and cured per requirements in NTMA's "Terrazzo Specifications and Design Guide"; comply with the following:
  - 1) Flammability: Self-extinguishing, maximum extent of burning 0.25 inch per ASTM D 635.
  - 2) Thermal Coefficient of Linear Expansion: 0.0025 inch/inch per deg. F for temperature range of minus 12 to plus 140 deg. F per ASTM D 696.
- c. Bond Strength of Epoxy Terrazzo: 300 lb. failure according to field test method for surface soundness and adhesion as described in ACI Committee No. 403 Bulletin.
- d. Test Specimens:
  - 1) Mix epoxy resin according to manufacturer's recommendations and blend 1 volume of epoxy resin with 3 volumes of marble aggregate, consisting of:
    - a) 60 percent No. 1 chip.
    - b) 40 percent No. 0 chip.
  - 2) Grind and grout with epoxy resin finished to a nominal 3/8" thickness.
  - 3) Cure specimens seven (7) days at 75 deg. F. plus/minus 2 deg. and 50 percent plus/minus 2 percent relative humidity.
- 5. Aggregates: Comply with NTMA gradation standards for mix indicated and contain no deleterious or foreign matter.
  - a. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C 131.
  - b. 24-Hour Absorption Rate: Less than 0.75 percent.
  - c. Dust Content: Less than 1.0 percent by weight.
- 6. Finishing Grout: Resin based.
- 7. Fiberglass Scrim: Scrim is required under all of the new Terrazzo areas. Material shall be as recommended in writing by the Contractor responsible for the entire Terrazzo system.
- 8. Sealant: Provide Sealant as recommended by the Terrazzo Contractor in writing. The "Basis of Design" used for this Project is Sika, Sikaflex-1a a one-part polyurethane elastomeric sealant adhesive.
- 9. Epoxy Floor Fill: Fill material shall be installed above the Concrete Slab over Metal Deck Slab. Material and methods shall be as recommended in writing by the Terrazzo Contractor responsible for the complete installation. The "Basis of Design" used for the new Terrazzo Substrate is a Terroxy Resin Systems — Terroxy Fill. Install Terroxy Primer over the complete concrete slab area, install an Epoxy Sand mix up to the

appropriate level and Slopes in the field. The material is an Iron Silicate Copper Slag which is Black and mixed thoroughly at the rate of five hundred pounds (500 lbs). of Slag to eight (8) gallons of Epoxy Resin. Confirm that ratio with the Product Data Sheets provided by Terroxy and their representatives for this application. The Iron Silicate material is by Kleen Industrial Services, the product is HK402 Kleen Blast Abrasives — (16-30).

- C. Terrazzo: Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrix and glass-chip, marble chip, aggregate proportions, and mixing.
- D. Custom Mix Color and Pattern: As Scheduled in Construction Documents. Refer to current Finish Schedule Drawing.

#### 2.4 PRECAST EXPOXY-RESIN TERRAZZO STAIR TREADS

- A. Precast Terrazzo Units: Comply with NTMA's written recommendations for fabricating precast terrazzo units in sizes and profiles indicated. Reinforce units as required by unit sizes, profiles, and thicknesses and as recommended by manufacturer. Finish exposed-to-view edges and reveals to match face finish. Ease exposed edges to 1/8-inch radius.
  - 1. Stair Treads and Landings: Thickness and profiles as indicated with cast-in nosing.
  - 2. Color, Pattern, and Finish: Match adjacent poured-in-place terrazzo flooring.

#### 2.5 STRIP MATERIALS

- A. Where needed provide strip and transition accessories to meet the possible design and colors as indicated on the drawings. The type and size to be compatible with terrazzo thickness and assembly properties. Provide expansion where indicated on drawings and needed. Coordinate with slab substrate and follow the ACI 302.1 R.89 for joint placement.
- B. Divider Strips – for color options provide:
  - 1. Type A:
    - a. Material: White-zinc alloy.
    - b. Top Width: 1/8 inch (3.2 mm).
  - 2. Type B:
    - a. Material: White-zinc alloy.
    - b. Top Width: 1/4 inch (3.2 mm).
  - 3. Type C:
    - a. Material: White-zinc alloy.
    - b. Top Width: 1/2 inch (3.2 mm).
  - 4. Type D:

- a. Material: Color TBD-zinc alloy.
  - b. Top Width: 1/8 inch (3.2 mm).
- 5. Type E:
  - a. Material: Color TBD-zinc alloy.
  - b. Top Width: 1/4 inch (3.2 mm).
- 6. Type F:
  - a. Material: Color TBD-zinc alloy
  - b. Top Width: 1/2 inch (3.2 mm).
- 7. Type G:
  - a. Material: Color TBD-zinc alloy.
  - b. Top Width: 1/8 inch (3.2 mm).
- 8. Type H:
  - a. Material: Color TBD-zinc alloy.
  - b. Top Width: 1/4 inch (3.2 mm).
- 9. Type J:
  - a. Material: Color TBD-zinc alloy
  - b. Top Width: 1/2 inch (3.2 mm).
- C. Transition Strips:
  - 1. Type K:
    - a. Material: White-zinc alloy.
    - b. Top Width: 1/8 inch (3.2 mm).
  - 2. Type M:
    - a. Material: Color TBD-zinc alloy.
    - b. Top Width: 1/8 inch (3.2 mm).
- D. Control-Joint Strips: Separate, double L-type angles, positioned back-to-back, that match material and color of divider strips and in depth required for topping thickness indicated.
- E. Accessory Strips: Match divider-strip width, material, and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:
  - 1. Base-bead strips for exposed top edge of terrazzo base.
  - 2. Edge-bead strips for exposed edges of terrazzo.
  - 3. Stainless Steel cove base metal edge at Wall to Floor transitions:
    - a. Use compatible Schluter Systems Cove Base Metal Edging Trim - Stainless Steel. Size to match the existing Restrooms.

## 2.6 MISCELLANEOUS ACCESSORIES

- A. Strip Adhesive: Epoxy-resin adhesive recommended by adhesive manufacturer for this use.
  - 1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Anchoring Devices:
  - 1. Strips: Provide mechanical anchoring devices or adhesives for strip materials as recommended by manufacturer and required for secure attachment to substrate.
- C. Patching and Fill Material: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- D. Joint Compound: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- E. Crack Suppression / Isolation Membrane: As recommended, produced and supplied by approved terrazzo resin formulator, having minimum 120 percent elongation potential per ASTM D412.
- F. Resinous Matrix Terrazzo Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by sealer manufacturer for use on terrazzo type indicated.
- G. Sealer: Slip- and stain-resistant, penetrating-type sealer that is chemically neutral; does not affect terrazzo color or physical properties; is recommended by sealer manufacturer; and complies with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated.
  - 1. Surface Friction: Not less than 0.6 according to ASTM D 2047.
  - 2. Acid-Base Properties: With pH factor between 7 and 10.
  - 3. Sealers shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 4. Solvent Based Sealer Properties: Flashpoint at 80 deg. F. or above according to ASTM D56.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. Slab Flatness Tolerance: Subfloor is not to vary more than 1/8 inch from true plane in a 10-foot span. Straight edge slab flatness to be witnessed by Owner.
  - 2. Cracks: Locate cracks and joints in concrete substrates. Verify location of control joints and expansion joints in epoxy terrazzo flooring. To prevent cracks in concrete substrates transmitting through epoxy terrazzo flooring, the Contractor shall install a crack suppression membrane.

- B. The Contractor shall retain the services of an independent testing laboratory to verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to epoxy resin manufacture's written instructions.
  - 1. Perform relative humidity test using in situ probes ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
  - 2. Perform anhydrous calcium chloride test, ASTM F1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lbs. of water / 1000 sq. ft. of slab area in 24 hours.
- C. Alkalinity and Adhesion Testing: The Installer shall retain the services of an independent testing laboratory to verify that concrete substrates have "ph" levels within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- D. The Installer shall be responsible for correcting non-conforming concrete substrates using materials compatible with epoxy terrazzo flooring system.
  - 1. Materials used to correct non-conforming conditions must be compatible with the selected epoxy system and be approved by the manufacturer of epoxy resin materials.
- E. The Installer shall proceed with installation only after unsatisfactory conditions, including levelness tolerances, cracking, excessive moisture vapor transmission and alkalinity have been corrected.

### 3.2 PREPARATION

- A. Clean substrates of substances, including oil, grease, and curing compounds, adhesives, that might impair terrazzo bond. Provide clean, dry, and neutral substrate for terrazzo application.
- B. Concrete Slabs:
  - 1. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with terrazzo.
    - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup. Surface preparation results should achieve a CSP3-CSP5 profile.
    - b. Concrete floor shall receive a steel trowel finish.
    - c. Concrete shall be cured a minimum of 28 days. No curing agents are to be used in areas to receive terrazzo.
    - d. Concrete slab shall have an efficient moisture vapor barrier directly under the concrete slab.
    - e. Repair damaged and deteriorated concrete according to terrazzo manufacturer's written recommendations.
    - f. Use patching and fill material to fill holes and depressions in substrates according to terrazzo manufacturer's written instructions.

- g. Installer shall provide moisture mitigation materials according to instructions and recommendations of the moisture mitigation materials manufacturer.
  - h. Installer shall provide flexible epoxy crack isolation / suppression membrane.
- C. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
  - D. Protect other work from water and dust generated by grinding operations. Control water and dust to comply with environmental protection regulations.
    - 1. Erect and maintain temporary enclosures and other suitable methods to limit water damage and dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

### 3.3 EPOXY-MATRIX TERRAZZO INSTALLATION

- A. Comply with NTMA's written recommendations for terrazzo and accessory installation.
- B. Place Epoxy Sand Floor Fill: at the appropriate thickness and slopes to provide the new Substrate for the Epoxy Flooring Material. Install as stated in section "2.3.B.9" above. Structural base concrete slab shall be shot blasted to create an approved surface by the installer before the Primer and Epoxy Sand Fill material can be installed.
- C. Place, rough grind, grout, cure grout, fine grind, and finish terrazzo according to manufacturer's written instructions and NTMA's "Terrazzo Specifications and Design Guide."
- D. Installation Tolerance: Limit variation in terrazzo surface from level to 1/8 inch in 10 feet; noncumulative. Straight edge slab flatness to be witnessed by Owner
- E. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.
- F. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.
- G. Waterproofing Membrane & Flexible Crack Isolation Reinforcing Membrane:
  - 1. Prepare and prefill substrate cracks with membrane material.
  - 2. Install membranes to produce full substrate coverage in areas to receive terrazzo.
  - 3. Waterproofing Membrane shall be installed cont. over primed Epoxy Sand Fill material
  - 4. Reinforce Crack Isolation Membrane with fiberglass scrim, this will be the second coat of Epoxy over the Waterproofing Membrane.
  - 5. Prepare membrane according to manufacturer's written instructions before applying substrate primer.
- H. Primer: Apply cont. to top of Bed blasted existing Concrete Structural Slab. Apply cont. to top of Epoxy-Sand Fill Underbed before installing waterproofing membrane according to manufacturer's written instructions.
- I. Strip Materials: Contractor shall install strip materials as follows:

1. Divider and Control-Joint Strips:
    - a. Locate divider strips in locations indicated.
    - b. Install control-joint strips back-to-back in locations indicated.
    - c. Install strips in epoxy adhesive setting bed without voids below strips.
  2. Accessory Strips: Install as required to provide a complete installation.
- J. Placing Terrazzo:
1. Prime subfloor in accordance with manufacturer's recommendations.
  2. Proportion and thoroughly blend the materials.
  3. Place mixture to achieve specified thickness.
- K. Poured in Place Terrazzo Base: Contractor shall provide mix color for terrazzo base to match approved sample and mockup.
1. Contractor shall place and finish terrazzo base at the same time the terrazzo floor is being installed. Refer to the Details and Elevations shown on the drawings that indicate a continuous coved base design. The Base will be 6 inch high with a 3/4-inch cove.
- L. Finishing: Contractor shall finish the terrazzo topping as follows:
1. Rough Grinding:
    - a. Grind with 24 or finer grit stones or with comparable diamond abrasives.
    - b. Follow initial grind with 60 / 80 grit stones or with comparable diamond abrasives.
  2. Grouting:
    - a. Clean terrazzo with clean water and rinse. Allow to dry.
    - b. Apply epoxy grout per manufacturer's instructions.
    - c. Allow Grout to cure.
- M. Fine Grinding / Polishing: Grind with 120 grit or with comparable diamond abrasives until all grout is removed from surface.
- N. Terrazzo Cleaning: Contractor shall clean finished terrazzo as follows:
1. Remove grinding residue from terrazzo surface.
  2. Wash terrazzo surfaces immediately after final grinding of terrazzo flooring with water and allow surfaces to dry thoroughly.
- O. Sealing: Contractor shall seal terrazzo according to sealer manufacturer's written instructions. The Sealer shall be Spartan Terra Glaze Acrylic Polymer Terrazzo Seal — 5810 as specified in previous line items of this Section. Seal surfaces according to NTMA's written recommendations.



### 3.4 APPLICATION OF SEALER

- A. Seal surfaces using four (4) coats of specified proprietary acrylic polymer sealer in strict accordance with manufacturer's written installation instructions and applicable recommendations of the NTMA, before turning over area to Owner.
- B. Upon Owner's acceptance at each Phase, Owner's custodial staff will clean and apply additional sealers/finishes as necessary and burnish flooring (machine buff) to achieve sealer and acceptable surface finish/sheen before each Phase is re-opened to public traffic. This applies to all of the Poured-in-Place Terrazzo installations.

### 3.5 PRECAST TERRAZZO INSTALLATION

- A. Install precast terrazzo units using method recommended by NTMA and manufacturer unless otherwise indicated.
- B. Do not install units that are chipped, cracked, discolored, or not properly finished.
- C. Seal joints between units with joint compound matching precast terrazzo matrix.

### 3.6 REPAIR

- A. Cut out and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.
- B. Deep scratches and gouges shall be removed by established grinding procedure, or should be routed out, cleaned and filled. The holes, cracks or chips should be allowed to thoroughly dry prior to using an approved fortified color matched Portland cement and aggregate to fill in repair area and make flush with existing terrazzo surface. Allow proper cure time prior to continuation of polishing process in repair areas.
- C. Water Recycling and Slurry Disposal: All slurry generated by contractor shall be picked up and dehydrate 3d to remove all water. Slurry solid shall then be removed and disposed of in accordance with local and state codes.
- D. Edge Work: All edges shall be polished to blend with entire floor so that final finish is equal in appearance.

### 3.7 CURING, CLEANING AND PROTECTION

- A. Cure epoxy matrix terrazzo flooring materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process. Close application area for a minimum of 24 hours.
- B. Cleaning:
  - 1. Remove grinding dust from installation and adjacent areas.

2. Wash surfaces with cleaner according to NTMA's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow them to dry thoroughly.

C. Sealing:

1. Seal surfaces according to NTMA's written recommendations.
2. Apply sealer according to sealer manufacturer's written instructions.
3. Provide Sealer to all epoxy matrix terrazzo flooring.

D. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION 096623.16

## SECTION 096813 - TILE CARPETING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section includes:

1. Modular, tufted carpet tile. (CPT-1 thru CPT-5)

B. Related Requirements:

1. Section 096513 "Resilient Base and Accessories: for resilient wall base and accessories installed with carpet.

#### 1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to carpet installation including, but not limited to, the following:
  - a. Review delivery, storage, and handling procedures.
  - b. Review ambient conditions and ventilation procedures.
  - c. Review subfloor preparation procedures.

#### 1.3 ACTION SUBMITTALS

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

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include installation recommendations for each type of substrate.

B. Sustainable Design Submittals.

1. Environmental Product Declarations (MRc2): Option 1 Environmental Product Declaration (EPD)
  - a. Submit product data or other published information verifying that this product has an EPD. Submit in accordance with Section 018113, LEED Submittals – MRc2 - Environmental Product Declarations.
  - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
2. Sourcing of Raw Materials (MRc3): Recycled content

- a. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight.
    - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
  3. Sourcing of Raw Materials (MRc3): Extended producer responsibility
    - a. Submit product data or other published information indicating that product manufacturer (producer) that participates in an extended producer responsibility program or is directly responsible for extended producer responsibility.
    - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
  4. Material Ingredients (MRc4): Option 1 Material Ingredient Reporting
    - a. Submit product data or other published information verifying product uses any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm): Manufacturer inventory of all ingredients or Health Product Declaration, Declare, Living Product Challenge, Cradle to Cradle v2 Basic or v3 Bronze, Product Lens Certification, Facts - NSF/ANSI 336, ANSI/BIFMA e3 Furniture Sustainability Standard; or other USGBC approved program, if applicable.
    - b. Include information on USGBC's v4.1 Building Products Calculator or use Green Badger to track and document this credit.
  5. Low Emitting Materials (EQc2): Flooring
    - a. Submit product data or other published information verifying the carpet meets the testing and product requirements of the Carpet and Rug Institute's Green Label Plus program, the carpet cushion meets the testing and product requirements of the Carpet and Rug Institute's Green Label program.
    - b. Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.
- C. Shop Drawings: Show the following:
1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
  2. Carpet tile type, color, and dye lot.
  3. Type of subfloor.
  4. Type of installation.
  5. Pattern of installation.
  6. Pattern type, location, and direction.
  7. Pile direction.
  8. Type, color, and location of insets and borders.
  9. Type, color, and location of edge, transition, and other accessory strips.
  10. Transition details to other flooring materials.
- D. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
  2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch- long Samples.
- E. Product Schedule: For carpet tile. Refer to Finishes Plan (Drawings).
- F. Qualification Data: For Installer.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
  2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.
- B. Warranty: Signed warranty with date initiated at Substantial Completion or later.

#### 1.5 QUALITY ASSURANCE

- B. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- C. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- D. Mockups: Before installing carpet tile, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site to review methods and procedures related to carpet tile installation including, but not limited to, the following:
1. Review delivery, storage, and handling procedures.
  2. Review ambient conditions and ventilation procedures.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling."

## 1.7 PROJECT CONDITIONS

- A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."
- B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

## 1.8 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
  - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
  - 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, moisture barrier, wick-back, excess static discharge of 3.0 KV when tested under the standard AATCC-134 Test Method, and delamination.
  - 3. Warranty Period: 10 years from date of Substantial Completion.

## 1.9 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Provide carpet materials and adhesives that are compatible with the following substrates:
  - 1. Cast-in-place concrete slabs.

## 2.2 TILE CARPETING SCHEDULE

A. See Interior Finishes Schedule and Plan(s) on the drawings for carpeting requirements:

1. Basis of Design Manufacturers and Products
2. Color
3. Pattern
4. Size

## 2.3 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
- C. Metal Edge/Transition Strips: Extruded aluminum with anodized finish of profile and width shown, of height required to protect exposed edge of carpet, and maximum lengths to minimize running joints.
1. Refer to Section 096513 "Resilient Base and Accessories".

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Examine carpet for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 03 30 00 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
    - b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

- c. Perform additional moisture tests recommended in writing by adhesive and carpet manufacturers. Proceed with installation only after substrates pass testing.
  - d. Where necessary to reduce slab moisture for installation of carpet flooring, provide vapor emission control treatment acceptable to carpet manufacturer and compatible with products, and modify environmental conditions within acceptable range for specified Work and work sequence as required to maintain Project Schedule at no additional cost to the Owner.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
  - 1. Grind high spots and fill low spots to produce a maximum 1/8-inch deviation in any direction when checked with a 10-foot straight edge.
  - 2. Finished concrete floor shall comply with requirements specified in this Section and in Section 033000 "Cast-in-Place Concrete". Contractor, at no cost to Owner, shall provide corrective measures required to comply with floor level and flatness within acceptable limits specified.
  - 3. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

### 3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by manufacturer and indicated.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns indicated on Drawings and recommended in writing by carpet manufacturer.



- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. Install pattern parallel to walls and borders.

### 3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
  - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
  - 2. Remove yarns that protrude from carpet tile surface.
  - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protection of Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

- A. Surface preparation.
- B. Exterior painting and coating systems.
- C. Scope:
  - 1. Finish surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
    - a. Exterior:
      - 1) Masonry: Concrete masonry units (CMU), cinder or concrete block.
      - 2) Metal, Miscellaneous: Iron, ornamental iron, structural iron and steel, ferrous metal.

### 1.2 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.
- B. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2020.
- C. SCAQMD 1113 - Architectural Coatings; 1977, with Amendment (2016).
- D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- E. SSPC-SP 2 - Hand Tool Cleaning; 2024.
- F. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

### 1.3 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Samples: Submit four paper draw down samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
- C. Maintenance Data: Submit coating maintenance manual including finish schedule showing where each product/color/finish was used, product technical data sheets, safety data sheets (SDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements for additional provisions.
  - 2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
  - 3. Label each container with color in addition to manufacturer's label.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, product name, product code, color designation, VOC content, batch date, environmental handling, surface preparation, application, and use instructions.
- C. Paint Materials: Store at a minimum of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.
- D. Handling: Maintain a clean, dry storage area to prevent contamination or damage to materials.

#### 1.5 FIELD CONDITIONS

- A. Do not apply materials when environmental conditions are outside the ranges required by manufacturer.
- B. Follow manufacturer's recommended procedures for producing the best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Basis of Design Products: Subject to compliance with requirements, provide Sherwin-Williams Company (The) products indicated; [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).

