

PROJECT MANUAL

MAY 17, 2011

NEW OFFICE BUILDING AT  
901 WASHINGTON AVENUE



FOR

J.B. BROWN & SONS  
36 DANFORTH STREET  
PORTLAND, MAINE 04112

PREPARED BY

HKTA / architects  
482 Congress Street  
Portland, Maine 04101

TABLE OF CONTENTS

PART A - BIDDING DOCUMENTS

By Construction Manager

PART B - CONTRACT FORMS

By Construction Manager

PART C - CONDITIONS OF THE CONTRACT

By Construction Manager

PART D - SPECIFICATIONS

DIVISION 01 - GENERAL REQUIREMENTS

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

DIVISION 02 - EXISTING CONDITIONS

Not Used

DIVISION 03 - CONCRETE

033000	Concrete Work
034500	Precast Architectural Concrete

NEW OFFICE BUILDING  
901 Washington Avenue  
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DIVISION 04 - MASONRY

042000 Unit Masonry

DIVISION 05 - METALS

051200 Structural Steel  
052100 Steel Joist Framing  
053100 Metal Decking  
054000 Cold-Formed Metal Framing  
055000 Metal Fabrications  
055213 Pipe and Tube Railings

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

061000 Rough Carpentry  
061600 Sheathing  
064023 Interior Architectural Woodwork  
066400 Plastic Paneling

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

072100 Thermal Insulation  
072616 Below-Grade Vapor Retarders  
072700 Air Barriers  
074213 Metal Wall Panels  
075323 EPDM Membrane Roofing  
076200 Sheet Metal Flashing and Trim  
079200 Joint Sealants

DIVISION 08 - OPENINGS

081113 Hollow Metal Doors and Frames  
081416 Flush Wood Doors  
084113 Aluminum-Framed Entrances & Storefronts  
085423 Translucent Skylight System  
087100 Door Hardware  
088000 Glazing

DIVISION 09 - FINISHES

092216 Non-Structural Metal Framing  
092900 Gypsum Board  
093000 Tiling  
095113 Acoustical Panel Ceilings  
096513 Resilient Base & Accessories  
096516 Resilient Sheet Flooring  
096519 Resilient Tile Flooring  
096813 Tile Carpeting  
099123 Interior Painting

DIVISION 10 – SPECIALTIES

101400	Signage
102113	Toilet Compartments
102800	Toilet Accessories
104413	Fire Extinguisher Cabinets
104416	Fire Extinguishers

DIVISION 11 - EQUIPMENT

Not Used

DIVISION 12 - FURNISHINGS

Not Used

DIVISION 13 - SPECIAL CONSTRUCTION

Not Used

DIVISION 14 - CONVEYING SYSTEMS

Not Used

DIVISIONS 15 – 19 - NOT USED

DIVISION 21 – FIRE SUPPRESSION

By Others

DIVISION 22 – PLUMBING

By Others

DIVISION 23 – HEATING, VENTILATION, AND AIR-CONDITIONING (HVAC)

By Others

DIVISION 24 – NOT USED

Not Used

DIVISION 25 – INTEGRATED AUTOMATION

Not Used

DIVISION 26 – ELECTRICAL

By Others

DIVISION 27 – COMMUNICATIONS

By Others

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

By Others

DIVISION 29 – NOT USED

DIVISION 31 – EARTHWORK

311000 Site Clearing  
312000 Earthwork  
312513 Temporary Erosion Control

DIVISION 32 – EXTERIOR IMPROVEMENTS

321216 Asphalt Paving  
321410 Precast Concrete Pavers  
321501 Granite Curbing  
329200 Lawns and Grasses  
329300 Plants