#### 2.2 PAINTINGS AND COATINGS

- A. General:
  - 1. Provide factory-mixed coatings unless otherwise indicated.
  - 2. Do not reduce, thin, or dilute coatings or add materials to coatings unless specifically indicated in manufacturer's instructions.
- B. Volatile Organic Compound (VOC) Content:
  - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
    - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
    - b. SCAQMD 1113 Rule.
    - c. CARB (SCM).
    - d. Ozone Transport Commission (OTC) Phase II Model Rule, Architectural and Industrial Maintenance Coatings; [www.otcair.org](http://www.otcair.org).
    - e. Architectural coatings VOC limits of State in which the project is located.
- C. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

## 2.3 PAINT SYSTEMS - EXTERIOR

- A. Masonry: Concrete masonry units (CMU), cinder or concrete block.
  - 1. Latex Systems:
    - a. Satin Finish:
      - 1) 1st Coat: Sherwin-Williams PrepRite Block Filler, B25W25: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
        - a) 75 to 125 sq ft/gal (1.8 to 3.1 sq m/L).
      - 2) 2nd and 3rd Coat: Sherwin-Williams A-100 Exterior Latex Satin, A82 Series: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
        - a) 4 mils wet, 1.5 mils dry per coat.
- B. Metal, Miscellaneous: Iron, ornamental iron, structural iron and steel, ferrous metal.
  - 1. Alkyd Systems, Water Based:
    - a. Gloss Finish:
      - 1) 1st Coat: Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
        - a) 5 mils wet, 2 mils dry per coat.
      - 2) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
        - a) 4 to 5 mils wet, 1.4 to 1.7 mils dry per coat.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.

### 3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove mildew from impervious surfaces by scrubbing with solution of water and bleach. Rinse with clean water and allow surface to dry.
- D. Concrete Masonry Units: Remove efflorescence and chalk.
- E. Galvanized Surfaces:
  - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
  - 2. Prepare surface according to SSPC-SP 2.
- F. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Prime bare steel surfaces.
3. Remove rust, loose mill scale, and other foreign substances using methods recommended by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

### 3.3 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions.
- C. Apply coatings at spread rate required to achieve manufacturer's recommended dry film thickness.
- D. Regardless of number of coats specified, apply additional coats until complete hide is achieved.

### 3.4 PRIMING

- A. Apply primer to all surfaces unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.
- B. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to top coat manufacturers.

### 3.5 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Clean surfaces immediately of overspray, splatter, and excess material.
- C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

### 3.6 PROTECTION

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

END OF SECTION

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## SECTION 099113 - EXTERIOR PAINTING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section includes:

1. Surface preparation and the application of paint systems on exterior substrates. Provide labor, materials, tools and other equipment, services and supervision required to complete exterior painting work as indicated on Finish Schedules, Drawings and Specifications. Utilize exterior paint systems for exterior substrates.

#### 1.2 DEFINITIONS

- A. Gloss Level 1: Matte or Flat Finish: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3: Eggshell Finish: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- C. Gloss Level 4: Satin Finish: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5: Semi-Gloss Finish: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6: Gloss Finish: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7: High Gloss Finish: More than 85 units at 60 degrees, according to ASTM D 523.

#### 1.3 REFERENCES

A. ASTM International:

1. ASTM C834 – Latex Sealing Compounds.
2. ASTM D16 – Standard Terminology Relating to Paint, Varnish, Lacquer, and Related Products.
3. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.

B. Architectural Painting Specification Manual by the Master Painters Institute (MPI), including Evaluation, Systems, Preparation and Approved Product List (MPI Manual).

C. Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).

#### 1.4 SYSTEM DESCRIPTION

- A. Painting and finishing shall include all coating systems materials, including primers, emulsions (except asphalt based), enamels, stains, sealers and fillers and other applied materials, whether used as prime, intermediate or finish coats.
- B. Materials to Finish:
  - 1. Unless otherwise indicated in documents, all Work receives painting and finishing. Consult Drawings, Schedules, and other Specification Sections for complete requirements. Where materials required to be finished are not indicated in the Finish Schedule or Drawings, refer to the MPI Manual for the appropriate finish; provide premium grade finish.
  - 2. Existing construction receives painting and finishing as indicated. Consult Drawings, Schedules, and other Specification Sections for complete requirements. Where materials required to be finished are not indicated in the Finish Schedule or Drawings, refer to the MPI Manual for the appropriate finish; provide premium grade finish.
- C. Materials Not to Finish
  - 1. Finished metal surfaces of anodized aluminum, polyvinylidene fluoride (PVDF), stainless steel, chromium plate, copper, bronze, and similar finished metals will not require finish painting, except as indicated otherwise.
  - 2. Glass and plastic, except as noted otherwise.
  - 3. Materials having complete factory finish or that require installer finishing, except as indicated otherwise. Shop priming of ferrous metal items and shop-fabricated components is included under various Sections.
  - 4. Walls and ceilings in concealed and generally inaccessible areas, above suspended ceilings, furred areas, pipe spaces, duct shafts, and the like.
  - 5. Acoustical ceiling tile and their suspension systems, unless indicated otherwise.
  - 6. Concrete floors, except as indicated to be painted.
  - 7. CMU walls, except as indicated on Drawings to be painted.
  - 8. Moving parts of operating units, moving parts of mechanical and electrical units, linkages, sensing devices, motor, and fan shafts, and the like.
  - 9. Code-required labels such as Underwriter's Laboratories, Factory Mutual, and Warnock-Hershey or any equipment identification, performance rating, name or nomenclature plates, and the like.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Step coats on Samples to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.



- C. Product List: For each product indicated, include the following:
  - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint: 5 percent, but less than 1 gallon of each material and color applied.

#### 1.7 QUALITY ASSURANCE

- A. Quality Standard:
  - 1. Work of this Section shall conform to not less than the minimum standards for material and Work including inspection and warranty requirements set forth in the MPI Manual.
  - 2. Work of this Section shall be of the grade and finish system in Accordance with the MPI as indicated in Painting and Finish Schedule in Part 3 of this Section.
- B. Qualifications:
  - 1. Product Manufacturers: As listed in Part 2 of this Section.
- C. Regulatory Requirements:
  - 1. Comply with applicable federal, state, and local requirements and publications pertaining to environmental protection and the protection of the health and safety of workers, visitors to the site, and persons occupying the Project Site.
  - 2. Where conflict among requirements or with this specification exists, the most stringent shall govern.

#### 1.8 DELIVERY STORAGE, AND HANDLING

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

#### 1.9 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperature are between 50 and 95 deg F.
- B. Perform no exterior painting work unless environmental conditions are within MPI and paint manufacturer's requirements or until adequate weather protection is provided. Where required,

suitable weatherproof covering and sufficient heating facilities shall be in place to maintain minimum ambient air substrate temperatures for 24 hours before, during and after paint application.

- C. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
- D. Perform no painting or decorating work when the maximum moisture content of the substrate exceeds:
  - 1. 15 percent for wood.
  - 2. 12 percent for plaster and gypsum board.
- E. Conduct all moisture tests using a properly calibrated electronic Moisture Meter.

#### 1.10 SPECIAL PROJECT WARRENTY

- A. Warranty: Furnish a two (2)-year Maintenance Bond. The Maintenance Bond shall warrant that all painting work has been performed in accordance with accepted industry quality standards.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Behr Paint Company
- B. Benjamin Moore & Co.
- C. Kelly-Moore Paint Company, Inc.
- D. PPG Paints.
- E. Sherwin-Williams

#### 2.2 PAINT PRODUCTS

- A. MPI Standards: Provide products complying with MPI standards indicated and listed in its "MPI Approved Products List."
- B. Source Limitations: Obtain paint from single source from single manufacturer.
- C. Material Compatibility:
  - 1. Provide materials for use with 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.

- D. Other materials such as linseed oil, shellac, thinners, solvents, etc., shall be the highest quality product, compatible with paint materials being used as required.
- E. VOC Content: For field applications, verify paints and coatings comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
  - 1. Flat Paints and Coatings: 50 g/L.
  - 2. Nonflat Paints and Coatings: 50 g/L.
  - 3. Dry-Fog Coatings: 150 g/L.
  - 4. Primers, Sealers, and Undercoaters: 100 g/L.
  - 5. Rust-Preventative Coatings: 100 g/L.
  - 6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
  - 7. Pretreatment Wash Primers: 420 g/L.
  - 8. Shellacs, Clear: 730 g/L.
  - 9. Shellacs, Pigmented: 550 g/L.

## 2.3 EQUIPMENT

- A. Painting and Decorating Equipment: To best trade standards for type of product and application.
- B. Spray Painting Equipment: Of ample capacity, suited to the type and consistency of paint or coating being applied and kept clean and in good working order at all times.

## 2.4 MIXING AND TINTING

- A. Unless otherwise specified herein or pre-approved, all paint shall be ready-mixed and pre-tinted. Re-mix all paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and color and gloss uniformly.
- B. Paste, powder, or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.
- C. Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.
- D. If required, thin paint for spraying according to strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to consultant.

## 2.5 FINISH AND COLOR

- A. Refer to Finish Schedule on Drawings for identification and location of colors.

## 2.6 GLOSS AND SHEEN RATINGS

- A. As indicated in Part 3 of this Specification Section.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows.
  - 1. Concrete: 12 percent.
  - 2. Masonry (Clay and CMU): 12 percent
  - 3. Wood: 15 percent.
  - 4. Portland Cement Plaster: 12 percent.
  - 5. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. 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 trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity or surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

- F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Wood Substrates:
  - 1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
  - 2. Sand surfaces that will be exposed to view, and dust off.
  - 3. Prime edges, ends, faces, undersides, and backsides of wood.
  - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations.
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
  - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
  - 4. Do not paint over labels or independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Exterior Mechanical and Electrical Equipment:
  - 1. General: Exterior painting and finishing of mechanical and electrical items includes all exposed items whether factory-finished or not.

2. Additional painting and finishing of mechanical and electrical items is indicated in Divisions 23 and 26.

### 3.4 FIELD QUALITY CONTROL

- A. Tolerances: Final application shall match color and texture of approved samples and shall be smooth, uniform in appearance, color, texture, sheen, and shall be free of runs, sags, holidays, lap marks, air bubbles, pin holes, and other detrimental effects in accordance with requirements of the MPI and this Specification.

### 3.5 CLEANING AND PROTECTING

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spatter 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.

### 3.6 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. Prime Coat: Latex, exterior, matching topcoat.
    - c. Intermediate Coat: Latex, exterior, matching topcoat.
    - d. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
  2. Water-Based Light Industrial Coating System MPI EXT 3.1C:
    - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
    - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
    - c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
- 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.
  2. Latex Deck Coating System MPI EXT 3.2B:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat: Deck coating, latex, MPI #127.
- 3. Alkyd Floor Enamel System MPI EXT 3.2D:
  - a. Prime Coat: Floor enamel, matching topcoat.
  - b. Intermediate Coat: Floor enamel, matching topcoat.
  - c. Topcoat: Floor enamel, alkyd, gloss (MPI Gloss Level 6), MPI #27.
  - d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
- 4. Clear Water-Based Sealer System MPI EXT 3.2H:
  - a. Prime Coat: Sealer, water based, matching topcoat.
  - b. Intermediate Coat: Sealer, water based, matching topcoat.
  - c. Topcoat: Sealer, water based, for concrete floors, MPI #99.
- 5. Clear Sealer System MPI EXT 3.2G:
  - a. Prime Coat: Sealer, solvent based, matching topcoat.
  - b. Intermediate Coat: Sealer, solvent based, matching topcoat.
  - c. Topcoat: Sealer, solvent based, for concrete floors, MPI #104.

C. Clay Masonry Substrates:

- 1. Latex System MPI EXT 4.1A:
  - a. Prime Coat: Latex, exterior, matching topcoat.
  - b. Intermediate Coat: Latex, exterior, matching topcoat.
  - c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
- 2. High-Build Latex System MPI EXT 4.1H: Dry film thickness of not less than 10 mils.
  - a. Prime Coat: As recommended in writing by topcoat manufacturer.
  - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
  - c. Topcoat: Latex, exterior, high build, MPI #40.
- 3. Water-Based Light Industrial Coating System MPI EXT 4.1C:
  - a. Prime Coat: Light industrial coating, exterior, water based, matching topcoat.
  - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
  - c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.

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. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.

E. Steel and Iron Substrates:

- 1. Alkyd System MPI EXT 5.1D:
  - a. Prime Coat: Primer, alkyd, anticorrosive, for metal, MPI #79.
  - b. Prime Coat: Primer, metal, surface tolerant, MPI #23.
  - c. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
  - d. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.
- 2. Aluminum Paint System MPI EXT 5.1K:
  - a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79.

- b. Prime Coat: Shop primer specified in Section where substrate is specified.
- c. Intermediate Coat: Aluminum paint, matching topcoat.
- d. Topcoat: Aluminum paint, MPI #1.

F. Galvanized-Metal Substrates:

- 1. Alkyd System MPI EXT 5.3B:
  - a. Prime Coat: Primer, galvanized, cementitious, MPI #26.
  - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
  - c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.
- 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. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
- 2. Water-Based Light Industrial Coating System MPI EXT 5.4G:
  - a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
  - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
  - c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
- 3. Alkyd System MPI EXT 5.4A:
  - a. Pretreatment Prime Coat: Vinyl wash primer, MPI #80.
  - b. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
  - c. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
  - d. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.

H. Stainless-Steel Substrates:

- 1. Latex System MPI EXT 5.6F:
  - a. Prime Coat: Primer, bonding, solvent based, MPI #69.
  - b. Intermediate Coat: Latex, exterior, matching topcoat.
  - c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
- 2. Water-Based Light Industrial Coating System MPI EXT 5.6G:
  - a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
  - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
  - c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
- 3. Alkyd System MPI EXT 5.6A:
  - a. Prime Coat: Vinyl wash primer, MPI #80.
  - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
  - c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.

I. Wood Substrates: Wood trim Wood board siding and wood fences.



1. Latex over Latex Primer System MPI EXT 6.3L:
  - a. Prime Coat: Primer, latex for exterior wood, MPI #6.
  - b. Intermediate Coat: Latex, exterior, matching topcoat.
  - c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
2. Latex System MPI EXT 6.3A:
  - a. Prime Coat: Primer, alkyd for exterior wood, MPI #5.
  - b. Intermediate Coat: Latex, exterior, matching topcoat.
  - c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
3. Water-Based Light Industrial Coating System MPI EXT 6.3J:
  - a. Prime Coat: Primer, alkyd for exterior wood, MPI #5.
  - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
  - c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
4. 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. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.

J. 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. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
2. Latex over Alkyd Primer System MPI EXT 6.4G:
  - a. Prime Coat: Primer, alkyd for exterior wood, MPI #5.
  - b. Intermediate Coat: Latex, exterior, matching topcoat.
  - c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
3. Alkyd System MPI EXT 6.4B:
  - a. Prime Coat: Primer, alkyd for exterior wood, MPI #5.
  - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
  - c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.

K. Wood Substrates: Traffic surfaces, including lumber decking.

1. Latex Porch and Floor Paint over Latex Primer System MPI EXT 6.5E:
  - a. Prime Coat: Primer, latex for exterior wood, MPI #6.
  - b. Intermediate Coat: Latex floor paint, matching topcoat.
  - c. Topcoat: Latex floor paint, low gloss, MPI #60.
  - d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
2. Latex Porch and Floor Paint over Alkyd Primer System MPI EXT 6.5A:
  - a. Prime Coat: Primer, alkyd for exterior wood, MPI #5.
  - b. Intermediate Coat: Latex floor paint, matching topcoat.
  - c. Topcoat: Latex floor paint, low gloss, MPI #60.
  - d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
3. Alkyd Floor Enamel System MPI EXT 6.5B:
  - a. Prime Coat: Floor enamel, alkyd, gloss, matching topcoat.
  - b. Intermediate Coat: Floor enamel, alkyd, gloss, matching topcoat.

- c. Topcoat: Floor enamel, alkyd, gloss (MPI Gloss Level 6), MPI #27.
- d. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.
- 4. Alkyd Floor Enamel over Wood Preservative System MPI EXT 6.5C:
  - a. Preservative Coat: Preservative, for exterior wood, MPI #37.
  - b. Prime Coat: Floor enamel, alkyd, gloss, matching topcoat.
  - c. Intermediate Coat: Floor enamel, alkyd, gloss, matching topcoat.
  - d. Topcoat: Floor enamel, alkyd, gloss (MPI Gloss Level 6), MPI #27.
  - e. Additive: Manufacturer's standard additive to increase skid resistance of painted surface.

L. Fiberglass Substrates:

- 1. Latex System MPI EXT 6.7A:
  - a. Prime Coat: Primer, bonding, solvent based, MPI #69.
  - b. Intermediate Coat: Latex, exterior, matching topcoat.
  - c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
- 2. Water-Based Light Industrial Coating System MPI EXT 6.7C:
  - a. Prime Coat: Primer, bonding, solvent based, MPI #69.
  - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
  - c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
- 3. Alkyd System MPI EXT 6.7B:
  - a. Prime Coat: Primer, bonding, solvent based, MPI #69.
  - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
  - c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.

M. Plastic Trim Fabrication Substrates:

- 1. Latex System MPI EXT 6.8A:
  - a. Prime Coat: Primer, bonding, water based, MPI #17.
  - b. Prime Coat: Primer, bonding, solvent based, MPI #69.
  - c. Intermediate Coat: Latex, exterior, matching topcoat.
  - d. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
- 2. Water-Based Light Industrial Coating System MPI EXT 6.8C:
  - a. Prime Coat: Primer, bonding, water based, MPI #17.
  - b. Prime Coat: Primer, bonding, solvent based, MPI #69.
  - c. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
  - d. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
- 3. Alkyd System MPI EXT 6.8B:
  - a. Prime Coat: Primer, bonding, water based, MPI #17.
  - b. Prime Coat: Primer, bonding, solvent based, MPI #69.
  - c. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
  - d. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.

N. Portland Cement Plaster Substrates:

- 1. Latex System MPI EXT 9.1A:

- a. Prime Coat: Latex, exterior, matching topcoat.
- b. Prime Coat: Primer, alkali resistant, water based, MPI #3.
- c. Intermediate Coat: Latex, exterior, matching topcoat.
- d. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
- 2. Water-Based Light Industrial Coating System MPI EXT 9.1B:
  - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
  - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
  - c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
- O. Exterior Gypsum Board Substrates:
  - 1. Latex System MPI EXT 9.2A:
    - a. Prime Coat: Primer, latex for exterior wood (reduced), MPI #6.
    - b. Intermediate Coat: Latex, exterior, matching topcoat.
    - c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
  - 2. High-Build Latex System MPI EXT 9.2D: Dry film thickness of not less than 10 mils.
    - a. Prime Coat: As recommended in writing by topcoat manufacturer.
    - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
    - c. Topcoat: Latex, exterior, high build, MPI #40.
  - 3. Alkyd System MPI EXT 9.2B:
    - a. Prime Coat: Primer, latex for exterior wood (reduced), MPI #6.
    - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
    - c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.

END OF SECTION 099113

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## SECTION 099123 - INTERIOR PAINTING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section includes:

1. Surface preparation and the application of paint systems on interior substrates. Provide labor, materials, tools and other equipment, services and supervision required to complete exterior painting work as indicated on Finish Schedules, Drawings and Specifications. Utilize interior paint systems for interior substrates.

#### 1.2 DEFINITIONS

- A. Gloss Level 1: Matte or Flat Finish: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3: Eggshell Finish: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- C. Gloss Level 4: Satin Finish: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5: Semi-Gloss Finish: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6: Gloss Finish: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7: High Gloss Finish: More than 85 units at 60 degrees, according to ASTM D 523.

#### 1.3 REFERENCES

A. ASTM International:

1. ASTM C834 – Latex Sealing Compounds.
2. ASTM D16 – Standard Terminology Relating to Paint, Varnish, Lacquer, and Related Products.
3. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.

B. Architectural Painting Specification Manual by the Master Painters Institute (MPI), including Evaluation, Systems, Preparation and Approved Product List (MPI Manual).

C. Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).

#### 1.4 SYSTEM DESCRIPTION

- A. Painting and finishing shall include all coating systems materials, including primers, emulsions (except asphalt based), enamels, stains, sealers and fillers and other applied materials, whether used as prime, intermediate or finish coats.
1. Materials to Paint:
    - a. Unless otherwise indicated in documents, all Work receives painting and finishing. Consult Drawings, Schedules, and other Specification Sections for complete requirements. Where materials required to be finished are not indicated in the Finish Schedule or Drawings, refer to the MPI Manual for the appropriate finish; provide premium grade finish.
  2. Paint all exposed structure, fire protection piping, ductwork, exposed conduits at open to structure ceilings.
  3. At “cloud ceilings”, paint exposed structure and other mechanical and electrical items to a minimum 5 feet beyond (behind) edge of suspended ceiling.
  4. Materials Not to Paint:
    - a. Finished metal surfaces of anodized aluminum, polyvinylidene fluoride (PVDF), stainless steel, chromium plate, copper, bronze, and similar finished metals will not require finish painting, except as indicated otherwise.
  5. Glass and plastic, except as noted otherwise.
  6. Materials having complete factory finish or that require installer finishing, except as indicated otherwise. Shop priming of ferrous metal items and shop-fabricated components is included under various Sections.
  7. Walls and ceilings in concealed and generally inaccessible areas, above suspended ceilings, furred areas, pipe spaces, duct shafts, and the like.
  8. Acoustical ceiling tile and their suspension systems, unless indicated otherwise.
  9. Concrete floors, except as indicated to be painted.
  10. CMU walls, except as indicated on Drawings to be painted.
  11. Moving parts of operating units, moving parts of mechanical and electrical units, linkages, sensing devices, motor, and fan shafts, and the like.
  12. Code-required labels such as Underwriter’s Laboratories, Factory Mutual, and Warnock-Hershey or any equipment identification, performance rating, name or nomenclature plates, and the like.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.