DIVISION 33 – UTILITIES

333000 Sewers and Drains  
333900 Manholes and Catchbasins

DIVISION 34 – TRANSPORTATION - NOT USED

DIVISION 35 – WATERWAY AND MARINE CONSTRUCTION - NOT USED

DIVISION 36 – 39 - NOT USED

DIVISION 40 – PROCESS INTEGRATION - NOT USED

DIVISION 41 – MATERIAL PROCESSING AND HANDLING EQUIPMENT - NOT USED

DIVISION 42 – PROCESS HEATING, COOLING, AND DRYING EQUIPMENT - NOT USED

DIVISION 43 – PROCESS GAS AND LIQUID HANDLING, PURIFICATION, AND STORAGE  
EQUIPMENT - NOT USED

DIVISION 44 – POLLUTION CONTROL EQUIPMENT - NOT USED

DIVISION 45 – INDUSTRY-SPECIFIC MANUFACTURING EQUIPMENT - NOT USED

DIVISION 46 – 47 - NOT USED

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901 Washington Avenue  
Portland, Maine

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DIVISION 48 – ELECTRICAL POWER GENERATION - NOT USED

## SECTION 011000 - SUMMARY

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Project information.
  - 2. Work covered by Contract Documents.
  - 3. Access to site.
  - 4. Work restrictions.
  - 5. Specification and drawing conventions.
- B. Related Sections include the following:
  - 1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

#### 1.3 PROJECT INFORMATION

- A. Project Identification: New Office Building - J.B. Brown & Sons.
  - 1. Project Location: 901 Washington Avenue, Portland, Maine.
- B. Owner: J.B. Brown & Sons.
- C. Architect Identification: The Contract Documents were prepared for Project by HKTA Architects, 482 Congress Street, Suite 200, Portland Maine, 04101.
- D. Construction Manager: Pizzagalli Construction Company.
  - 1. Construction Manager for this Project is Project's Constructor. In Divisions 01 through 49 Sections, the terms "Construction Manager" and "Contractor" are synonymous.

#### 1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work consists of the following:

1. The Work involves the construction of a New Office Building at location indicated on Drawings. Work includes but is not limited to, demolition, earthwork, site utilities and site improvements, paving, and landscaping. Work also includes concrete foundations and slab-on-grade, steel structure, steel joists and decking, roof membrane over roof insulation, sheet metal, masonry, metal stud partitions, insulation, gypsum board walls and ceilings, ceramic tile, acoustical ceilings, resilient flooring, carpeting, custom cabinets and fixtures, carpentry, glass storefront system, painting, metal doors, wood doors, metal frames, door hardware, toilet partitions and accessories, signage, fire protection and detection systems, security systems, electrical, and heating, ventilating, and air conditioning complete and ready for use.

#### 1.5 ACCESS TO SITE

- A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

#### 1.6 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
  1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except otherwise indicated.
  1. Weekend Hours: As approved by Owner.
  2. Early Morning Hours: As approved by Owner.
  3. Hours for Utility Shutdowns: As approved by Owner.
  4. Provide 24 hour notice to Owner when performing work other than normal working hours.
- C. Controlled Substances: Use of tobacco products and other controlled substances within the building is not permitted.

#### 1.7 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:



1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on the Drawings are described in detail in the Specifications. One or more of the following are used on the Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
  3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

## SECTION 012100 - ALLOWANCES

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements governing allowances.
  - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.
  - 2. Include the cost of allowances in the contract bid price.
- B. Types of allowances include the following:
  - 1. Lump-sum allowances.
  - 2. Unit-cost allowances.
  - 3. Quantity allowances.
- C. Related Sections include the following:
  - 1. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders for allowances.
  - 2. Division 01 Section "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.
  - 3. Divisions 02 through 48 Sections for items of Work covered by allowances.

#### 1.3 SELECTION AND PURCHASE

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

#### 1.4 ACTION SUBMITTALS

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

#### 1.5 INFORMATIONAL SUBMITTALS

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

#### 1.6 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

#### 1.7 ALLOWANCES

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

#### 1.8 ADJUSTMENT OF ALLOWANCES

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

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

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

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

### 3.3 SCHEDULE OF ALLOWANCES

- A. Allowances to be determined.

END OF SECTION 012100

## SECTION 012500 - SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Sections:
  - 1. Division 01 Section "Allowances" for products selected under an allowance.
  - 2. Division 01 Section "Alternates" for products selected under an alternate.
  - 3. Divisions 02 through 48 Sections for specific requirements and limitations for substitutions.