#### 1.6 Sustainable Design Submittals

1. Low Emitting Materials (EQc2), Paints and Coatings:
  - a. For paints and coatings applied on site and inside the weatherproofing system, submit product data or other published information verifying the VOC (Volatile Organic Compound) content is less than or equal to the allowable VOC content established by the governing standards.
  - b. For paints and coatings applied on site and inside the weatherproofing system, submit product data or other published information verifying compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017,

using the applicable exposure scenario. Manufacturer's claims of compliance must also state the range of total VOCs after 14 days.

- c. Include information on USGBC's v4.1 Low Emitting Materials Calculator or use Green Badger to track and document this credit.

B. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

- 1. Submit Samples on rigid backing, 8 inches square.
- 2. Step coats on Samples to show each coat required for system.
- 3. Label each coat of each Sample.
- 4. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:

- 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

## 1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

- 1. Paint: 5 percent, but less than 1 gallon of each material and color applied.

## 1.8 QUALITY ASSURANCE

A. Quality Standard:

- 1. Work of this Section shall conform to not less than the minimum standards for material and Work including inspection and warranty requirements set forth in the MPI Manual.
- 2. Work of this Section shall be of the grade and finish system in Accordance with the MPI as indicated in Painting and Finish Schedule in Part 3 of this Section.

B. Qualifications:

- 1. Product Manufacturers: As listed in Part 2 of this Section.

C. Regulatory Requirements:

- 1. Comply with applicable federal, state, and local requirements and publications pertaining to environmental protection and the protection of the health and safety of workers, visitors to the site, and persons occupying the Project Site.
- 2. Where conflict among requirements or with this specification exists, the most stringent shall govern.

## 1.9 DELIVERY STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage area daily.

#### 1.10 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperature are between 50 and 95 deg F.
- B. Perform no interior painting or decorating work unless adequate continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above minimum requirements for 24 hours before, during and after paint application. Provide supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
- C. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg. F above the dew point; or to damp or wet surfaces.
- D. Apply paint only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.
- E. Perform no painting or decorating work unless a minimum lighting level of 323 Lux (30-foot candles) is provided on surfaces to be painted or decorated.
- F. Perform no painting or decorating work when the maximum moisture content of the substrate exceeds:
  1. 15 percent for wood.
  2. 12 percent for plaster and gypsum board.
- G. Conduct all moisture tests using a properly calibrated electronic Moisture Meter.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Behr Company.
- B. Benjamin Moore & Co.
- C. Kelly-Moore Paint Company, Inc.
- D. PPG Paints.
- E. Sherwin Williams



## 2.2 PAINT PRODUCTS

- A. MPI Standards: Provide products complying with MPI standards indicated and listed in its “MPI Approved Products List.”
- B. Source Limitations: Obtain paint from single source from single manufacturer
- C. Material Compatibility:
  - 1. Provide materials for use with 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.
- D. Other materials such as linseed oil, shellac, thinners, solvents, etc., shall be the highest quality product, compatible with paint materials beings used as required.
- E. Low-Emitting Materials (EQc2), Paints & Coatings:
  - 1. Paints and coatings applied on site within the weather proofing system in this section must comply with South Coast Air Quality Management District Rule 1113 effective February 5, 2016, OR California Air Resource Board (CARB) 2007 - Suggested Control Measures (SCM) for Architectural Coatings. Products must also comply with the California Department of Public Health (CDPH) Standard Method v1.2-2017, using the applicable exposure scenario. Refer to Sustainable Design Requirements Section 018113 for specific VOC requirements.

## 2.3 EQUIPMENT

- A. Painting and Decorating Equipment: To best trade standards for type of product and application.
- B. Spray Painting Equipment: Of ample capacity, suited to the type and consistency of paint or coating being applied and kept clean and in good working order at all times.

## 2.4 MIXING AND TINTING

- A. Unless otherwise specified herein or pre-approved, all paint shall be ready-mixed and pre-tinted. Re-mix all paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and color and gloss uniformly.
- B. Paste, powder, or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.
- C. Where thinner is used, addition shall not exceed paint manufacturer’s recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.
- D. If required, thin paint for spraying according to strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Consultant.

## 2.5 FINISH AND COLOR

- A. Unless otherwise specified herein, all painting work shall be in accordance with MPI Premium Grade finish requirements.
- B. Refer to Finish Schedule on Drawings for identification and location of colors.
- C. Except as noted herein or indicated in the Finish Schedule, interior walls and ceiling surfaces shall be painted in accordance with the following criteria over appropriated primer / sealer coat.
  - 1. All areas (except as noted): washable latex with GL3 (eggshell) finish.
  - 2. Laundry facilities / rooms, public wash / shower / bathrooms: washable latex with G5 (semi-gloss) finish.
  - 3. Public change / wash / shower rooms with institutional facility bathing and shower rooms: G5 (semi-gloss) finish for wet surfaces.
  - 4. Public and institutional facility “clean” or “sanitary” areas such as food preparation and laboratory areas: G5 (semi-gloss) finish for dry surfaces.
- D. Access doors, prime coated butts, and other prime coated hardware, registers, radiators, and covers, exposed piping and electrical panels shall be painted to match adjacent surfaces (i.e. same color, texture, and sheen), unless otherwise noted or where pre-finished.
- E. Plywood service panels (e.g. electrical, telephone, and cable vision panels) including edges shall be back primed and painted to match painted wall mounted on.
- F. The inside of light valances shall be painted gloss white.
- G. The inside of all ductwork behind louvers, grills, and diffusers for a minimum of 18” (460 mm) or beyond site-line, whichever is greater, shall be painted using flat black (non-reflecting) paint.

## 2.6 GLOSS AND SHEEN RATINGS

- A. As indicated in Part 3 of this Specification Section.

## 2.7 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows.
  - 1. Concrete: 12 percent.
  - 2. Masonry (Clay and CMU): 12 percent
  - 3. Wood: 15 percent.
  - 4. Portland Cement Plaster: 12 percent.
  - 5. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

- D. Proceed with coating application only after unsatisfactory conditions have been corrected.

- 1. Application of coating indicates acceptance of surfaces and conditions.

## 2.8 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. Carefully clean and replace all such items upon completion of painting work in each area. Do not use solvent or reactive cleaning agents on items that will mar or remove finishes (e.g. lacquer finishes).
  - 2. After completing painting operations, use workers skilled in trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Protect all adjacent interior surfaces and areas, including rating and instruction labels on doors, frames, equipment, piping, etc., from painting operations and damage with drop cloths, shields, masking, templates, or other suitable protective means and make good any damages caused by failure to provide such protection.
- E. Substrate defections shall be made good and sanded by others ready for painting particularly after the first coat of paint. Start of finish painting of defective surfaces (e.g. gypsum board) shall indicate acceptance of substrate and any costs of making good defects shall be borne by the painter including re-painting of entire defective surface (no touch-up painting).
- F. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- G. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- H. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.
- I. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

- J. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- K. Wood Substrates:
  - 1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
  - 2. Sand surfaces that will be exposed to view, and dust off.
  - 3. Prime edges, ends, faces, undersides, and backsides of wood.
  - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

## 2.9 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations.
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
  - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
  - 4. Do not paint over labels or independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but, provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

## 2.10 FIELD QUALITY CONTROL

- A. Tolerances: Final application shall match color and texture of approved samples and shall be smooth, uniform in appearance, color, texture, sheen, and shall be free of runs, sags, holidays, lap marks, air bubbles, pin holes, and other detrimental effects in accordance with requirements of the MPI and this Specification.

## 2.11 CLEANING AND PROTECTING

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spatter 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.

## 2.12 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
  - 1. Institutional Low-Odor/VOC Latex System MPI INT 3.1M:
    - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
  - 2. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
  - 3. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
- B. Concrete Substrates, Traffic Surfaces:
  - 1. Latex Floor Enamel System MPI INT 3.2A:
    - a. Prime Coat: Floor paint, latex, matching topcoat.
  - 2. Intermediate Coat: Floor paint, latex, matching topcoat.
  - 3. Topcoat: Floor paint, latex, low gloss (maximum MPI Gloss Level 3), MPI #60.
  - 4. Water-Based Concrete Floor Sealer System MPI INT 3.2G:
    - a. First Coat: Sealer, water based, for concrete floors, matching topcoat.
  - 5. Topcoat: Sealer, water based, for concrete floors, MPI #99.
- C. CMU Substrates:
  - 1. Institutional Low-Odor/VOC Latex System MPI INT 4.2E:
    - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
  - 2. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
  - 3. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
  - 4. Alkyd System MPI INT 4.2C:
    - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
  - 5. Intermediate Coat: Alkyd, interior, matching topcoat.
  - 6. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.
  - 7. Clear (2-Component) Polyurethane System MPI INT 4.2Q:
    - a. Prime Coat: Two-component polyurethane, matching topcoat.
  - 8. Intermediate Coat: Two-component polyurethane, matching topcoat.

9. Topcoat: Varnish, aliphatic polyurethane, two component (MPI Gloss Level 6 or MPI Gloss Level 7), MPI #78.

D. Steel Substrates:

1. Institutional Low-Odor/VOC Latex System MPI INT 5.1S:
  - a. Prime Coat: Primer, rust inhibitive, water based MPI #107.
2. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
3. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
4. Alkyd System MPI INT 5.1E:
  - a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79.
5. Intermediate Coat: Alkyd, interior, matching topcoat.
6. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.
7. Alkyd over Shop-Applied Quick-Drying Shop Primer System MPI INT 5.1W:
  - a. Prime Coat: Primer, quick dry, for shop application, MPI #275.
8. Intermediate Coat: Alkyd, interior, matching topcoat.
9. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.
10. Quick-Dry Enamel System MPI INT 5.1A:
  - a. Prime Coat: Primer, alkyd, quick dry, for metal, MPI #76.
11. Intermediate Coat: Alkyd, quick dry, matching topcoat.
12. Topcoat: Alkyd, quick dry, semi-gloss (MPI Gloss Level 5), MPI #81.
13. Alkyd Dry-Fall System MPI INT 5.1D:
  - a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79.
14. Topcoat: Dry fall, alkyd, semi-gloss (MPI Gloss Level 5), MPI #225.
15. Alkyd Dry-Fall over Quick-Drying Primer System MPI INT 5.1ZZ:
  - a. Prime Coat: Primer, quick dry, for shop application, MPI #275.
16. Topcoat: Dry fall, alkyd, semi-gloss (MPI Gloss Level 5), MPI #225.
17. Aluminum Paint System MPI INT 5.1M:
  - a. Prime Coat: Primer, alkyd, quick dry, for metal, MPI #76
18. Intermediate Coat: Aluminum paint, matching topcoat.
19. Topcoat: Aluminum paint, MPI #1.

E. Galvanized-Metal Substrates:

1. Institutional Low-Odor/VOC Latex System MPI INT 5.3N:
  - a. Prime Coat: Primer, galvanized, water based, MPI #134.
2. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
3. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
4. Water-Based Dry-Fall System MPI INT 5.3H:
  - a. Prime Coat: Dry fall, water based, for galvanized steel, matching topcoat.
  - b. Topcoat: Dry fall, water based, for galvanized steel, flat (MPI Gloss Level 1), MPI #133.

F. Aluminum (Not Anodized or Otherwise Coated) Substrates:

1. Institutional Low-Odor/VOC Latex System MPI INT 5.4G:
  - a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
2. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.

3. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
4. Alkyd System MPI INT 5.4A:
  - a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
5. Intermediate Coat: Alkyd, interior, matching topcoat.
6. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.

G. Stainless Steel Substrates:

1. Alkyd System MPI INT 5.6B:
  - a. Prime Coat: Primer, vinyl wash, MPI #80.
2. Intermediate Coat: Alkyd, interior, matching topcoat.
3. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.

H. Wood Substrates: Glued-laminated construction.

1. Institutional Low-Odor/VOC Latex System MPI INT 6.1Q:
  - a. Prime Coat: Primer, latex, for interior wood, MPI #39.
2. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
3. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
4. Alkyd System MPI INT 6.1B:
  - a. Prime Coat: Primer sealer, alkyd, interior, MPI #45.
5. Intermediate Coat: Alkyd, interior, matching topcoat.
6. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.

I. Wood Substrates: Exposed framing.

1. Institutional Low-Odor/VOC Latex System MPI INT 6.2L:
  - a. Prime Coat: Primer, latex, for interior wood, MPI #39.
2. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
3. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
4. Alkyd System MPI INT 6.2C:
  - a. Prime Coat: Primer sealer, alkyd, interior, MPI #45.
5. Intermediate Coat: Alkyd, interior, matching topcoat.
6. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.

J. Wood Substrates: Doors.

1. Institutional Low-Odor/VOC Latex System MPI INT 6.3V:
  - a. Prime Coat: Primer, latex, for interior wood, MPI #39.
2. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
3. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
4. Alkyd System MPI INT 6.3B:
  - a. Prime Coat: Primer sealer, alkyd, interior, MPI #45.
5. Intermediate Coat: Alkyd, interior, matching topcoat.
6. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.

K. Spray-Textured Ceiling Substrates:

1. Latex, Flat System MPI INT 9.1A: Spray applied.
  - a. Prime Coat: Latex, interior, flat, matching topcoat.
2. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.
3. Alkyd, Flat System MPI INT 9.1C:
  - a. Prime Coat: Alkyd, interior, flat matching topcoat.
4. Topcoat: Alkyd, interior, flat (MPI Gloss Level 1), MPI #49.

L. Gypsum Board and Plaster Substrates:

1. Institutional Low-Odor/VOC Latex System MPI INT 9.2M:
  - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
2. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
3. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 4), MPI #146.
4. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
5. Alkyd over Latex Sealer System MPI INT 9.2C:
  - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
6. Intermediate Coat: Alkyd, interior, matching topcoat.

END OF SECTION 099123



## **SECTION 101400 - IDENTIFYING DEVICES**

### **PART 1 – GENERAL**

#### **1.1 SUMMARY**

- A. General: Provide Signage and Graphic Products in accordance with requirements of the Contract Documents.
- B. Work Included: Perform all work necessary to complete and install all sign and graphic products including supports and mounting hardware, as shown on the drawings or inferable therefrom and/or as specified herein in accordance with the requirements of the Contract Documents. Work shall include obtaining all necessary permits from applicable agencies Work shall also include the demo, removal and disposal of all old signage within the scope of work area that has a comparable replacement.
- C. Subcontractors: Within 5 working days of notification, the successful bidder shall submit the names of all Subcontractors for review and approval. The approval or disapproval of any Subcontractor will not relieve the Signage Contractor of his responsibility for the performance of the Work as called for under the Contract Documents, nor will approval of a particular Sub-contractor be construed as approval of any particular process or material.
- D. Future Purchase of Signage: Signage Contractor shall furnish cost information for future purchases (guaranteed up to 1 year from substantial completion) for all signs and graphic products in these documents; information shall include costs for items ordered individually as well as minimum order required to obtain price break.
- E. If this specification is a component of a complete Architectural project specification, any conditions or requirements stated within the Signage specification that are less-stringent than those stated in the Architectural project specification do not in any way relieve the Signage Contractor from compliance with the terms of the Architectural project specification. Any conflicting conditions or requirements should be reported to and resolved with Designer and Architect.

#### **1.2 REFERENCES**

- A. "Americans with Disabilities Act (ADA)" legislation, published in the Department of Justice Federal Register. [www.ada.gov](http://www.ada.gov)
  - 1. "ADA Standards for Accessible Design", as published in the revised Titles II and III of the Americans with Disabilities Act of 1990 (ADA) in the Federal Register issued by the Department of Justice on September 15, 2010. The ADA Standards for Accessible Design are, [http://www.ada.gov/2010ADASTandards\\_index.htm](http://www.ada.gov/2010ADASTandards_index.htm) or <http://www.access-board.gov/ada/>
- B. "Architectural Barriers Act (ABA)", current revision, <http://www.access-board.gov/aba/> .
- C. "NFPA Life Safety Code

- D. "The Americans with Disabilities Act White Paper Update 2006: Guidelines, Best Practices and Innovation for Signs for the Blind and Visually Impaired," published by the Society for Environmental Graphic Design, Society for Environmental Graphic Design; 401 F Street NW, Suite 333; Washington, DC 20001; 202.638.5555, [www.segd.org](http://www.segd.org)
- E. "American National Standard Institute: Accessible and Usable Buildings and Facilities" ICC/ANSI A117.1-2009, current revision, published by the International Code Council. [www.ansi.org](http://www.ansi.org)
- F. "Instruction Manual for Braille Transcribing" Fourth Edition, 2000, National Library Service for the Blind and Physically Handicapped, Library of Congress, 888-657-7323, [www.loc.gov/nls/](http://www.loc.gov/nls/)
- G. "English Braille, American Edition, 1994" American Printing House for the Blind, [www.brl.org/ebae](http://www.brl.org/ebae)
- H. "Wayfinding and Signing Guidelines for Airport Terminals and Landside" (ACRP Report 52) by the Airport Cooperative Research Program sponsored by the Federal Aviation Administration.

### 1.3 SUBMITTALS

- A. Procedures: Not later than 20 working days from the Contract Date, the Signage Contractor shall provide the specified items noted on the Submittal Schedule "APPENDIX A" included at the end of this specification section. Except for the quantities required for producing samples and mockups, fabrication shall not begin nor shall orders be placed for materials until Signage Contractor has obtained approvals on submittals. Signage Contractor shall notify Designer of any items that require excessive lead times and may require expedited ordering.
- B. Signage Contractor's Shop Schedule: Submit for Designer's information not less than 5 working days from the Contract Date an updated comprehensive fabrication schedule, if required. Schedule shall be augmented with detail delivery and expected Designer's response times for all signage/graphic products, and shall include overview schedule information for anticipated shop activity for each sign type, including delivery of outsourced items, completion of major subcomponents, and any crucial fabrication milestones, especially those that are affected by Designer's response times. Substantial Completion and Final Due dates shall not be altered, unless otherwise stipulated in writing by Owner and/or Owner's Representative.
- C. Product Data: Submit for Designer's action, electronic documentation in PDF or other standard format, a material list with technical data documenting the primary function, quality, and performance of each system to be used in the Work or other such primary characteristics as required by the Drawings or Specifications.
- D. Manufacturers' Data: For all non-custom items, materials, subassemblies, etc., submit to Designer for review only, electronic documentation in PDF or other standard format, manufacturer's specifications and installation instructions for "sign" to show compliance with these specifications.

- E. Shop Drawings: Submit for Designer's action, electronic documentation in PDF or other standard format, shop drawings for the fabrication and installation of the Work. Prepare details at not less than 3" = 1'-0" minimum scale with critical points at full scale. All shop drawings shall be explicit in depicting materials, material grades and thicknesses, finishes, substructure, footings, fabrication joints, corners, edges, intersections, fasteners and copy composition including letter and line spacing.
- F. Samples: Submit for Designer's action, two sets of samples of each finish, color and lettering type required, one set which will be returned with appropriate action noted. Color samples shall be 6" x 6" and shall be on same or similar substrate to finished product and shall be treated with any specified protective films or coatings. Material and metal finish samples shall be 6" x 6" and shall be same gauge as finished product where reasonable. Label samples to indicate product, characteristics, and locations in the Work. Samples will be reviewed for color and appearance only. Compliance with all other requirements is the exclusive responsibility of the Signage Contractor.
- G. Mock-ups/Prototypes: Submit one of each for Designer's action as outlined in the "Submittals Schedule" at the end of this specification section. Submittals are required by Designer to assist in performing the work in a manner consistent with the Contract Documents and to insure the best possible construction and quality of finished product. They should be identical to the anticipated production run, and should be complete and assembled. These mock-ups will serve as quality control standards throughout the life of the production run. The review of submittals in no way shall relieve the Signage Contractor of responsibility to provide signage of a quality level consistent with these Contract Documents.
- H. Copy Layouts: Submit two copies for Designer's action, full-size, laser or plotter prints (color or black text on white bond paper) of all UNIQUE sign faces with actual fabrication-ready formatting. Electronic files are not acceptable unless approved by the designer. Layouts shall be annotated to indicate location, as per Message Schedule and Sign Location Plan conventions. Layouts can be ganged onto a single page/plot not to exceed 30" X 42" Laser prints which, at full-size, will exceed the dimension of 30" x 42" may be submitted at the largest scale that will fit on a 30" x 42" sheet. Output shall be of sufficient resolution that visual integrity of the layout may be inspected, but in no case shall the scale be less than 3" = 1'-0". Samples are to be produced on the same device as that used to produce camera artwork and/or router outlines. Layouts will be reviewed for composition, letterspacing, font usage, and copyfitting. Copy accuracy and/or spelling will not be reviewed; it is the responsibility of the Signage Contractor to conform to the Message Schedule as submitted. Some samples will be required to be submitted at actual size or a specific architectural scale and on the actual final material as noted in Design Intent Drawings and as requested in the Submittal Schedule "APPENDIX A".
- I. Structural Drawings/calculations: Submit two copies for Designer' information. For large, structurally crucial sign types, furnish engineering drawings and calculations to show that maximum stresses and deflections to not exceed performance requirements under full design loading. Drawings and calculations shall be prepared and sealed by a qualified Structural Engineer licensed in the State where the project is located.

#### 1.4 STANDARDS

- A. Provide Sign types of the size, material, images and arrangements made up of special and standard components and construction as shown and specified.
- B. All drawings pertaining to general sign configuration, typography, graphic layout, and sign placement are included.
- C. If there is a conflict, stated dimensions on the drawings shall take precedence over scaled dimensions. Signage Contractor shall verify sign and copy length for proper fit and shall notify Designer in writing of any discrepancies in the documents prior to fabrication.
- D. All materials shall be new stock, free from defects impairing strength, durability and appearance.
- E. All fabrication and installation shall be in accordance with highest standards of the trade. All signs and components shall be complete and free from visual and mechanical defects. (Such as unfilled and unfinished seams or exposed fasteners).
- F. All electrical work must comply with UL standards, N.E.C. requirements, and local jurisdictional requirements.
- G. No fabrication or installation materials or procedures shall be used that will in any way change the visual quality or in any manner have an adverse effect on existing materials, surfaces and environment.
- H. All damaged signing surfaces and materials incurred shall be restored to original condition and appearance or replaced by the Signage Contractor.
- I. All copy noted on contract documents to be Braille, shall be Grade 2 Braille to match the performance and use specifications of Title III of the Americans with Disabilities Act, Public Law 101-336. It shall be the responsibility of the Signage Contractor to verify accuracy of all Braille messages.

#### 1.5 QUALITY ASSURANCE

- A. Signage Contractor's Quality Assurance Responsibilities: Signage Contractor is solely responsible for quality control of the Work and its installation.
- B. Regulatory Requirements: Signage Contractor is solely responsible for complying with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and Municipal authorities having jurisdiction. Obtain necessary approvals and permits from all such authorities.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. General: Unless otherwise stipulated or agreed to in writing from the Owner, Signage Contractor is responsible for storage and delivery of all materials until installation. Specific on-site storage needs shall be coordinated with the Owners' representative and/or General Contractor.

## 1.7 PROJECT/SITE CONDITIONS

- A. Weather Conditions: For exterior concrete or painting/finish work, do not proceed with the Work during inclement weather nor when weather forecasts are unfavorable, unless the Work will proceed in accordance with the manufacturer's requirements and instructions.
- B. Site Readiness: Unless otherwise requested, do not install signs until underlying and adjacent surfaces are completed. Coordinate installation timing with all other applicable trades.

## 1.8 WARRANTY

- A. Guarantee: The Signage Contractor shall guarantee all workmanship and material used to manufacture and install the signage product he has furnished as follows: General workmanship and materials shall be guaranteed for a period of one year. Applied finishes (paint, vinyl, silkscreening) shall be guaranteed for a period of seven years. Electrical components shall be guaranteed to the extent of the electrical components manufacturer's guarantee. If during the guarantee period any defects or faulty materials are found, he shall immediately upon notification by the Owner, proceed at his own expense, to replace and repair same, together with any damage to all finishes, fixtures, equipment and furnishings that may be damaged as a result of this defective equipment or workmanship.

## 1.9 Maintenance

- A. Record Drawings: Furnish record drawings annotated with the changes made during shop drawing reviews and/or installation of the Work so as to be a complete set of "as-built and installed" plans. Drawings shall include any applicable wiring diagrams, as well as the locations and methods of any concealed fasteners or access areas. Any installation, service, or removal "tricks" or methods should be communicated graphically/verbally as required.
- B. Maintenance and Removal: Signage Contractor shall provide written instructions for removal of interior signs from wall surfaces including recommended methods for removal of residual adhesives. Signage Contractor shall provide written instructions for the Owner to follow proper maintenance.
- C. Graffiti Resistance: Signage Contractor shall provide written documentation listing each sign that has been treated with a graffiti-resistant film or coating and identifying the product or products used on each. Documentation shall include manufacturer's recommended materials or products to be used for removal of graffiti from each graffiti-resistant film or coating. Signage Contractor shall provide manufacturer's written instructions for maintaining all graffiti-resistant films or coatings used.

## **PART 2 – PRODUCTS**

### 2.1 FABRICATION: GENERAL

- A. All fabrication shall be executed in such a manner that all edges and corners of finished letter forms and sign substrates are true and clean. Letterforms and signs with rounded

positive and negative corners, nicked, cut or ragged edges, bent or distressed edges etc. will not be accepted.

- B. All finishes shall be executed in such a manner that all surfaces shall have a smooth even finish and are free of any and all irregularities.
- C. All letterforms shall be so aligned as to maintain a baseline parallel to the sign format. Margins shall be maintained as specified by sign type layouts.
- D. All edges of letterforms shall be sharp and clean with no edge buildup or bleeding. All surfaces of letterforms shall be without pinholes.
- E. Sheet metal letterforms and other items shall be cut from rolled sheet of specified gauge, all edges of copy to be perpendicular to copy face, ground smooth and polished to finish as noted on drawings and schedules. No surface deflection, "oil-canning" or warping will be tolerated.
- F. All signs and copy noted on drawings as acid-etched, photopolymer or tactile shall be photo chemically etched to a depth of 1/32" unless otherwise shown on the drawings. Etched surfaces shall be paint filled or sprayed in color noted on drawings. All etching shall be executed in such a manner that all edges and corners of finished copy or graphics are true and clean. Contours of Braille etching shall comply with Braille standards.
- G. All engraving is to be computerized CNC engraving systems. Engraving to be uniform depth of 1/32" with no visible tooling marks.
- H. All copy noted as sandblasted shall be blasted utilizing the appropriate texture of blasting silica to achieve consistent depth. Careful control of nozzle pressure, distance and angle is necessary to prevent distortion.
- I. All silk-screens shall be executed from photo-screens or negatives prepared per specification and drawings. Silkscreen mesh shall be 390 or finer. Signage Contractor shall not use images as shown in the Contract Documents as camera ready art.
- J. All silkscreen printing shall be executed in such a manner that all edges and corners of finished letterforms are true and clean. Letterforms with rounded positive or negative corners, edge buildup or bleedings, etc. will not be accepted.
- K. Preparation, primer and semi gloss polyurethane acrylic base finish coats to provide weather resistant finish guaranteed for seven (7) years against pitting, peeling, or fading. Polyurethane coating provided for use on surfaces shall have properties of moisture resistance in all weather conditions and shall be guaranteed for seven (7) years against pitting, peeling or fading.
- L. No paints that will prematurely fade, discolor, or de-laminate as a result of ultraviolet light or heat shall be used.
- M. All paints required for lettering including silk-screens and imprinted surfaces shall be a type made for the surface material on which it is applied and recommended by the manufacturer of the paint. Exact identification of all paints shall be noted on shop

drawings, together with data describing the method of application and curing, if other than "air" drying.

- N. All paints shall be evenly applied and without pinholes, orange peeling, debris, scratches, application marks, and other imperfections. Workmanship in conjunction with finishes of signage shall conform to the highest standards of the trade.
- O. Primer coats or other surface pretreatments, where recommended by the manufacturer for paints, shall be included in the work as part of the finished surface work at no extra cost to the Owner.
- P. All adhesives as may be required shall be used in accordance with recommendations made by the manufacturer of the material specified to be laminated or adhered. No adhesives that will fade, discolor or de-laminate as a result of ultraviolet light or heat shall be used and shall not change the color of or deteriorate the materials to which they are to be applied. The adhesives shall be of a non-staining, non-yellowing quality and all visible joints shall be free from air bubbles and other defects.
- Q. For the fabrication of general metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, roughness, seam marks, and trade names. Unless the surfaces are to be painted, do not use materials that have stains and discolorations.
- R. For exposed items of work that include plain flat surfaces in width of more than 50 times the metal thickness, provide sheet stock from the mill that has been stretcher leveled to the highest standard of flatness commercially available.
- S. Welding, when necessary, shall be of the correct type to minimize permanent distortions of flat surfaces. All welding flux, oxides and discolorations must be removed by pickling or grinding, so that these areas match finish of the adjacent areas. Any damage caused by welding must be repaired by grinding, polishing or buffing.
- T. Signage Contractor shall be responsible for the accurate seating and leveling of all anchor bolts.

## 2.2 MATERIALS

- A. Anchors and Inserts: Either furnish inserts to be set in concrete work, or provide other anchoring devices as required for the installation of signs as specified on drawings. Furnish cast iron, or malleable iron or hot dip zinc coated inserts. Provide toothed stainless steel, galvanized or zinc-and-chrome-plated high carbon steel expansion bolt devices for drilled in place anchors.
  - 1. "Thunderstud", Concrete Wedge Anchor,  
<http://www.confast.com/products/thunderstud-anchor.aspx>
  - 2. "Kwik Bolt", Hilti Fastening System, [www.hilti.com](http://www.hilti.com)

B. Metals:

1. Aluminum: AA Alloy 5052, 6061T6, 6063T6 or as recommended to suit required service and finish. Exposed aluminum is to carry Protective Finish as per this specification.
2. Stainless Steel: Type 316 Alloy with sheet finish as noted on Drawings. Unless otherwise shown or specified, provide stainless steel finishes as follows (AISI Designations):
  - a. No. 4 (Bright, Directional Brushed)

C. Metal Fasteners: non-oxidizing finish to match metal work. For machine screws, comply with Industrial Fastener Institute (IFI), Countersunk Phillips flat head where exposed unless otherwise shown.

D. Acrylic

1. Furnish acrylic in the thickness and finishes as specified and as manufactured by one of the following or approved equal:
  - a. 3form, chroma, vitamin c + white out, front face - renewable matte, back face – matte, [www.3-form.com](http://www.3-form.com)
  - b. Acrylite SG, [www.USPlastic.com](http://www.USPlastic.com)
  - c. Aristech, [www.aristechacrylics.com](http://www.aristechacrylics.com)
  - d. Mitsubishi Rayon Co., LTD, [www.mrc.co.jp/english](http://www.mrc.co.jp/english)
  - e. Rohm and Haas, [www.rohmhaas.com](http://www.rohmhaas.com)
  - f. Altuglas Plexiglass, <http://www.plexiglas.com/>

E. Adhesives: Furnish adhesives as specified and as manufactured by one of the following or approved equal:

1. 3M VHB Acrylic Foam Tape 4950, [www.3m.com](http://www.3m.com)
2. Silicone adhesive - Ready to use, high performance adhesive. General Electric GE1200 sealant, translucent SCS 1201 or equal, as recommended by manufacturer for bonding condition.
3. 3M Double Coated Tape 415 Clear, [www.3m.com](http://www.3m.com)
4. Dow Corning 999-A Silicone Building & Glazing Sealant 999, [http://www.dowcorning.com/content/construction/weather/999a\\_color\\_chart.asp](http://www.dowcorning.com/content/construction/weather/999a_color_chart.asp)
5. Epoxy - Two component thermosetting epoxy adhesive with 100% solid content.
6. 3M Dual Lock industrial Velcro, [www.3M.com](http://www.3M.com)
7. 3M DP Scotchweld Adhesives, [www.3m.com](http://www.3m.com)
8. Lord Engineered Adhesives, [www.lord.com](http://www.lord.com)

F. Coatings

1. Powder Coating with thermally-embedded Image: The process embeds a high resolution image deep into and throughout a super durable powder coated layer. The image is embedded inside the powder and flows seamlessly over edges and corners. It is not a film or a laminate. There are no visible corners and no



- delamination. The process shall be capable of coating and decorating both flat surfaces and dimensional objects.
2. Coating shall be super durable polyurethane powder coated finish that is resistant to abrasion, humidity and corrosion. It shall be anti-graffiti, scratch resistant and non-combustible. The coating process shall be applicable for both interior and exterior applications. Coating shall withstand high traffic and extreme weather.
    - a. Acceptable Manufacturer: Direct Embed Coating Systems, [www.directembedcoating.com](http://www.directembedcoating.com)
  3. Acrylic Polyurethane Enamel: Provide an aliphatic polyurethane enamel consisting of ultra-violet inhibitors which are lightfast, weather, abrasion and wear resistant. Provide only products that deliver a maximum applied VOC of 2.8 (for latex) or 3.5 (for oil-based) pounds per gallon. Provide products that are Green Seal certified where performance is comparable to higher-VOC products.
    - a. VOC MAP, Matthews Paint, [corporateportal.ppg.com/na/refinish/matthews/default.htm](http://corporateportal.ppg.com/na/refinish/matthews/default.htm)
    - b. Grip-Gard, Akzo Nobel, [www.signfinishes.com](http://www.signfinishes.com)
  4. Translucent Sign Coating: Provide Gripflex Intermix Sign Paint available through Akzo Nobel. Coat with Gripflex Solar Clear (10AFRO2266) when used first surface.
    - a. [www.signfinishes.com](http://www.signfinishes.com)
  5. Protective Finish: For all painted surfaces, apply two coats of acrylic polyurethane clear coat. Sheen as specified in drawings. Coating shall be compatible with inks or paints applied to surfaces.
    - a. VOC MAP, Matthews Paint, [www.corporateportal.ppg.com/na/refinish/matthews/default.htm](http://www.corporateportal.ppg.com/na/refinish/matthews/default.htm)
    - b. Grip-Gard, Akzo Nobel, [www.signfinishes.com](http://www.signfinishes.com)
  6. Silk Screen: Enamel inks shall be in colors and sheen as shown and be manufactured by the following or approved equal:
    - a. Nazdar Co., Chicago, IL., [www.nazdar.com](http://www.nazdar.com)
    - b. 3M Screen printing Inks 9800 UV Series, [www.3mgraphics.com](http://www.3mgraphics.com)
- G. Vinyl Machine-Cut Artwork: Computer-driven machine cut letters in thickness as specified below, selected from standard colors.
1. Opaque Applications
    - a. 3M 7125 or 7725 series - 2 mil cast vinyl, [www.3m.com](http://www.3m.com)
    - b. Avery A7 Reflective or A9 series - 2 mil cast vinyl, [www.averyvinyl.com](http://www.averyvinyl.com)
    - c. Oracal 951 Series - 2 mil cast vinyl, [www.oracal.com](http://www.oracal.com)

2. Reflective Applications

- a. 3M 680 series - 7 mil cast vinyl, [www.3m.com](http://www.3m.com)
- b. Avery A7 Reflective, Engineer Grade – 7 mil cast vinyl, [www.averyvinyl.com](http://www.averyvinyl.com)
- c. Oracal 5500, 5700 and 5800 Series – 5, 6 or 10 mil cast vinyl, [www.oracal.com](http://www.oracal.com)

3. Backlit applications

- a. 3M 3630 series - 3mil cast vinyl, [www.3m.com](http://www.3m.com)
- b. Avery A6 Translucent series - 3 mil cast vinyl, [www.averyvinyl.com](http://www.averyvinyl.com)
- c. Avery A9 Translucent series - 2.3 mil cast vinyl, [www.averyvinyl.com](http://www.averyvinyl.com)
- d. Oracal 8800 and 8500 Series – 2 and 3 mil cast vinyl, [www.oracal.com](http://www.oracal.com)

H. High Pressure Laminates: Provide decorative surface papers, impregnated with melamine resins, bonded under heat and pressure to kraft papers impregnated with phenolic resins. Provide materials in patterns and finishes as specified in the drawings. Provide general surface type, vertical surface type, and/or post-forming type as recommended by the manufacturer. Provide adhesive types as specified in manufacturer's printed installation instructions.

- 1. Richlite, Bronze Boulder or Chocolate Glacier, mill finish, [www.richlite.com](http://www.richlite.com)

I. Digitally Printed Graphics: Provide permanent adhesive vinyl film with satin liquid laminate for application to the specified substrate.

- 1. Adhesive Vinyl Film: Avery 2010 vinyl or equal, white. Avery MPI 2120 Matte White vinyl or equal.
- 2. Solvent based printer: HP DesignJet 10000, 6-color.
- 3. Inks or toner: UV-resistant.
- 4. Unless otherwise noted in drawings, apply Avery Dennison High Performance Vinyl "HP" HP DOL 2070 Luster Overlaminate or equal over digital prints.
- 5. Unless otherwise noted in drawings, the minimum resolution for digital printing on vinyl or other substrate shall be 750 DPI.

## **PART 3 – EXECUTION**

### **3.1 SIGN CONSTRUCTION**

- A. All anchorage is to be reviewed and accepted by Designer/Architect. Designer/Architect to be notified in writing of any conditions detrimental to proper and timely installation of the sign work.
- B. Letters and signs to be structurally designed as required to resist wind loads and thermal movements without distortions or excessive deflections according to local codes and ordinances. Letter and sign fabrication is to be a complete system including all stiffeners, fasteners, welding, sealants, jointing, miscellaneous pieces and material thickness as required to form high quality workmanship. Connections, angles, shapes and details shown are suggestive and are to be sized, reinforced and detailed as required by the

Signage Contractor. Details, anchors, or devices, etc. not shown, are to be submitted for review and acceptance by Designer before fabrication.

- C. Changes in the visual elements are not to be made without Designer/Architect's review and approval.

### **3.2 INSTALLATION**

- A. Inspect all signs for evidence of damage at the site before installation.
- B. Examine the conditions and substrates under which the installation is to be performed and notify Designer in writing of any unsatisfactory condition. Do not proceed with the work until the unsatisfactory conditions have been corrected or subsequent change of location has been indicated.
- C. Follow all recommendations and instructions for installation as provided herein (or by the manufacturer in such a case where instructions are provided). Notify Designer in writing if in your judgment such installation will not provide permanent, rigid installation in the existing conditions.
- D. Install letter and sign units and components at the locations shown or scheduled, securely mounted with concealed fasteners, unless otherwise shown, attach signs to substrates in accordance with manufacture's instructions, unless shown. Provide anchorage and fitting; coordinate location in field with Designer.
- E. Install, level and plumb at the proper height. Cooperate with other trades for installation of sign units to finish surfaces. Repair or replace damaged units as directed by Designer or Owner. Installer will coordinate and field measure proper location of sign units, where required, with Designer.
- F. All installation procedures and required scheduling are to avoid delays or additional costs and shall be coordinated with Designer and the Owner.
- G. Signage Contractor shall coordinate sign locations with existing mechanical, electrical and plumbing elements and shall notify Designer in writing of any visual or physical conflicts.
- H. Protect all adjacent surfaces from damage during installation; promptly repair any such damage should it occur.
- I. Following installation, remove all traces of visible tapes, adhesives, wrappings or refuse from the installation.

### **3.3 ADDITIONAL REQUIREMENTS**

- A. Sign contractor shall include in the "Contract Documents" any specifications noted in the Design Intent drawings.

**END OF SECTION 101400**

## APPENDIX A – SUBMITTAL SCHEDULE

Rework mock-up areas as required to produce acceptable work.

| SIGN TYPE      | REQUIRED                                                                                                                                                                                                                               |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All Sign Types | <ol style="list-style-type: none"><li>1. Detailed Shop Drawings</li><li>2. 6"x6" sample from each color/material on actual material with finish as noted in drawings.</li><li>3. Scaled copy layout for each unique message.</li></ol> |
| ST-C12         | 1. Complete prototype of final product produced at full scale. Sheet A-921                                                                                                                                                             |
| ST-Z3.A        | 1. Complete prototype of final product produced at full scale. Sheet A-925                                                                                                                                                             |
| ST-ED2         | 1. Complete prototype of final product produced at full scale (Capital Letter "Y" and Lower Case Letter "e"). Sheet A-926                                                                                                              |

## **SECTION 123600 - COUNTERTOPS**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Countertops for architectural cabinet work.
- B. Countertops for manufactured casework.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 064100 - Architectural Wood Casework

#### **1.3 REFERENCE STANDARDS**

- A. ANSI A208.1 - American National Standard for Particleboard; 2022.
- B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.
- C. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.
- D. AWI (QCP) - Quality Certification Program; Current Edition.
- E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- F. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- G. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- H. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material; 2013.
- I. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- J. NSI (DSDM) - Dimensional Stone Design Manual, Version VIII; 2016.
- K. PS 1 - Structural Plywood; 2023.

#### **1.4 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.
  3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
  - D. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.
  - E. Sustainable Design Submittal: Documentation for sustainably harvested wood-based components.
  - F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
  - G. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
  - H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

## 1.5 QUALITY ASSURANCE

- A. Quality Certification:
  1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: [www.awiqcp.org/#sle](http://www.awiqcp.org/#sle).
  2. Provide labels or certificates indicating that the installed work complies with AWMAC/WI (NAAWS) requirements for grade or grades specified.
  3. Provide designated labels on shop drawings as required by certification program.
  4. Provide designated labels on installed products as required by certification program.
  5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

## PART 2 PRODUCTS

### 2.1 COUNTERTOPS

- A. Quality Standard: Custom Grade, in accordance with AWMAC/WI (NAAWS), unless noted otherwise.
- B. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin over continuous substrate.
  1. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard stone fabrication tools; no surface coating; color and pattern consistent throughout thickness.

- a. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with NSI (DSDM).
- b. Finish on Exposed Surfaces: Polished.
- 2. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
- 3. Fabricate in accordance with AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

## 2.2 MATERIALS

- A. Extruded Aluminum: ASTM B211/B211M, 6463 alloy, T5 temper.
- B. Wood-Based Components:
  - 1. Wood fabricated from old growth timber is not permitted.
- C. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.
- D. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf minimum density; minimum 3/4 inch thick; join lengths using metal splines.
- E. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.
- F. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

## 2.3 ACCESSORIES

- A. Fixed Top-Mounted Countertop Support Brackets:
  - 1. Finish: Manufacturer's standard, factory-applied, textured powder coat.
  - 2. Color: Black.

## 2.4 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
  - 1. Join lengths of tops using best method recommended by manufacturer.
  - 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
  - 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
  - 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

### 3.2 INSTALLATION

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

### 3.3 TOLERANCES

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

### 3.4 PROTECTION

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

**END OF SECTION 123600**



## SECTION 125000 - FURNITURE

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. Section includes furniture items listed in the Furniture Schedule on Drawings.
- B. Work of this Section includes packing, shipping, freight, express charges, hauling charges, unpacking, assembly or setup, delivery to and placement, including complete installation of furniture and accessories, on the floors and in specific room or rooms, as indicated on the Drawings.

#### 1.2 PREINSTALLATION MEETINGS

- A. Preliminary Conference: Conduct conference at Project site to comply with Division 01 requirements and the following:
  - 1. Examine substrate conditions and finishes for compliance with requirements.
  - 2. Review procedures related to installation including manufacturer's written instructions.
  - 3. Review repair procedures.
  - 4. Review temporary protection requirements.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's cut sheets, specifications, and installation instructions including data indicating compliance with requirements.
- B. Sustainable Design Submittals:
  - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
  - 2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
  - 3. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
  - 4. Chain-of-Custody Qualification Data: For manufacturer and vendor.
  - 5. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
  - 6. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: Submit in PDF

1. Shop drawings are required for all specially fabricated construction.
  2. Shop drawings are required for all items requiring fabrication and coordination with existing construction.
- D. Show types and thicknesses of material, construction, profiles, hardware locations and reinforcements, dimensions, and all other pertinent information.
1. Verify job conditions affecting the work of this Section and obtain accurate measurements covering all parts thereof for incorporation into shop drawings.
  2. Do not alter shop drawings and data bearing Consultant's action stamp, nor deviate from them unless such deviations are approved by, the Consultant.
- E. Samples for verification purposes prepared from same material to be used for the work:
1. Submit 3 x 5 inch samples of each type wood finish, plastic laminate, paint color, and similar finishes proposed for use on this Project.
  2. Submit 12 inch square samples of all fabric types proposed for use on this Project.
  3. Label each sample showing name of Project, Contractor, subcontractor, manufacturer, material type, finish, color, catalog number, and item number proposed for use.
  4. Provide fabricated materials matching accepted samples retained by Architect.

5. One set of samples will be returned to the Contractor for comparison purposes during production finishing. Materials which are not finished within the acceptable color range exhibited by the samples will be rejected and replaced with acceptable materials at no additional cost to the Owner.

#### 1.4 INFORMATIONAL SUBMITTALS

##### A. Status Reports:

1. Submit, for information only, a monthly status report giving Owner's name, Project name, Contractor's name, date of report, scheduled installation date, Consultant's name, salesperson and/or expeditor's name, and the following information for each item of furniture and accessory specified:
  - a. Manufacturer's name and purchase order number.
  - b. Quantity of each item ordered.
  - c. Manufacturer's catalog or stock number.
  - d. Item description as placed on order.
  - e. Anticipated shipping date.
  - f. Date shipped by manufacturer.
  - g. Date received.
  - h. Remarks column showing all other pertinent information, such as returned for shipping damage and action taken.
2. Update status report monthly and submit on or about the first working day each month until Final Acceptance by Owner.

##### B. Submit documentation that all materials and fabrics used comply with the local Fire Code for Institutional Occupancies.

##### C. Sample Warranty: For special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- ##### A. Provide printed instructions for the Owner in order to follow proper maintenance for all textiles

#### 1.6 QUALITY ASSURANCE

- ##### A. Engage a single firm to install furniture and accessories for the entire Project unless otherwise approved by the Consultant.
- ##### B. Take field measurements for all work required to be built into or adjacent to existing construction prior to preparation of shop drawings and fabrication where possible, to ensure proper fitting of the work.

1. Do not delay job progress; allow for trimming and fitting wherever the taking of field measurements before fabrication might delay the work.
- C. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delays.
- D. Where materials are scheduled that are not normally provided by the listed manufacturer, confirm suitability of special materials for each scheduled item prior to placing orders for materials.
- E. Where required by Code, Health Department, or other body, treat all materials used in fabrication with fire retardant chemicals to provide fire rating required by Authorities Having Jurisdiction.
  1. Verify with upholstery materials and fire-retardant manufacturers that materials are compatible and ensure that no undesirable effects will result from treatment.
- F. Treat all upholstery fabric with protective solution to minimize soiling following fabric and chemical manufacturer's recommendations.
  1. Verify with upholstery materials and soil retardant manufacturers that materials are compatible and ensure that no undesirable effects will result from treatment.

- G. Fire Performance Characteristics: Provide furniture that is identical to that tested for the following fire performance requirements, according to ASTM E84 or other testing and inspecting agency acceptable to Authorities Having Jurisdiction.
1. Surface Burning Characteristics as follows:
    - a. Flame Spread: Not more than 25.
    - b. Smoke Developed: Not more than 50.
  2. Fire Performance Characteristics of padding as follows:
    - a. Test Method: Federal Test Method Standard 191.
    - b. Rating: Average burn length not exceeding 8 inches. Average flame time not exceeding 15 seconds after removal from source.
  3. Flammability as follows:
    - a. Test Method: F-11-1987 BIFMA First Generation Voluntary Upholstery Furniture Flammability Standards for Business and Institutional Markets.
    - b. Rating: Certified as complying with requirements for Class A fabric.
- H. Provide furniture that is identical to that tested for the following physical properties, according to test method indicated and acceptable to Authorities Having Jurisdiction.
1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate installation schedule with the Owner.
1. The Owner will not accept delivery of items before the scheduled date of installation.
- B. Legibly stencil and tag each carton and item of furniture and accessory indicating item number and room number. Unpack and place all furniture and accessories in its proper location, in new condition, clean and ready for use. Remove all cartons, crating, and similar packing and shipping material from the Site and legally dispose of them.

## 1.8 WARRANTY

- A. Special Product Warranty: Submit a written warranty, executed by Manufacturer, agreeing to repair or replace furniture which fails in materials or workmanship within the specified warranty period. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have against the Contractor under the Contract Documents.
1. Warranty Period: Three years after date of Substantial Completion.

## PART 2 PRODUCTS

### 2.1 FURNITURE AND ACCESSORIES

- A. Refer to Furniture Schedule on Sheet A-801 of the Drawings.

### 2.2 FABRICATION

- A. Fabricate all items of furniture, furnishings, and equipment following industry standard practices except where "custom" work is required.
  - 1. Cut straight and true to the weave of the fabric.
  - 2. Fabricate without seam wherever possible.
  - 3. Straight stitch all hems.
  - 4. Crooked selvedge edges are not permitted.
  - 5. Perform sewing operations utilizing experienced machine operators thoroughly familiar with the requirements of this specification.
  - 6. Match fabric patterns at seat cushions and backs. Where applicable, center pattern on seat cushion and seat back.
  - 7. Provide cleaning and maintenance instructions for fabrics on a label attached to seat bottom of all seating.
  - 8. Provide manufacturer's name and address, product number, fabric specification (if applicable), and specification code on a label attached to seat bottom of all seating

## PART 3 EXECUTION

### 3.1 INSPECTION

- A. Examine substrates and conditions under which furniture and accessories are to be installed and notify the Consultant in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

### 3.2 INSTALLATION

- A. Deliver and install furniture and accessories in new condition, free of defects, including, but not limited to, scratches, dents, abrasions, and stains in the locations as shown on the Drawings.
- B. Securely install all hardware, brackets, and similar items in a neat and workman like manner, adjusted, and left in new, properly operating condition.

- C. Repair, refinish, and make good all damage to adjacent work resulting from installation operations, including damage to plaster, tile work, wallcovering, paint, ceilings, floors, and other finished work. Provide repaired or replaced work that is as good or better than that which existed prior to damage as determined by the Consultant.
- D. Make all minor adjustments, relocation of individual pieces of furniture and accessories, and similar final corrections as directed by the Consultant.

### 3.3 FIELD QUALITY CONTROL

- A. Engage manufacturer's representative of each fixed furniture item to verify correct installation.

### 3.4 PROTECTION

- A. Protection furniture against damage during remainder of construction period, complying with manufacturer's directions.
- B. Provide additional protection as needed to ensure furniture will not be damaged or deteriorated at time of Substantial Completion.

### 3.5 CLEANING UP

- A. Sweep, dust, vacuum, and clean up to the satisfaction of Owner and Consultant. Remove and legally dispose of all trash, rubbish, and other waste scattered throughout the building caused by the installation of the furniture and accessories.

END OF SECTION 125000

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## SECTION 210800 - COMMISSIONING OF FIRE SUPPRESSION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes commissioning process requirements for fire suppression systems, assemblies, and equipment.
- B. Section includes a list of construction verification checklists and functional performance tests required for this project.

#### 1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
  - 1. Section 019113 "General Commissioning Requirements"

#### 1.3 DEFINITIONS

- A. Systems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Equipment start-up documents
- B. Completed construction verification checklists.
- C. Completed piping pressure tests
- D. Certificates of readiness.
- E. Certificates of completion of installation, prestart, and startup activities

#### 1.5 CONTRACTOR'S RESPONSIBILITIES

- A. Assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities.
- B. Evaluate performance deficiencies identified in test reports and in collaboration with entity responsible for the system and equipment installation.

- C. Cooperate with the CxP for resolution of issues recorded in the Commissioning Issues List.
- D. Integrate and coordinate commissioning process activities with construction schedule.
- E. Attend commissioning team meetings held on a monthly basis. At specific times during the construction process there may be meetings held every other week as needed
- F. Complete all construction verification checklists uploaded to the project.
- G. Participate in fire suppression systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxP.
- H. Complete preliminary functional performance tests within the commissioning software prior to scheduling final functional testing to be witnessed by the commissioning provider and owner representative.
- I. Conduct final functional testing as directed by the commissioning provider for all equipment listed in the systems to be commissioned in each represented specification section.
- J. Provide information requested by the CxP for final commissioning documentation.
- K. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.
- L. Conduct seasonal testing with the commissioning provider as necessary to demonstrate system performance in the opposite season of Substantial Completion and the scheduled system functional testing.
- M. Participate in lessons learned meeting held 10 months after Substantial Completion and provide updated regarding all "Open" items.
- N. Provide corrective action to close all commissioning items related to equipment and installation efforts related to scope of contracted work.

#### 1.6 CxP'S RESPONSIBILITIES

- A. Provide Project-specific construction verification checklists and commissioning process test procedures for fire suppression systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.
- B. Develop the Commissioning Software project account and invite all cx team members to participate.
- C. Direct the necessary system testing and provide test reports to the CxP.
- D. Review equipment and control systems submittals and provide comment directly to A/E and owner representative.
- E. Review equipment start-up and checkout plans and forms.
- F. Provide test data, inspection reports, and certificates in Systems Manual.

## 1.7 COMMISSIONING DOCUMENTATION

- A. Provide the following information to the CxP for inclusion in the commissioning plan:
  - 1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
  - 2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
  - 3. Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for fire suppression systems, assemblies, equipment, and components to be verified and tested.
  - 4. Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.
  - 5. Test and inspection reports and certificates.
  - 6. Corrective action documents.
  - 7. Verification of testing, adjusting, and balancing reports.

## 1.8 SUBMITTALS

- A. Certificates of completion of installation, prestart, and startup activities.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 TESTING PREPARATION

- A. Certify that fire suppression systems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
- B. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

### 3.2 GENERAL TESTING REQUIREMENTS

- A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxP.
- B. Scope of testing shall include energy using and related portions of the plumbing system. Testing shall include measuring effectiveness of operational and control functions.
- C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of fire alarm system and building automation system controllers and sensors.

### 3.3 COMMISSIONING DOCUMENTATION

- A. Commissioning documentation is to be filled in as work progresses by the individuals responsible for installation and shall be completed for each installation phase. The commissioning documentation will be completed via a web-based commissioning software and is to be weekly to reflect progress of the system installation.
- B. For each entry provide a description of the work completed since the last entry, the percentage of the total work completed for the system for that area and the step of installation or finalization.
- C. Check Yes or No for each commissioning form item as appropriate. If the information requested for an item does not apply to the given stage of installation for the system, list it as “N/A”. Explain all discrepancies, negative responses or N/A responses in the negative responses section.
- D. Once the work is 100% complete and the responses to each item are complete and resolved for a given commissioning forms group, mark as complete, initial and date in the spaces provided.
- E. In the event there are questions or discrepancies contact the commissioning provider 2 days prior to the next construction progress meeting.
- F. Construction Verification Checklists required for this project
  - 1. CVC-21 09 00 Water Based Fire Suppression Systems

END OF SECTION 210800

## SECTION 219000 - WATER BASED FIRE SUPPRESSION SYSTEMS

### PART 1 - GENERAL

#### 1.1 DEFINITIONS

- A. Standard-Pressure Sprinkler Piping: Fire suppression system piping designed to operate at working pressure of 175 psig maximum.
- B. Fire Protection Engineer (FPE): Qualifications of the Fire Protection Engineer, with license number, shall be submitted to and approved by architect/engineer prior to submission of the show drawings. For the purposes of these specifications, the FPE shall have one of the following qualifications:
  - 1. The FPE shall be a registered Professional Engineer (PE), who has passed the National Council of Examiners for Engineering and Surveys (NCEES) written examination in fire protection engineering. OR
  - 2. The FPE shall be a registered Professional Engineer who is regularly engaged in the design of fire protection systems. OR
  - 3. The FPE shall have Level III certification for water-based fire protection systems layout, plus a minimum of 5 years of work experience in fire protection engineering.
  - 4. The FPE shall have Level IV certification for complex fire protection systems layout, plus a minimum of 5 years of work experience in fire protection engineering.
- C. NFPA: National Fire Protection Association

#### 1.2 SYSTEM DESCRIPTIONS

- A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
- B. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a FPE, using performance requirements and design criteria indicated.
  - 1. Available fire-hydrant flow test records indicate the following conditions:
    - a. Date: 09/06/2023
    - b. Static Pressure: 71 psig.
    - c. Measured Flow: 1205 gpm
    - d. Residual Pressure: 60 psi
  - 2. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.

3. Specific sprinkler design parameters shall be per drawings and per NFPA 13 and per FM Global Property Loss Prevention Data Sheets.
  4. Specific standpipe design parameters shall be per drawings and per NFPA 14 and per FM Global Property Loss Prevention Data Sheets.
  5. Maximum Protection Area per Sprinkler: Per UL listing.
- C. Sprinkler system design shall be approved by authorities having jurisdiction.
- D. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

#### 1.4 SUBMITTALS

- A. For each item indicated, to be submitted prior to start of construction.
- B. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- C. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified FPE responsible for their preparation. Design documents shall include the features indicated in NFPA 13, which include but are not limited to:
1. Piping layout, including risers.
  2. Valve and sprinkler locations.
  3. Drains and drain outlet locations.
  4. Hydraulically most remote area and sprinkler density.
  5. Hydraulic node locations.
  6. Hydraulic calculations for hydraulically most remote area, including pressures at hydraulic nodes and each sprinkler.
  7. Installation details.
  8. Flow and tamper switch locations.
- D. Fire-Hydrant Flow Test Report: Report shall contain data including, but not limited to:
1. Full name of person who performed the test.
  2. Full name of persons who witnessed the test.
  3. Date of the test.
  4. Static pressure.
  5. Flow rate, and corresponding residual pressure when stated flow rate occurred.
  6. Sketch indicating site location of hydrants used for test.
  7. FPE shall witness or perform the flow test. Flow tests not witnessed or performed by the FPE shall not be used.
- E. Qualification Data: For qualified Installer and FPE.
1. Submit the name and documentation of certification of the proposed FPE, no later than 14 days after the Notice to Proceed and prior to the submittal of the sprinkler system drawings and hydraulic calculations.

- F. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable. Contractor shall submit plans to AHJ for review per AHJ requirements.
- G. CLOSEOUT SUBMITTALS
- H. For each item indicated, to be submitted within 30 days of substantial completion of construction. All submittals shall be delivered to Owner 30 days prior to proposed scheduled final acceptance of system.
- I. Welding certificates, if field welding was performed.
- J. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- K. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.
- L. Record Drawings: Submit drawings showing sprinkler system as installed. Drawings shall be stamped with FPE seal indicating FPE has inspected and approved installation. Drawings shall include, but are not limited to, all features included in the Delegated-Design Submittal.

#### 1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
  - 1. NFPA 13, "Installation of Sprinkler Systems."
  - 2. NFPA 14, "Installation of Standpipe and Hose Systems."
  - 3. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."
  - 4. NFPA 415 "Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways."
- D. ASCE/SEI 7, "Minimum Design Loads for Buildings and Other Structures."

#### 1.6 COORDINATION

- A. Coordinate layout and installation of sprinkler systems with other construction, including but not limited to light fixtures, HVAC equipment, and partition assemblies.

## 1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

## PART 2 - PRODUCTS

### 2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

### 2.2 STEEL PIPE AND FITTINGS

- A. Schedule 40, Black-Steel Pipe: ASTM A 53/A 53M, Schedule 40.
- B. Thin wall Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, with wall thickness less than Schedule 40 and equal to or greater than Schedule 10.
- C. Schedule 10, Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, Schedule 10, plain end.
- D. Ferrous fittings per NFPA 13.
- E. Listed ferrous, rubber-gasketed pipe fittings per NFPA 13.
- F. Grooved-Joint, Steel-Pipe Appurtenances:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Anvil International, Inc.
    - b. Tyco Fire & Building Products LP.
    - c. Victaulic Company.
  - 2. Pressure Rating: 300 psig minimum.
  - 3. Galvanized and Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
  - 4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.
- G. Steel Pressure-Seal Fittings: UL 213, FM-approved, 175-psig pressure rating with steel housing, rubber O-rings, and pipe stop; for use with fitting manufacturers' pressure-seal tools.



1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Victaulic Company.

## 2.3 LISTED FIRE-PROTECTION VALVES

### A. General Requirements:

1. Valves shall be UL listed or FM approved.
2. Minimum Pressure Rating: 175 psig.

### B. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Conbraco Industries, Inc.; Apollo Valves.
  - b. Hammond Valve.
  - c. Milwaukee Valve Company.
  - d. NIBCO INC.
  - e. Watts; a Watts Water Technologies company.
2. Description:
  - a. Standard: MSS SP-110.
  - b. CWP Rating: 300 psig

### C. Iron Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Anvil International.
  - b. Milwaukee Valve Company.
  - c. NIBCO INC.
  - d. Tyco Fire & Building Products LP.
  - e. Victaulic Company.
2. Standard: UL 1091.
3. Pressure Rating: 175 psig.
4. Body Material: Cast or ductile iron.
5. End Connections: Lug or Grooved.

### D. Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Anvil International.
  - b. Milwaukee Valve Company.
  - c. NIBCO INC.
  - d. Tyco Fire & Building Products LP.
  - e. Victaulic Company.
  - f. Viking Corporation.
  - g. Watts; a Watts Water Technologies company.
2. Standard: UL 312.

3. Pressure Rating: 300 psig.
4. Type: Swing check.
5. Body Material: Cast iron.
6. End Connections: Flanged or grooved.

E. Bronze OS&Y Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Milwaukee Valve Company.
  - b. NIBCO INC.
2. Standard: UL 262.
3. Pressure Rating: 175 psig.
4. Body Material: Bronze.
5. End Connections: Threaded.

F. Iron OS&Y Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Hammond Valve.
  - b. Milwaukee Valve Company.
  - c. NIBCO INC.
  - d. Tyco Fire & Building Products LP.
  - e. Watts; a Watts Water Technologies company.
2. Standard: UL 262.
3. Pressure Rating: 300 psig.
4. Body Material: Cast or ductile iron.
5. End Connections: Flanged or grooved.

G. Indicating-Type Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Anvil International.
  - b. Milwaukee Valve Company.
  - c. NIBCO INC.
  - d. Tyco Fire & Building Products LP.
  - e. Victaulic Company.
2. Standard: UL 1091.
3. Pressure Rating: 175 psig minimum.
4. Valves NPS 2 and Smaller:
  - a. Valve Type: Ball or butterfly.
  - b. Body Material: Bronze.
  - c. End Connections: Threaded.
5. Valves NPS 2-1/2 and Larger:
  - a. Valve Type: Butterfly.
  - b. Body Material: Cast or ductile iron.
  - c. End Connections: Flanged, grooved, or wafer.
6. Valve Operation: Integral supervisory switch.

## 2.4 SPECIALTY VALVES

### A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating:
  - a. Standard-Pressure Piping Specialty Valves: 175 psig minimum.
3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.

### B. Double-Check, Backflow-Prevention Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Conbraco Industries, Inc.
  - b. FEBCO.
  - c. Watts; a Watts Water Technologies company.
  - d. Zurn Industries, LLC.
2. Standard: ASSE 1015.
3. Body Material: Lead free bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved or stainless steel for NPS 2-1/2 and larger.
4. Accessories: Ball valves with threaded ends on inlet and outlet of NPS 2 and smaller; OS&Y gate valves with flanged ends on inlet and outlet of NPS 2-1/2 and larger.

### C. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Reliable Automatic Sprinkler Co., Inc. (The).
  - b. Tyco Fire & Building Products LP.
2. Standard: UL 1726.
3. Pressure Rating: 175 psig minimum.
4. Type: Automatic draining, ball check.

## 2.5 FIRE-DEPARTMENT CONNECTIONS

### A. Exposed-Type, Fire-Department Connection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Elkhart Brass Mfg. Co., Inc.
  - b. Guardian Fire Equipment, Inc.
  - c. Potter Roemer.
  - d. Tyco Fire & Building Products LP.
2. Standard: UL 405.
3. Type: Exposed, projecting, for wall mounting.
4. Pressure Rating: 175 psig minimum.

5. Body Material: Corrosion-resistant metal.
6. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
7. Caps: Brass, lugged type, with gasket and chain.
8. Escutcheon Plate: Round, brass, wall type.
9. Outlet: Back, with pipe threads.
10. Number of Inlets: Two.
11. Escutcheon Plate Marking: Similar to " AUTO SPKR."
12. Finish: Polished brass or bronze.

## 2.6 SPRINKLER SPECIALTY PIPE FITTINGS

### A. Flow Detection and Sprinkler Inspector's Test Assemblies:

1. Reliable Automatic Sprinkler Co., Inc. (The).
  - a. Tyco Fire & Building Products LP.
  - b. Victaulic Company.
2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

### B. Flexible, Sprinkler Hose Fittings:

1. Tyco Fire & Building Products LP.
2. Victaulic Company.
3. Viking Corporation.
4. Standard: UL 1474.
5. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
6. Pressure Rating: 175 psig minimum.
7. Size: Same as connected piping, for sprinkler.

### C. Fire-rated pipe penetration assembly:

1. Listed for the application.
2. Include Schedule 40 steel sleeve that protrudes 2" from surface of wall or floor.
3. Seal between pipe and sleeve.
4. Seal between sleeve and wall or floor.
5. Reliable Automatic Sprinkler Co., Inc. (The).
6. Tyco Fire & Building Products LP.
7. Victaulic Company.
8. Viking Corporation.

### D. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
  2. Pressure Rating for Residential Sprinklers: 175 psig maximum.
  3. Pressure Rating for Automatic Sprinklers: 175 psig minimum.
- E. Open Sprinklers with Heat-Responsive Element Removed: UL 199.
- F. Sprinkler Finishes:
1. Chrome plated.
  2. Bronze.
  3. Painted.
- G. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
- H. Sprinkler Guards: Wire cage with fastening device for attaching to sprinkler.

## 2.7 ALARM DEVICES

- A. Alarm-device types shall match piping and equipment connections.
- B. Electrically Operated Alarm Bell:
1. Standard: UL 464.
  2. Type: Vibrating, metal alarm bell.
  3. Finish: Red-enamel factory finish, suitable for outdoor use.
- C. Water-Flow Indicators:
1. Standard: UL 346.
  2. Water-Flow Detector: Electrically supervised with tamperproof cover.
  3. Type: Paddle operated.
  4. Pressure Rating: 250 psig.
  5. Design Installation: Horizontal or vertical.
- D. Pressure Switches:
1. Standard: UL 346.
  2. Type: Electrically supervised water-flow switch with retard feature.
  3. Design Operation: Rising pressure signals water flow.
- E. Valve Supervisory Switches:
1. Standard: UL 346.
  2. Type: Electrically supervised.
  3. Design: Signals that controlled valve is in other than fully open position.

## 2.8 PRESSURE GAGES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Trerice, H. O. Co.
  - 2. Weiss Instruments, Inc.
  - 3. Winters Instruments - U.S.
- B. Standard: UL 393.
- C. Dial Size: 3-1/2- to 4-1/2-inch diameter.
- D. Pressure Gage Range: 0 to 250 psig minimum.
- E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.
- F. Air System Piping Gage: Include "AIR" or "AIR/WATER" label on dial face.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.

### 3.2 WATER-SUPPLY CONNECTIONS

- A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Section 221116 "Domestic Water Piping."
- B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-distribution piping.

### 3.3 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
  - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

- C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- G. Install sprinkler piping with drains for complete system drainage.
- H. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- I. Install drain valves on standpipes. Extend drain piping to outside of building.
- J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.
- K. Install alarm devices in piping systems.
- L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.
- M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.
- N. Fill wet-type sprinkler system piping with water.
- O. Install sleeves and escutcheons for piping penetrations of walls, ceilings, and floors.

### 3.4 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
  - 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.
- I. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- J. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- K. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.
- L. Do not use cleated flanges or glands that use setscrews or wedges that mechanically deform the outer diameter of the pipe.

### 3.5 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
  - 1. Route main drain to exterior. Route auxiliary drains to floor drains or exterior.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
  - 1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.



### 3.6 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.
- B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.
- C. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.

### 3.7 FIRE-DEPARTMENT CONNECTION INSTALLATION

- A. Install wall-type, fire-department connections.
- B. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

### 3.8 IDENTIFICATION

- A. Paint interior piping where exposed in finished rooms. Paint pipe to match the room background color as viewed from the center of the room. Apply paint per requirements listed in Division 9.
- B. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
- C. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26.
- D. Install tags with unique identifier numbers on the following components:
  - 1. Piping flexible connections.
  - 2. Valves.
  - 3. Backflow prevention devices.
  - 4. Inspector's test fittings.
  - 5. Alarm devices, including electrical devices.
  - 6. Air compressors and accessories.
  - 7. Components not listed above but may potentially require servicing.

### 3.9 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
  - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.

4. Energize circuits to electrical equipment and devices.
5. Start and run air compressors.
6. Coordinate with fire-alarm tests. Operate as required.
7. Coordinate with fire-pump tests. Operate as required.
8. Verify that equipment hose threads are same as local fire-department equipment.

- C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report test results promptly and in writing to AHJ.

### 3.10 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Remove and replace sprinklers with paint other than factory finish.

### 3.11 DEMONSTRATION

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

### 3.12 PIPING SCHEDULE

- A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends; cast-iron threaded fittings; and threaded joints or grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
- B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.
- C. Copper-tube, extruded-tee connections may be used for tee branches in copper tubing instead of specified copper fittings. Branch-connection joints must be brazed.
- D. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be one of the following:
  1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
  2. Schedule 40, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
  3. Schedule 40, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
  4. Schedule 40, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
  5. Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.
- E. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 and larger, shall be one of the following:

1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Schedule 40, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
3. Schedule 40, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
4. Schedule 40, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
5. Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.
6. Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
7. Schedule 10, black-steel pipe with plain ends; welding fittings; and welded joints.
8. Schedule 10, black-steel pipe with plain ends; welding fittings; and welded joints.

### 3.13 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
  1. Finished spaces: Concealed or recessed pendent sprinklers, factory painted white, with escutcheons.
  2. Unfinished spaces: Rough bronze.
  3. Wall Mounting: Sidewall sprinklers.
  4. Spaces Subject to Freezing: Upright dry sprinklers unless indicated otherwise..
- B. Use sprinklers with temperature ratings higher than expected ambient temperatures. In areas with skylights, use sprinklers with 175 F minimum temperature rating.
- C. Use sprinklers with identical temperature ratings throughout compartments.
- D. Use sprinklers with identical thermal sensitivities throughout compartments.
- E. Use sprinklers with standard response intermediate temperature classification throughout server rooms.

END OF SECTION 219000

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## SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

### 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 ACCURACY OF DATA AND CONTRACT DRAWINGS

- A. The design drawings are diagrammatic and they may not show all physical arrangements, offsets, bends, or elbows which may be required for installation of various materials, equipment, piping, and ductwork systems in allotted spaces. The Contractor shall examine these and other available drawings to determine space limitations and interferences. The Contractor shall be responsible for making any minor changes in location of equipment, pipe and ductwork from that shown on drawings and for all physical details required for installation. Cost for adapting Contractor's work to jobsite conditions shall not be considered as basis of an extra cost to contract. The Contractor shall get approval before proceeding with any change.
- B. Elevation of piping, ductwork and equipment indicated on drawings are to be used as guidelines to assist Contractor with installations. Minor changes to these elevations may be necessary to eliminate unforeseen interferences.
- C. The Contractor must carefully examine the drawings, specifications and project site, and verify all measurements, distances, levels, materials, equipment, etc. before starting work.
- D. Drawings shall not be scaled for determining exact dimensions or location of equipment.
- E. Except as otherwise specified herein or indicated on drawings, furnish and install all piping, tubing, valves, specialties and supports to connect fixtures and equipment into their respective systems as required for or incidental to the proper operation of the indicated systems. This shall include the following systems:
  - 1. All miscellaneous piping called for on piping and instrument diagrams, regardless of whether or not indicated in the specifications or on the drawings. Reference shall be made to piping and instrument diagrams, control air piping drawings, and manufacturer's equipment drawings to determine full extent or required piping.

#### 1.3 SUMMARY

See Editing Instruction No. 3 in the Evaluations for discussion about how this Section supplements other Division 22 Sections.

A. This Section includes the following:

Adjust list below to suit Project.

1. Joining materials
2. Dielectric fittings
3. Escutcheons
4. Sleeves
5. Sealants
6. Through-penetration firestop assembly
7. Wall and floor penetrations

#### 1.4 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, 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, inside wall spaces, and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. PVC: Polyvinyl chloride plastic.
- G. EPDM: Ethylene-propylene-diene terpolymer rubber.

## 1.5 SUBMITTALS

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

1. Dielectric fittings.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.
- C. The Contractor or the Contractor's authorized representative must be present to accept delivery of all equipment and materials furnished by him. The Owner's personnel will not knowingly accept, unload or store anything delivered to the site for the Contractor's use. Inadvertent acceptance of delivered items by a representative of the Owner shall not constitute acceptance or responsibility for any of the materials or equipment. It shall be the Contractor's responsibility to assume all liability for any equipment or materials furnished by him which are delivered to the job site.
- D. Storage of materials on the grounds and within the building shall be in strict accordance with instructions of the Owner. Storage of materials within building shall at no time exceed design carrying capacity of the structural system.
- E. The Owner assumes no responsibility for materials stored in building or on the site. Each Contractor shall assume full responsibility for all losses or damage due to the storing of his materials.
- F. Handle items carefully to avoid damage to components, enclosures and finishes. Follow the manufacturer's rigging instructions when handling and moving equipment.

## 1.7 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

- C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

#### 1.8 CODES AND REGULATIONS

- A. All codes and regulations of state and local authorities shall become part of this specification and must be adhered to where they exceed requirements as shown on the drawings or stated in the specifications, without additional cost to the Contract.

#### 1.9 CONTINUITY OF EXISTING SERVICES

- A. Do not interrupt or change existing services without prior written approval. When interruption is required, coordinate length of service time with the Owner to minimize disruption of occupant activities.

#### 1.10 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. The Contractor shall provide operating and maintenance instruction manuals covering each and every item of equipment and devices furnished or erected by the Contractor prior to "Substantial Completion" as required by Division 1.
- B. Each separate manual shall consist of the following:
  - 1. Neatly typewritten table of contents including contractor's name, address and telephone number; list of each product referenced in manual; and name, address and telephone number of installing contractor and maintenance contractor for each product.
  - 2. Tabbed sections of catalog data and literature for each product including model number, description and component parts; operating procedures; maintenance procedures; servicing and lubrication schedules; description of sequence of operations; parts lists; illustrations, assembly drawings and diagrams required for maintenance; any additional drawings, diagrams, charts or written text which may be required to supplement product data for particular installation; certified test and balance report; list of control point labels, and wiring diagrams.
  - 3. Copy of warranty, bond and/or service contract issued for each product including an information sheet for operations personnel with proper procedures in event of a product failure and instances which might affect validity of warranties or bonds.
  - 4. All literature pertaining to backflow prevention devices shall be in one tabbed section.
  - 5. Full size sheets, if required, shall be folded into special holding pockets. Faxed, handwritten, or illegible materials are not acceptable.



6. Simplified Component Locator document which includes the following:
  - a. Cross reference of unique identifier numbers to component descriptions (see “Labeling and Identification” section below for list of required components) arranged in numerical order.
  - b. Scale drawing showing location of each component within 2’ of actual location, including elevation above floor.
- C. Prior to final inspection or acceptance, fully instruct designated facility operating and maintenance personnel on operation, adjustment and maintenance of products, equipment and systems. Review contents of operating and maintenance manual with personnel in full detail to explain all aspects of operations and maintenance.

#### 1.11 PROTECTION OF ROOF

- A. Contractors are cautioned that they must exercise extreme care in any activity involving contact with any installed roof membrane.
- B. Construct protective plywood (3/4 in. thick) runways across the roof for moving, setting, and installing equipment and piping systems. No activity on the roof will be permitted without this protection. Start runways at the point of origin of any equipment placed on roof and terminate at the point of installation on curb or base. At completion of work, or when directed by the Owner, completely remove, neatly and cleanly, without damage to roofing system, these protective items and runways.
- C. Any and all repairs necessary to bring the roofing system to its original condition shall be made by an approved Roofing Contractor and paid for by the Contractor responsible for the damage

#### 1.12 WORK COORDINATION

- A. All Trades shall work in cooperation with each other, and fit their work into the structure as job conditions may demand. All final decisions as to right-of-way and run of pipes and ducts, etc. shall be made by the Owner.

#### 1.13 INSPECTION

- A. The Contractor shall verify the location of underground service, utilities, structures, etc., which may be encountered or be affected by his work and shall be responsible for any damage caused by neglect to provide proper precautions or protection.

- B. Any work that is to be concealed, such as inside walls, inside chases, above ceilings, and inside soffits, shall be inspected by Owner or Architect/Engineer prior to concealment.

#### 1.14 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
  - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- 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, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- D. Solvent Cements and Primers for Joining PVC Plastic Piping:
  - 1. Primer: ASTM F 656
  - 2. Cement: ASTM D 2564.
  - 3. Use primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 4. Use cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

#### 1.15 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

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. Jomar
  - b. Watts
  - c. Zurn/Wilkins
2. Description:
  - a. Pressure Rating: 150 psig (1035 kPa) at 180 deg F (82 deg C).
  - b. First End Connection: Solder-joint copper alloy.
  - c. Second End Connection: Threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Capitol Manufacturing
  - b. Central Plastics
  - c. Watts
2. Description:
  - a. Factory-fabricated, bolted, companion-flange assembly.
  - b. Pressure Rating: 150 psig at 180 deg F.
  - c. First End Connection: Solder-joint copper alloy.
  - d. Second End Connection: Threaded ferrous.

1.16 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe (or pipe insulation, if used) and an OD that completely covers opening. Use one piece, stamped, chrome-plated steel escutcheons with spring clips.

1.17 SLEEVES

- A. PVC Pipe: ASTM D 1785, Schedule 40.

- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron Pipe: ASTM A 888 or CISPI 301.
- D. Ductile Iron Pipe: AWWA/ANSI C150/A21.50
- E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

#### 1.18 FOUNDATION WALL SLEEVES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following
  - 1. Advance Products & Systems, Inc.
  - 2. Calpico
  - 3. Linkseal
- B. Typical product: Linkseal Model CS
- C. Description:
  - 1. Wall Pipe: with integral waterstop on outer dimension. Sized for use with mechanical sleeve seal.
  - 2. Wall Pipe: with integral waterstop on outer dimension. Sized for use with mechanical sleeve seal.
  - 3. Description: Cast iron, ductile iron, or plastic sleeve with integral waterstop on outer dimension. Sized for use with mechanical sleeve seal.

#### 1.19 MECHANICAL SLEEVE SEALS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following
  - 1. Advance Products & Systems, Inc.
  - 2. Calpico
  - 3. Metraflex
  - 4. Linkseal
- B. Typical product: Link-Seal Model S-316.
- C. Description:

1. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material, pipe outer diameter, and sleeve inner diameter, and pipe offset from sleeve hole centerline.
2. Pressure Plates: Stainless steel or composite 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.

#### 1.20 CASING END SEALS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following

1. Advance Products & Systems, Inc.
2. Calpico
3. Pipeline Seal and Insulator

- B. Typical product: Calpico Model W

- C. Description:

1. General: Flexible membrane system intended to prevent soil from entering annular space between pipes and casings.
2. Membrane: Either of the following:
  - a. 1/8" thick flexible coal-tar sheet reinforced with fiberglass.
  - b. 1/8" neoprene.
  - c. 1/8" Buna-N (nitrile)
  - d. 1/8" EPDM
3. Clamps: Stainless band clamps.
4. On split type membranes: Provide adhesive membrane lap seal per manufacturer's installation instructions.

#### 1.21 SEALANTS

- A. Reference Division 7 specification for sealant requirements

### PART 2 - EXECUTION

## 2.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 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. Exceptions:
  - 1. Where otherwise indicated on drawings.
  - 2. Equipment rooms.
  - 3. Service areas.
  - 4. Horizontal piping close to ceiling where no ceiling exists.
- D. Where piping is installed exposed, install as follows:
  - 1. Install piping at right angles and parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
  - 2. Install vertical piping close to walls.
  - 3. Install horizontal piping close to ceilings.
- E. Where piping is installed above accessible ceilings, install piping 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 where required..
- K. Full lengths of pipe shall be used. Short lengths and couplings will not be permitted.
- L. Where more than one pipe material specification or valve is allowed for particular service, the Contractor is required to use one and only one of the pipe materials specified throughout project.

Two or more different piping materials or valves for same service will not be allowed unless indicated otherwise on drawings or specified herein.

- M. Independently support piping so that its weight shall not be supported by the equipment to which it is connected.
- N. Size reduction shall be made using reducing fittings; bushings are not acceptable.
- O. Mitered ells, notched tees, and orange peel reducers are not acceptable. On threaded piping, bushings are not acceptable.
- P. Cover ends of piping during installation to keep inside of piping clean.
- Q. Piping shall not be routed through electrical rooms or transformer vaults, or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment.
- R. Use only wrenches having square flat jaws, or non-metallic strap wrenches on brass specialties; wrench marks not permitted.
- S. Select system components with pressure rating equal to or greater than system operating pressure.
- T. Install escutcheons at exposed piping penetrations of walls, ceilings, and floors in finished spaces.
- U. Fire-Barrier Pipe Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with approved through-penetration firestop assemblies. Refer to Division 07 Section "Penetration Firestopping" for materials.
- V. Aboveground Non-Fire Barrier Pipe Penetrations
  - 1. All except waterproof floors:
    - a. Install sleeves for pipes passing through concrete walls, masonry walls, gypsum-board partitions, concrete floors, and roof slabs.  
Exception: Sleeves are not required for core-drilled holes in concrete.  
Exception: Permanent sleeves are not required for holes formed in concrete by removable sleeves.
    - 1) Install sleeves flush with both surfaces.  
Exception: In mechanical rooms, install floor sleeves 2 inches above finished floor.

- 2) Aboveground: Use sleeves that are large enough to provide at least  $\frac{1}{4}$  inch annular clear space between sleeve and pipe or pipe insulation. Use cast iron, galvanized steel, or PVC sleeves on pipe sizes 4 inches and smaller. Use galvanized sheet steel sleeves on pipe sizes larger than 4 inches.
- 3) Aboveground: Seal annular space around outside of sleeves with grout or sealant.
- 4) Aboveground: Seal annular space between pipe (or pipe insulation) and sleeve with flexible sealant. Refer to Division 07 Section "Joint Sealants" for materials and installation.

2. Waterproof floors:

a. Install sleeves for pipes passing through floors.

- 1) Install sleeves flush with bottom surface and 2 inches above finished floor.
- 2) Use sleeves that are large enough to provide at least  $\frac{1}{4}$  inch annular clear space between sleeve and pipe or pipe insulation. Use cast iron, galvanized steel, or PVC sleeves.
- 3) Seal annular space around outside of sleeves with sealant.
- 4) Seal annular space between pipe (or pipe insulation) and sleeve with flexible sealant. Refer to Division 07 Section "Joint Sealants" for materials and installation.

W. Underground Pipe Penetrations and Transitions

1. Through foundation walls, both sides underground:

a. Install sleeves for pipes passing through foundation walls.  
Exception: Sleeves are not required for core-drilled holes in concrete.  
Exception: Permanent sleeves are not required for holes formed in concrete by removable sleeves.

- 1) Install sleeves flush with both surfaces.
- 2) Use sleeves that are large enough to provide at least 1 inch annular clear space between sleeve and pipe (or pipe insulation). Use cast iron sleeves.



2. Through foundation walls, one side underground:
- a. Install foundation wall sleeves for pipes passing through foundation walls.  
Exception: Sleeves are not required for core-drilled holes in concrete.  
Exception: Permanent sleeves are not required for holes formed in concrete by removable sleeves.
    - 1) Install sleeves flush with both surfaces.
    - 2) Install pipe centered in opening.
    - 3) Install mechanical sleeve seal.

- X. Verify final equipment locations for roughing-in.
- Y. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

## 2.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 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.

- G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- H. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672.
  - 3. PVC DWV Piping: Join according to ASTM D 2855.

## 2.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  - 3. Install dielectric unions and flanges to connect piping materials of dissimilar metals.

## 2.4 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 plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

## 2.5 PAINTING

- A. In exposed areas, paint plumbing systems, equipment, and components as specified in Division 09 painting Sections.
- B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

## 2.6 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
  - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
  - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
  - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
  - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
  - 7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

## 2.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

## 2.8 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

## 2.9 GROUTING

- A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 220500

## SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING

### 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. Bronze ball valves.
  - 2. Bronze swing check valves.
  - 3. Balancing valves
- B. Related Sections:
  - 1. Section 220553 "Identification for Plumbing" for valve tags and schedules.

#### 1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Non-rising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.
- G. SWP: Steam working pressure.

#### 1.4 SUBMITTALS

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

#### 1.5 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

- B. ASME Compliance:
  - 1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
  - 2. ASME B31.1 for power piping valves.
  - 3. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, grooves, and weld ends.
  - 3. Set gate valves closed to prevent rattling.
  - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
  - 5. Set butterfly valves closed or slightly open.
  - 6. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valve Actuator Types:
  - 1. Handlever: For quarter-turn valves NPS 6 and smaller.
- E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
  - 1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
- F. Valve-End Connections:
  - 1. Solder Joint: With sockets according to ASME B16.18.
  - 2. Threaded: With threads according to ASME B1.20.1.
- G. Valve Bypass and Drain Connections: MSS SP-45.

## 2.2 BRONZE BALL VALVES

### A. Bronze Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Conbraco Industries, Inc.; Apollo Valves
  - b. Hammond Valve.
  - c. Milwaukee Valve Company.
  - d. NIBCO INC.
  - e. Watts; a Watts Water Technologies company.
2. Description:
  - a. Standard: MSS SP-110.
  - b. SWP Rating: 150 psig.
  - c. CWP Rating: 600 psig.
  - d. Body Design: Two piece.
  - e. Body Material: Lead-Free Bronze.
  - f. Seats: PTFE or TFE.
  - g. Stem: Stainless steel.
  - h. Ball: Stainless steel, vented.
  - i. Port: Full.

## 2.3 BALANCING VALVES

### A. Thermostatic Balancing Valve

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Acorn Controls
  - b. Caleffi Hydronic Solutions
  - c. ThermOmegaTech
2. Type: Thermostatic self-actuating balancing valve. Valve shall not have positive shut-off.
3. Body: DZR brass or stainless steel
4. Size: Same as connected piping, but not larger than NPS 2 (DN 50)
5. Accessories: Temperature gauge and check valve.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

### 3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install check valves for proper direction of flow and as follows:
  - 1. Swing Check Valves: In horizontal position with hinge pin level.

### 3.3 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.

### 3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
  - 1. Shutoff Service: Ball.
  - 2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
  - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.



### 3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

#### A. Pipe NPS 3 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full port, bronze with stainless-steel trim.
3. Bronze Swing Check Valves.
4. Bronze Gate Valves.
5. Thermostatic Balancing Valves.

END OF SECTION

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## SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

### 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. Metal pipe hangers and supports.
  - 2. Trapeze pipe hangers.
  - 3. Thermal-hanger shield inserts.
  - 4. Fastener systems.
  - 5. Pipe stands.
  - 6. Pipe positioning systems.
- B. Related Sections:
  - 1. Section 220500 "Common Work Results for Plumbing."

#### 1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
  - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

#### 1.5 ACTION SUBMITTALS

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

## 1.6 QUALITY ASSURANCE

- A. Structural Steel 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.

## PART 2 - PRODUCTS

### 2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
  - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
  - 2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
  - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
  - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
  - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Copper Pipe Hangers:
  - 1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
  - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

### 2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

### 2.3 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. ERICO International Corporation.
  - 2. Rilco Manufacturing Co., Inc.
  - 3. Value Engineered Products, Inc.
- B. Insulation-Insert Material: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig minimum compressive strength. Provide with vapor barrier for piping operating below ambient air temperature.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

## 2.4 FASTENER SYSTEMS

- A. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened Portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

## 2.5 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

## 2.6 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
  - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.

# PART 3 - EXECUTION

## 3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal 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 the building structure.
- B. Metal 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 for individual pipe hangers.
  - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.

F. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. Install hangers and supports to allow controlled thermal 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.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

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 allowed by ASME B31.9 for building services piping.

2. Install Protective shields that span an arc of 180 degrees.
  - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Shield Dimensions for Pipe: Not less than the following:
  - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
4. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### 3.2 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

### 3.3 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

### 3.4 HANGER AND SUPPORT SCHEDULE

- A. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- B. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- C. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- D. Use carbon-steel pipe hangers and supports and attachments for general service applications.
- E. Use padded hangers for piping that is subject to scratching.
- F. Use thermal-hanger shield inserts for insulated piping and tubing.
- G. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, hangers and supports shall be MSS Type 1 – 46.:

- H. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, vertical piping clamps shall be MSS Type 8 or 42.
- I. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, hanger rod attachments shall be MSS Type 13 – 17.
- J. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, building attachments shall be MSS Type 18 – 58.
- K. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- L. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- M. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- N. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529



## SECTION 220553 - IDENTIFICATION FOR PLUMBING

### 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. Equipment labels.
  - 2. Warning signs and labels.
  - 3. Pipe labels.
  - 4. Valve tags.
  - 5. Warning tags.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- C. Valve numbering scheme.
- D. Valve Schedules: For each piping system to include in maintenance manuals.

### PART 2 - PRODUCTS

#### 2.1 EQUIPMENT LABELS

- A. Labels for Equipment:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. Marking Services, Inc.
    - c. Seton Identification Products.

2. Material and Thickness: Multilayer plastic, 1/8 inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  3. Letter Color: White.
  4. Background Color: Safety-Green.
  5. Maximum Temperature: Able to withstand temperatures up to 160 deg F
  6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
  7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
  8. Fasteners: Stainless-steel rivets or self-tapping screws.
  9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

## 2.2 WARNING SIGNS AND LABELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Brady Corporation.
  2. Marking Services Inc.
  3. Seton Identification Products.
- B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- C. Letter Color: Black.
- D. Background Color: Yellow.
- E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

- H. Fasteners: Stainless-steel rivets or self-tapping screws.
- I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- J. Label Content: Include caution and warning information plus emergency notification instructions.
  - 1. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."

## 2.3 PIPE LABELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Brady Corporation.
  - 2. Marking Services Inc.
  - 3. Seton Identification Products.
- B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- C. Pretensioned Pipe Labels: Pre-coiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
  - 1. Lettering Size: Size letters according to ASME A13.1 for piping.

Use pipe stencils on budget conscious projects only.

## 2.4 VALVE TAGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Brady Corporation.
  - 2. Marking Services Inc.
  - 3. Seton Identification Products.
- B. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
  - 1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  - 2. Fasteners: Brass wire-link chain or beaded chain.

- C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

### 3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

### 3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

### 3.4 PIPE LABEL INSTALLATION

- A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
  1. Near each valve and control device.
  2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
  3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
  4. At access doors, manholes, and similar access points that permit view of concealed piping.
  5. Near major equipment items and other points of origination and termination.
  6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
  7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

C. Pipe Label Color Schedule:

1. Domestic Water Piping

- a. Background: Safety green.
- b. Letter Colors: White.

2. Sanitary Waste and Storm Drainage Piping:

- a. Background Color: Safety white.
- b. Letter Color: Black.

### 3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

- a. Cold Water: 1-1/2 inches, round.
- b. Hot Water: 1-1/2 inches, round.
- c. Compressed Air: 1-1/2 inches, round.

### 3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

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## SECTION 220700 - INSULATION FOR PLUMBING

### 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. Insulation Materials
  - 2. Insulating Cements
  - 3. Adhesives
  - 4. Mastics
  - 5. Sealants
  - 6. Factory Applied Jackets
  - 7. Field Applied Jackets
  - 8. Tapes
  - 9. Protective Shielding Guards

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

#### 1.5 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- B. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in Part 3 Scheduling articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber, Preformed Pipe Insulation:



1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Johns Manville; a Berkshire Hathaway company.
  - b. Knauf Insulation.
  - c. Owens Corning.
2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

G. Mineral-Fiber, Pipe and Tank Insulation:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Johns Manville; a Berkshire Hathaway company.
  - b. Knauf Insulation.
  - c. Owens Corning.
2. Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

## 2.2 INSULATING CEMENTS

- A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
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. Ramco Insulation, Inc.

## 2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. For indoor applications, adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.

- b. Eagle Bridges - Marathon Industries.
  - c. Foster Brand; H. B. Fuller Construction Products.
- D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
- E. PVC Jacket Adhesive: Compatible with PVC jacket.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dow Corning Corporation.
    - b. Johns Manville; a Berkshire Hathaway company.
    - c. P.I.C. Plastics, Inc.
    - d. Speedline Corporation.

## 2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
- B. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Knauf Insulation
    - d. Foster Brand; H. B. Fuller Construction Products.
  - 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
  - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
  - 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
  - 5. Color: White.

## 2.5 SEALANTS

- A. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Joint Sealants:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. Pittsburgh Corning Corporation.
  - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 3. Permanently flexible, elastomeric sealant.
  - 4. Service Temperature Range: Minus 100 to plus 300 deg F.
  - 5. Color: White or gray.
- C. ASJ Flashing Sealants, and Vinyl, and PVC Jacket Flashing Sealants:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Eagle Bridges - Marathon Industries.
    - c. Foster Brand; H. B. Fuller Construction Products.
  - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 3. Fire- and water-resistant, flexible, elastomeric sealant.
  - 4. Service Temperature Range: Minus 40 to plus 250 deg F.
  - 5. Color: White.

## 2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
  - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
  - 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
  - 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

## 2.7 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Johns Manville; a Berkshire Hathaway company.
    - b. P.I.C. Plastics, Inc.
    - c. Proto Corporation.
    - d. Speedline Corporation.
  2. Adhesive: As recommended by jacket material manufacturer.
  3. Color: White.
  4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

## 2.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Avery Dennison Corporation, Specialty Tapes Division.
    - b. Compac Corporation.
    - c. Ideal Tape Co., Inc., an American Biltrite Company.
    - d. Knauf Insulation.
    - e. Venture Tape.
  2. Width: 3 inches.
  3. Thickness: 11.5 mils.
  4. Adhesion: 90 ounces force/inch in width.
  5. Elongation: 2 percent.
  6. Tensile Strength: 40 lbf/inch in width.
  7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Avery Dennison Corporation, Specialty Tapes Division.
    - b. Compac Corporation.
    - c. Ideal Tape Co., Inc., an American Biltrite Company.
    - d. Knauf Insulation.
    - e. Venture Tape.
  2. Width: 3 inches.

3. Thickness: 6.5 mils.
  4. Adhesion: 90 ounces force/inch in width.
  5. Elongation: 2 percent.
  6. Tensile Strength: 40 lbf/inch in width.
  7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Avery Dennison Corporation, Specialty Tapes Division.
    - b. Compac Corporation.
    - c. Ideal Tape Co., Inc., an American Biltrite Company.
    - d. Venture Tape.
  2. Width: 2 inches.
  3. Thickness: 6 mils.
  4. Adhesion: 64 ounces force/inch in width.
  5. Elongation: 500 percent.
  6. Tensile Strength: 18 lbf/inch in width.

## 2.9 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers,:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. McGuire Manufacturing.
    - b. Plumberex Specialty Products, Inc.
    - c. Truebro.
    - d. Zurn Industries, LLC.
  2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems to be insulated have been tested and are free of defects.
  2. Verify that surfaces to be insulated are clean and dry.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

- L. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge.
    - a. For below-ambient services, apply vapor-barrier mastic over staples.
  - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
  - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
  - 1. Vibration-control devices.
  - 2. Testing agency labels and stamps.
  - 3. Nameplates and data plates.
  - 4. Cleanouts.
  - 5. Manholes.
  - 6. Handholes.

### 3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
  - 1. Comply with requirements in Division 7 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- C. Insulation Installation at Floor Penetrations:
  - 1. Pipe: Install insulation continuously through floor penetrations.

2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 7 "Penetration Firestopping."

### 3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
  1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
  2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
  4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
  5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
  6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
  7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
  8. For services not specified to receive a field-applied jacket except for flexible elastomeric, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
  9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.



- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
  - 1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
  - 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
  - 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
  - 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
  - 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

### 3.6 INSTALLATION OF MINERAL-FIBER INSULATION

#### A. Insulation Installation on Straight Pipes and Tubes:

- 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
- 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
- 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
- 4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

#### B. Insulation Installation on Pipe Flanges:

- 1. Install preformed pipe insulation to outer diameter of pipe flange.
- 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
- 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
- 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

### 3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

### 3.8 FINISHES

A. Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9 "Exterior Painting" and "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

- a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

### 3.9 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded valves, and for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- B. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

### 3.10 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
  - 1. Drainage piping located in crawl spaces.
  - 2. Underground piping.
  - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

### 3.11 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cold Water:
  - 1. Insulation shall be one of the following:
    - a. Flexible Elastomeric: 1 inch thick.
    - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- B. Domestic Hot and Recirculated Hot Water:
  - 1. NPS 1-1/2 and Smaller: Insulation shall be :
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- C. Stormwater and Overflow:

1. All Pipe Sizes: Insulation shall be the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- D. Roof Drain and Overflow Drain Bodies:
  1. All Pipe Sizes: Insulation shall:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- E. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:
  1. All Pipe Sizes: Insulation shall be the following:
    - a. Protective shielding pipe covers.

END OF SECTION

## SECTION 220800 - COMMISSIONING OF PLUMBING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes commissioning process requirements for Plumbing systems, assemblies, and equipment.
- B. Section includes a list of construction verification checklists and functional performance tests required for this project.
- C. Related Sections:
  - 1. Section 019113 "General Commissioning Requirements"

#### 1.2 RELATED DOCUMENTS

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

#### 1.3 DEFINITIONS

- A. Systems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Equipment start-up documents
- B. Completed construction verification checklists.
- C. Completed preliminary functional performance tests
- D. Certificates of readiness.
- E. Certificates of completion of installation, prestart, and startup activities

#### 1.5 CONTRACTOR'S RESPONSIBILITIES

- A. Assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities.
- B. Evaluate performance deficiencies identified in test reports and in collaboration with entity responsible for the system and equipment installation.

- C. Cooperate with the CxP for resolution of issues recorded in the Commissioning Issues List.
- D. Integrate and coordinate commissioning process activities with construction schedule.
- E. Attend commissioning team meetings held on a monthly basis. At specific times during the construction process there may be meetings held every other week as needed
- F. Attend construction phase controls coordination meeting.
- G. Complete and deliver construction checklists.
- H. Provide information requested by the CxP for final commissioning documentation.
- I. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.
- J. Complete preliminary functional performance tests within the commissioning software prior to scheduling final functional testing to be witnessed by the commissioning provider and owner representative.
- K. Conduct final functional testing as directed by the commissioning provider for all equipment listed in the systems to be commissioned in each represented specification section.
- L. Participate in Plumbing systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxP.
- M. Conduct seasonal testing with the commissioning provider as necessary to demonstrate system performance in the opposite season of Substantial Completion and the scheduled system functional testing.
- N. Participate in lessons learned meeting held 10 months after Substantial Completion and provide updated regarding all "Open" items.
- O. Provide corrective action to close all commissioning items related to equipment and installation efforts related to scope of contracted work.

#### 1.6 CxP'S RESPONSIBILITIES

- A. Provide Project-specific construction checklists and commissioning process test procedures for actual Plumbing systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.
- B. Develop the Commissioning Software project account and invite all cx team members to participate.
- C. Direct commissioning testing.
- D. Review equipment and control systems submittals and provide comment directly to A/E and owner representative.
- E. Witness sample of pressure testing, leak testing, flushing, and equipment startup.

- F. Review equipment start-up and checkout plans and forms.
- G. Provide test data, inspection reports, and certificates in Systems Manual.

#### 1.7 COMMISSIONING DOCUMENTATION

- A. Provide the following information to the CxP for inclusion in the commissioning plan:
  - 1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
  - 2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
  - 3. Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for plumbing systems, assemblies, equipment, and components to be verified and tested.
  - 4. Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.
  - 5. Test and inspection reports and certificates.
  - 6. Corrective action documents.
  - 7. Verification of testing, adjusting, and balancing reports.

#### 1.8 SUBMITTALS

- A. Certificates of completion of installation, prestart, and startup activities.

### PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION

#### 3.1 TESTING PREPARATION

- A. Certify that plumbing systems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
- B. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

#### 3.2 GENERAL TESTING REQUIREMENTS

- A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxP.
- B. Scope of testing shall include energy using and related portions of the plumbing system. Testing shall include measuring effectiveness of operational and control functions.

- C. The CxP shall prepare detailed testing plans, procedures, and checklists for Plumbing systems, subsystems, and equipment. The CxP will review functional testing plans with the Plumbing Subcontractor prior to testing.
- D. Simulated conditions may need to be imposed on the system. Set simulated conditions as directed by the CxP and document simulated conditions and methods of simulation. The CxA may direct that set points be altered when simulating conditions is not practical. After tests, return settings to normal operating conditions.
- E. The CxP may direct that set points be altered when simulating conditions is not practical.
- F. If tests cannot be completed because of a deficiency outside the scope of the plumbing system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

### 3.3 COMMISSIONING DOCUMENTATION

- A. Commissioning documentation is to be filled in as work progresses by the individuals responsible for installation and shall be completed for each installation phase. The commissioning documentation will be completed via a web-based commissioning software and is to be weekly to reflect progress of the system installation.
- B. For each entry provide a description of the work completed since the last entry, the percentage of the total work completed for the system for that area and the step of installation or finalization.
- C. Check Yes or No for each commissioning form item as appropriate. If the information requested for an item does not apply to the given stage of installation for the system, list it as “N/A”. Explain all discrepancies, negative responses or N/A responses in the negative responses section.
- D. Once the work is 100% complete and the responses to each item are complete and resolved for a given commissioning forms group, mark as complete, initial and date in the spaces provided.
- E. In the event there are questions or discrepancies contact the commissioning provider 2 days prior to the next construction progress meeting.
- F. Construction Verification Checklists required for this project
 

|     |            |                              |
|-----|------------|------------------------------|
| 1.  | CVC-221006 | Backflow Preventers          |
| 2.  | CVC-220719 | Plumbing Insulation          |
| 3.  | CVC-221005 | Facility Water Distribution  |
| 4.  | CVC-221005 | Facility Sanitary Sewerage   |
| 5.  | CVC-221005 | Facility Storm Drainage      |
| 6.  | CVC-223000 | Inline Centrifugal Pumps     |
| 7.  | CVC-223000 | Sewage Ejector Pumps         |
| 8.  | CVC-223000 | Sump Pumps                   |
| 9.  | CVC-223000 | Water Heaters                |
| 10. | CVC-224000 | Commercial Plumbing Fixtures |
| 11. | CVC-224000 | Electric Water Coolers       |
- G. Functional Performance Tests required for this project



- |    |              |                         |
|----|--------------|-------------------------|
| 1. | FPT-22 30 00 | Inline Centrifugal Pump |
| 2. | FPT-22 30 00 | Sewage Ejector Pumps    |
| 3. | FPT-22 30 00 | Sump Pumps              |
| 4. | FPT-22 30 00 | Water Heaters           |

END OF SECTION 220800

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## SECTION 221116 - SUPPLY PIPING FOR PLUMBING

### 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. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
  - 2. Encasement for piping.

- B. Related Requirements:

- 1. Section 220500 "Common Work Results for Plumbing."
  - 2. Section 220519 "Meters and Gages for Plumbing."
  - 3. Section 220529 "Hangers and Supports for Plumbing,"
  - 4. Section 220553 "Identification for Plumbing."
  - 5. Section 221119 Supply Piping Specialties for Plumbing."

#### 1.3 SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

#### 1.4 FIELD CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
  - 1. Notify Owner no fewer than two days in advance of proposed interruption of water service.
  - 2. Do not interrupt water service without Owner's written permission.

## PART 2 - PRODUCTS

### 2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

### 2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.
- C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- F. Copper Unions:
  - 1. MSS SP-123.
  - 2. Cast-copper-alloy, hexagonal-stock body.
  - 3. Ball-and-socket, metal-to-metal seating surfaces.
  - 4. Solder-joint or threaded ends.

### 2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
  - 1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
  - 2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Flux: ASTM B 813, water flushable.

### 2.4 ENCASEMENT FOR PIPING

- A. Standard: ASTM A 674 or AWWA C105/A21.5.
- B. Form: Sheet.

- C. Color: Black.

## 2.5 TRANSITION FITTINGS

- A. General Requirements:
  - 1. Same size as pipes to be joined.
  - 2. Pressure rating at least equal to pipes to be joined.
  - 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

### 3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install shutoff valve immediately upstream of each dielectric fitting.
- D. Install domestic water piping level without pitch and plumb.
- E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- F. 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.
- G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- H. Install piping to permit valve servicing.
- I. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

- J. Install piping free of sags and bends.
- K. Install fittings for changes in direction and branch connections.
- L. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- M. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- N. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220500 "Common Work Results for Plumbing."
- O. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

### 3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- F. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

### 3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

### 3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing."

### 3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
  - 1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
  - 2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
  - 3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
  - 4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

### 3.7 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing."

### 3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Piping Inspections:
    - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
    - b. During installation, notify authorities having jurisdiction at least one day 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 authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
  - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
  - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
2. Piping Tests:
- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
  - b. 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 a separate report for each test, complete with diagram of portion of piping tested.
  - c. 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.
  - d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
  - e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
  - f. Prepare reports for tests and for corrective action required.
- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.9 ADJUSTING

- A. Perform the following adjustments before operation:
1. Close drain valves, hydrants, and hose bibbs.
  2. Open shutoff valves to fully open position.
  3. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
    - a. Adjust thermostatic balancing valves to 110°F.
  4. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
  5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
  6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
  7. Check plumbing specialties and verify proper settings, adjustments, and operation.



### 3.10 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
  - 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
  - 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Fill and isolate system according to either of the following:
      - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
      - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
    - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    - d. Repeat procedures if biological examination shows contamination.
    - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Clean non-potable domestic water piping according to the requirements for potable domestic water piping.
- C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

### 3.11 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections may be used on aboveground copper tubing.
- D. Aboveground domestic water piping,, shall be one of the following:
  - 1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and soldered joints.

### 3.12 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller. Use butterfly or ball valves for piping NPS 2-1/2 and larger.
  2. Hot-Water Circulation Piping, Balancing Duty: Thermostatic balancing valves.
  3. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 221116

## SECTION 221119 - SUPPLY PIPING SPECIALTIES FOR PLUMBING

### 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. Vacuum breakers.
2. Strainers.
3. Hose bibbs.
4. Wall hydrants.

- B. Related Requirements:

1. Section 220519 "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.

#### 1.3 ACTION SUBMITTALS

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

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

### PART 2 - PRODUCTS

#### 2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61 Annex G and NSF 14. Mark "NSF-pw" on plastic piping components.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

## 2.3 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Cash Acme.
  - b. Conbraco Industries, Inc.
  - c. Watts; a Watts Water Technologies company.
  - d. Zurn Industries, LLC.
- 2. Standard: ASSE 1001.
- 3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
- 4. Body: Bronze.
- 5. Inlet and Outlet Connections: Threaded.
- 6. Finish: Chrome plated.

- B. Hose-Connection Vacuum Breakers:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Cash Acme.
  - b. Conbraco Industries, Inc.
  - c. Prier Products, Inc.
  - d. Watts; a Watts Water Technologies company.
  - e. Zurn Industries, LLC.
- 2. Standard: ASSE 1011.
- 3. Body: Bronze, nonremovable, with manual drain.
- 4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
- 5. Finish: Chrome or nickel plated.

## 2.4 TEMPERATURE-ACTUATED, WATER MIXING VALVES

- A. Individual-Fixture, Water Tempering Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Lawler Manufacturing Company, Inc.
  - b. Leonard Valve Company.
  - c. Powers.

2. Standard: ASSE 1016 or ASSE 1070, thermostatically controlled, water tempering valve.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Finish: Rough or chrome-plated bronze.

## 2.5 STRAINERS FOR DOMESTIC WATER PIPING

### A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron or steel with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Drain: Pipe plug.

## 2.6 HOSE BIBBS

### A. Hose Bibbs:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Chicago Faucets
  - b. Prier Products, Inc.
  - c. Smith, Jay R. Mfg. Co.
  - d. Watts; a Watts Water Technologies company.
  - e. Woodford Manufacturing Company.
  - f. Zurn Industries, LLC.
2. Standard: ASME A112.18.1 for sediment faucets.
3. Body Material: Bronze.
4. Seat: Bronze, replaceable.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Finished Rooms: Chrome or nickel plated.
10. Operation for Equipment Rooms: Wheel handle or operating key.
11. Operation for Finished Rooms: Operating key.
12. Include operating key with each operating-key hose bibb.
13. Include integral wall flange with each chrome- or nickel-plated hose bibb.

## 2.7 WALL HYDRANTS

### A. Non-freeze Wall Hydrants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Prier Products, Inc.
  - b. Smith, Jay R. Mfg. Co.
  - c. Watts; a Watts Water Technologies company.
  - d. Woodford Manufacturing Company.
  - e. Zurn Industries, LLC.
2. Standard: ASSE 1019, Type B.
3. Type: Freeze-resistant, automatic draining with integral air-inlet valve.
4. Classification: Type B, for automatic draining with hose removed or with hose attached and nozzle closed.
5. Pressure Rating: 125 psig.
6. Operation: Loose key.
7. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
8. Inlet: NPS 1/2 or NPS 3/4.
9. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install balancing valves in locations where they can easily be adjusted.
- B. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
- C. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, solenoid valve, and pump.

### 3.2 CONNECTIONS

- A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

### 3.3 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
  1. Pressure vacuum breakers.
  2. Intermediate atmospheric-vent backflow preventers.
  3. Reduced-pressure-principle backflow preventers.
  4. Thermostatic balancing valves.
  5. Individual fixture water tempering valves.

- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing."

### 3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Test each pressure vacuum breaker according to authorities having jurisdiction and the device's reference standard.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.5 ADJUSTING

- A. Set field-adjustable temperature set points of temperature-actuated balance valves.
- B. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 221119

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## SECTION 221316 - DRAIN AND VENT PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Pipe, tube, and fittings.
  - 2. Specialty pipe fittings.
  - 3. Encasement for underground metal piping.

- B. Related Sections:

- 1. Section 221313 "Facility Sewer Piping" for sanitary sewerage piping and structures outside the building.
  - 2. Section 221329 "Drain Pumps" for effluent and sewage pumps.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
  - 1. Soil, Waste, and Vent Piping: 10-foot head of water.
  - 2. Waste, Force-Main Piping: 100 psig.

#### 1.4 SUBMITTALS

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

#### 1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

## 1.6 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  - 1. Notify Construction Manager no fewer than seven days in advance of proposed interruption of sanitary waste service.
  - 2. Do not proceed with interruption of sanitary waste service without Construction Manager's written permission.

## PART 2 - PRODUCTS

### 2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

### 2.2 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 1785, drain, waste, and vent.
- B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- C. Adhesive Primer: ASTM F 656.
  - 1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Solvent Cement: ASTM D 2564.
  - 1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

### 2.3 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
  - 1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
  - 2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
  - 3. Unshielded, Non-pressure Transition Couplings:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) Fernco Inc.
  - 2) Froet Industries LLC.
  - 3) Mission Rubber Company, LLC; a division of MCP Industries.
- b. Standard: ASTM C 1173.
  - c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
  - d. Sleeve Materials:
    - 1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
    - 2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
    - 3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

### PART 3 - EXECUTION

#### 3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

#### 3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. 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.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at plumbing code required slopes or indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.

- J. 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 two 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.
- K. 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.
- L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
  - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
  - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
  - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
  - 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.
- N. Install aboveground PVC piping according to ASTM D 2665.
- O. Install underground PVC piping according to ASTM D 2321.
- P. Install engineered soil and waste drainage and vent piping systems as follows:
- Q. Plumbing Specialties:
  - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Section 221319 "Drain Piping Specialties for Plumbing."
  - 2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Drain Piping Specialties for Plumbing."
- R. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."

- T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220500 "Common Work Results for Plumbing."
- U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

### 3.3 JOINT CONSTRUCTION

- A. Plastic, Non-pressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.
  - 3. CPVC Piping: Join according to ASTM F 2618 Appendix.

### 3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
  - 1. Install transition couplings at joints of piping with small differences in OD's.
  - 2. In Drainage Piping: Unshielded, non-pressure transition couplings.
- B. Dielectric Fittings:
  - 1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

### 3.5 VALVE INSTALLATION

- A. General valve installation requirements are specified in Section 220523 "General-Duty Valves for Plumbing."
- B. Shutoff Valves:
  - 1. Install shutoff valve on each sewage pump discharge.
  - 2. Install full-port ball valve for piping NPS 2 and smaller.

### 3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing."

### 3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
  - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
  - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
  - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
  - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
  - 5. Comply with requirements for cleanouts and drains specified in Section 221319 "Drain Piping Specialties for Plumbing."
  - 6. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

### 3.8 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing."

### 3.9 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
  - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

### 3.10 CLEANING AND PROTECTION

- 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.
- D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

### 3.11 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping shall be any of the following:
  1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
  2. Dissimilar Pipe-Material Couplings: Unshielded, non-pressure transition couplings.
- C. Aboveground, vent piping shall be any of the following:
  1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
  2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
  3. Stainless-steel pipe and fittings gaskets, and gasketed joints.
  4. Copper tube, Type M; copper pressure fittings; and soldered joints.
  5. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
  6. Solid-wall CPVC pipe, CPVC socket fittings, and solvent-cemented joints.
  7. Dissimilar Pipe-Material Couplings: Unshielded, non-pressure transition couplings.

- D. Underground, soil, waste, and vent piping shall be any of the following:
1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
  2. Dissimilar Pipe-Material Couplings: Unshielded, non-pressure transition couplings.



## SECTION 221319 - DRAIN PIPING SPECIALTIES FOR PLUMBING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Roof drains.
  - 2. Cleanouts.
  - 3. Trench drains.
  - 4. Miscellaneous sanitary drainage piping specialties.
  - 5. Flashing materials.
  - 6. Catch Basins
- B. Related Requirements:

#### 1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. FOG: Fats, oils, and greases.
- C. FRP: Fiberglass-reinforced plastic.
- D. HDPE: High-density polyethylene plastic.
- E. PE: Polyethylene plastic.
- F. PP: Polypropylene plastic.
- G. PVC: Polyvinyl chloride plastic.

#### 1.4 ACTION SUBMITTALS

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

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

## 1.6 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

## 1.7 COORDINATION

- A. Coordinate size and location of roof penetrations.

## PART 2 - PRODUCTS

### 2.1 ROOF DRAINS

- A. Refer to Schedules on drawings for complete description of Roof Drains.
- B. Cast-Iron, Large-Sump, General-Purpose Roof Drains:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Jay R. Smith Mfg. Co.
    - b. Josam Company.
    - c. Wade; a subsidiary of McWane Inc.
    - d. Watts; a Watts Water Technologies company.
    - e. Zurn Industries, LLC.
  - 2. Standard: ASME A112.6.4.
  - 3. Body Material: Cast iron.
  - 4. Dimension of Body: Nominal 14-to 16-inch diameter.
  - 5. Combination Flashing Ring and Gravel Stop: Required.
  - 6. Outlet: Bottom.
  - 7. Outlet Type: No hub.
  - 8. Extension Collars: Required.
  - 9. Underdeck Clamp: Required.
  - 10. Sump Receiver Plate: Required.
  - 11. Dome Material: Aluminum.
  - 12. Perforated Gravel Guard: Stainless steel.
  - 13. Vandal-Proof Dome: Required.

### 2.2 CLEANOUTS

- A. Metal Floor Cleanouts:

1. ASME A112.36.2M, Cast-Iron Cleanouts:
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Smith, Jay R. Mfg. Co.
    - 2) Watts; a Watts Water Technologies company.
    - 3) Zurn Industries, LLC.
2. Standard: ASME A112.36.2M for adjustable housing cleanout.
3. Size: Same as connected branch.
4. Body or Ferrule: Cast iron.
5. Closure: Brass plug with tapered threads.
6. Adjustable Housing Material: Cast iron .
7. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
8. Top Loading Classification: Medium Duty.

B. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Smith, Jay R. Mfg. Co.
  - b. Watts; a Watts Water Technologies company.
  - c. Zurn Industries, LLC.
2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Cast-iron soil pipe test tee as required to match connected piping.
5. Closure: , drilled-and-threaded brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

## 2.3 TRENCH DRAINS

A. Trench Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Smith, Jay R. Mfg. Co.
  - b. Watts; a Watts Water Technologies company.
  - c. Zurn Industries, LLC.
2. Material: HDPE
3. Outlet: Bottom.
4. Grate Material: Ductile iron.
5. Top Loading Classification: Heavy Duty.
6. Trap Material: Same as connected drain pipe.
7. Trap Pattern: Deep-seal P-trap.

## 2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

### A. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

### B. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

## 2.5 CATCH BASINS

### A. Standard Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.

1. Base Section: 6" minimum thickness for floor slab and 4" minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
2. Riser Sections: 4" minimum thickness, 48" diameter, and lengths to provide depth indicated.
3. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
4. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
5. Grade Rings: Include two (2) or three (3) reinforced-concrete rings, of 6" to 9" total thickness that match 24" diameter frame and grate.
6. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one (1) step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12" to 16" intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60".
7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

### B. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16 (ASSHTO HS20-44), structural loading. Include 24" ID by 7" to 9" riser with 4" minimum width flange, and 26" diameter flat grate with small square or short-slotted drainage openings.

1. Grate Free Area: Approximately 50 percent, unless otherwise indicated.
2. Provide solid cover for storm manholes.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.
  - 1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
  - 2. Install expansion joints, if indicated, in roof drain outlets.
  - 3. Position roof drains for easy access and maintenance.
- B. Install conductor nozzles at exposed bottom of conductors where they spill onto grade.
- C. 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] [NPS 6]. Use [NPS 4DN 100] [NPS 6] for larger drainage piping unless larger cleanout is indicated.
  - 2. Locate at each change in direction of piping greater than 45 degrees.
  - 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
  - 4. Locate at minimum intervals of 75 feet40 feetNPS 275 feet
  - 5. Locate at base of each vertical soil and waste stack.
- D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- E. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- F. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface, unless otherwise indicated.
- G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- H. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.
- I. Assemble open drain fittings and install with top of hub 2 inches above floor.
- J. Install deep-seal traps on floor drains and other waste outlets, if indicated.
- K. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- L. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

### 3.2 CONNECTIONS

- A. Comply with requirements in Section 221316 "Drain and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

### 3.3 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### 3.4 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

## SECTION 224000 - PLUMBING FIXTURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following conventional plumbing fixtures and related components:
  - 1. Laminar-flow faucet-spout outlets.
  - 2. Protective shielding guards.
  - 3. Kitchen sinks.
  - 4. Owner-furnished fixtures.
- B. Related Sections include the following:
  - 1. Division 22 Section "Domestic Water Piping Specialties" for backflow preventers, floor drains, and specialty fixtures not included in this Section.
  - 2. Division 22 Section "Emergency Plumbing Fixtures."

#### 1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- C. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.
- D. FRP: Fiberglass-reinforced plastic.
- E. PVC: Polyvinyl chloride plastic.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.
- B. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

- C. Warranty: Special warranty specified in this Section.

## 1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
  - 1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- 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. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities for plumbing fixtures for people with disabilities.
- D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- E. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- G. Comply with the following applicable standards and other requirements specified for l sink faucets:
  - 1. Faucets: ASME A112.18.1.
  - 2. NSF Potable-Water Materials: NSF 61.
  - 3. Pipe Threads: ASME B1.20.1.
  - 4. Supply Fittings: ASME A112.18.1.
- H. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
  - 1. Atmospheric Vacuum Breakers: ASSE 1001.
  - 2. Brass and Copper Supplies: ASME A112.18.1.
  - 3. Manual-Operation Flushometers: ASSE 1037.
  - 4. Brass Waste Fittings: ASME A112.18.2.
- I. Comply with the following applicable standards and other requirements specified for miscellaneous components:
  - 1. Flexible Water Connectors: ASME A112.18.6.
  - 2. Floor Drains: ASME A112.6.3.
  - 3. Hose-Coupling Threads: ASME B1.20.7.
  - 4. Pipe Threads: ASME B1.20.1.
  - 5. Supply and Drain Protective Shielding Guards: ICC A117.1.



## 1.6 WARRANTY

- A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace components of whirlpools that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures of unit shell.
    - b. Faulty operation of controls, blowers, pumps, heaters, and timers.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
  - 2. Warranty Period for Commercial Applications: Three year(s) from date of Substantial Completion.

## 1.7 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. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
  - 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

## PART 2 - PRODUCTS

### 2.1 KITCHEN SINKS

- A. Kitchen Sinks, :
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following: See fixture schedule on drawings for complete description of fixture and accessories.
    - a. Kohler Co.
    - b. American Standard Companies, Inc.
    - c. Dayton Products, Inc.
    - d. Elkay Manufacturing Co.
    - e. Just Manufacturing Company.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

- B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install counter-mounting fixtures in and attached to casework.
- C. Install fixtures level and plumb according to roughing-in drawings.
- D. 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.
  - 1. Exception: Use ball, if supply stops are not specified with fixture. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."
- E. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- F. 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.
- G. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.
- H. 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.
- I. Install traps on fixture outlets.
  - 1. Exception: Omit trap on fixtures with integral traps.
  - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- J. 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. Escutcheons are specified in Division 22 Section "Escutcheons for Plumbing Piping."
- K. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

### 3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

### 3.4 FIELD QUALITY CONTROL

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

### 3.5 ADJUSTING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Operate and adjust controls. Replace damaged and malfunctioning units and controls.
- C. Replace washers and seals of leaking and dripping faucets and stops.

### 3.6 CLEANING

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
  - 1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
  - 2. Remove sediment and debris from drains.
- B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

### 3.7 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.

- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224000

## SECTION 224500 - EMERGENCY PLUMBING FIXTURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following emergency plumbing fixtures:
  - 1. Eyewash equipment.
- B. Related Sections include the following:
  - 1. Division 22 Section "Domestic Water Piping Specialties" for backflow preventers.
  - 2. Division 22 Section "Sanitary Waste Piping Specialties" for floor drains.
  - 3. Division 22 Section "Domestic Water Filtration Equipment" for water filters.

#### 1.3 DEFINITIONS

- A. Accessible Fixture: Emergency plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Plumbed Emergency Plumbing Fixture: Fixture with fixed, potable-water supply.
- C. Self-Contained Emergency Plumbing Fixture: Fixture with flushing-fluid-solution supply.
- D. Tepid: Moderately warm.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include flow rates and capacities, furnished specialties, and accessories.
- B. Operation and Maintenance Data: For emergency plumbing fixtures to include in maintenance manuals.

### PART 2 - PRODUCTS

#### 2.1 EYEWASH EQUIPMENT

- A. Eyewash Equipment,:

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 following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
  - a. Bradley Corporation.
  - b. Chicago Faucets.
  - c. Encon Safety Products.
  - d. Guardian Equipment Co.
  - e. Haws Corporation.
  - f. Lab Safety Supply Inc.
  - g. Murdock, Inc.
  - h. Sellstrom Manufacturing Co.
  - i. Speakman Company.
  - j. WaterSaver Faucet Co.
  - k. Western Emergency Equipment.
  - l.
4. Description: Plumbed, freestanding eyewash equipment.
  - a. Capacity: Deliver potable water at rate not less than 0.4 gpm for at least 15 minutes.
  - b. Supply Piping: NPS 1/2 chrome-plated brass or stainless steel with flow regulator and stay-open control valve.
  - c. Control-Valve Actuator: Paddle.
  - d. Receptor: Plastic bowl.
  - e. Drain Piping: NPS 1-1/4 minimum, piped to floor in direction of drain.or drain P-trap, waste to wall, and wall flange complying with ASME A112.18.2.

## 2.2 WATER-TEMPERING EQUIPMENT

### A. Water-Tempering Equipment,:

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 following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
  - a. Armstrong International, Inc.
  - b. Bradley Corporation.
  - c. Encon Safety Products.
  - d. Haws Corporation.
  - e. Lawler Manufacturing Co., Inc.
  - f. Leonard Valve Company.

- g. Powers, a Watts Industries Co.
  - h. Speakman Company.
  - i. Therm-Omega-Tech, Inc.
  - j. Western Emergency Equipment.
- 4. Description: Factory-fabricated, hot- and cold-water-tempering equipment with thermostatic mixing valve.
  - a. Thermostatic Mixing Valve: Designed to provide 85 deg F tepid, potable water at emergency plumbing fixtures, to maintain temperature at plus or minus 5 deg F throughout required 15-minute test period, and in case of unit failure to continue cold-water flow, with union connections, controls, metal piping, and corrosion-resistant enclosure.

## 2.3 SOURCE QUALITY CONTROL

- A. Certify performance of plumbed emergency plumbing fixtures by independent testing agency acceptable to authorities having jurisdiction.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in for water piping systems to verify actual locations of piping connections before plumbed emergency plumbing fixture installation.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 EMERGENCY PLUMBING FIXTURE INSTALLATION

- A. Assemble emergency plumbing fixture piping, fittings, control valves, and other components.
- B. Install fixtures level and plumb.
- C. Fasten fixtures to substrate.
- D. Install shutoff valves in water-supply piping to fixtures. Use ball, gate, or globe valve if specific type valve is not indicated. Install valves chained or locked in open position if permitted. Install valves in locations where they can easily be reached for operation. Valves are specified in Division 22 Section "General-Duty Valves For Plumbing Piping."
  - 1. Exception: Omit shutoff valve on supply to group of plumbing fixtures that includes emergency plumbing fixture.
  - 2. Exception: Omit shutoff valve on supply to emergency equipment if prohibited by authorities having jurisdiction.

- E. Install dielectric fitting in supply piping to fixture if piping and fixture connections are made of different metals. Dielectric fittings are specified in Division 22 Section "Common Work Results for Plumbing."
- F. Install thermometers in supply and outlet piping connections to water-tempering equipment. Thermometers are specified in Division 22 Section "Meters and Gages for Plumbing Piping."
- G. Install indirect waste piping to wall on drain outlet of fixture receptors that are indicated to be indirectly connected to drainage system. Drainage piping is specified in Division 22 Section "Sanitary Waste and Vent Piping."
- H. Install escutcheons on piping wall and ceiling penetrations in exposed, finished locations. Escutcheons are specified in Division 22 Section "Escutcheons for Plumbing Piping."
- I. Install equipment nameplates or equipment markers on fixtures and equipment signs on water-tempering equipment. Identification materials are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

### 3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect hot- and cold-water-supply piping to hot- and cold-water-tempering equipment. Connect output from water-tempering equipment to emergency plumbing fixtures.
- C. Connect cold water and electrical power to electric heating water-tempering equipment.
- D. Indirectly connect emergency plumbing fixture receptors without trapped drain outlet to sanitary or storm drainage piping.
- E. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- F. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

### 3.4 FIELD QUALITY CONTROL

- A. Mechanical-Component Testing: After plumbing connections have been made, test for compliance with requirements. Verify ability to achieve indicated capacities and temperatures.
- B. Electrical-Component Testing: After electrical circuitry has been energized, test for compliance with requirements.
  - 1. Test and adjust controls and safeties.
- C. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.



- D. Report test results in writing.

### 3.5 ADJUSTING

- A. Adjust or replace fixture flow regulators for proper flow.
- B. Adjust equipment temperature settings.

END OF SECTION 224500