#### 1.3 DEFINITIONS

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

#### 1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use facsimile of form provided at end of this Section.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.

- b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
  - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
  - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
  - e. Samples, where applicable or requested.
  - f. Certificates and qualification data, where applicable or requested.
  - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
  - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
  - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
  - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - k. Cost information, including a proposal of change, if any, in the Contract Sum.
  - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
  - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Owner's Action: If necessary, Owner will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Owner will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Owner does not issue a decision on use of a proposed substitution within time allocated.

## 1.5 QUALITY ASSURANCE

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

- B. Products with asbestos: Asbestos containing materials are not to be purchased or installed in this project.

## 1.6 PROCEDURES

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

## PART 2 - PRODUCTS

### 2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
  - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - b. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    - c. Substitution request is fully documented and properly submitted.
    - d. Requested substitution will not adversely affect Contractor's construction schedule.
    - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - f. Requested substitution is compatible with other portions of the Work.
    - g. Requested substitution has been coordinated with other portions of the Work.
    - h. Requested substitution provides specified warranty.
    - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Owner will consider requests for substitution if received within 60 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Owner.
  - 1. Conditions: Owner will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
- b. Requested substitution does not require extensive revisions to the Contract Documents.
- c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- d. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
- e. Substitution request is fully documented and properly submitted.
- f. Requested substitution will not adversely affect Contractor's construction schedule.
- g. Requested substitution has received necessary approvals of authorities having jurisdiction.
- h. Requested substitution is compatible with other portions of the Work.
- i. Requested substitution has been coordinated with other portions of the Work.
- j. Requested substitution provides specified warranty.
- k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)



SUBSTITUTION REQUEST FORM

Project: \_\_\_\_\_ Substitution Request Number: \_\_\_\_\_  
To: \_\_\_\_\_ From: \_\_\_\_\_  
Re: \_\_\_\_\_ Date: \_\_\_\_\_

Specification Title: \_\_\_\_\_ Description: \_\_\_\_\_  
Section: \_\_\_\_\_ Page: \_\_\_\_\_ Article/Paragraph: \_\_\_\_\_

Proposed Substitution: \_\_\_\_\_  
Manufacturer: \_\_\_\_\_ Address: \_\_\_\_\_ Phone: \_\_\_\_\_  
Trade Name: \_\_\_\_\_ Model No. \_\_\_\_\_

Attached data includes product description, specifications, drawings, and performance and test data adequate for evaluation of the request: applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitutions will require for its proper installation.

The Undersigned certifies:

1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified product.
2. Will provide the same warranty for the Substitution as for the specified Product.
3. Will provide no additional cost to the Owner.
4. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
5. Waive claims for additional costs or time extension that may subsequently become apparent.
6. Will reimburse Owner and Architect/Engineer for review or redesign services associated with substitution.

Submitted By: \_\_\_\_\_  
Signed By: \_\_\_\_\_  
Firm: \_\_\_\_\_  
Address: \_\_\_\_\_  
Telephone: \_\_\_\_\_ Fax: \_\_\_\_\_

A/E's REVIEW AND ACTION

- Submission approved - Make submittals in accordance with Specification Section 013300.  
 Submission approved as noted - Make submittals in accordance with Specification Section 013300.  
 Submission rejected - Use specified materials.  
 Submission request received too late - Use specified materials.

Signed by: \_\_\_\_\_ Date: \_\_\_\_\_

Supporting Data Attached:  Drawings  Product Data  Samples  Tests  Reports  
 Other \_\_\_\_\_

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END OF SECTION 012500

## SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
  - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

#### 1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Owner will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Work Change Proposal Requests issued by Owner are not instructions either to stop work in progress or to execute the proposed change.
  - 2. Within 20 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include costs of labor and supervision directly attributable to the change.
    - d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use CSI Form 13.6A, "Change Order Request (Proposal)," with attachments CSI Form 13.6D, "Proposal Worksheet Summary," and Form 13.6C, "Proposal Worksheet Detail."

#### 1.4 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: Refer to Division 01 Section "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

#### 1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Owner will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

## SECTION 012900 - PAYMENT PROCEDURES

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
  - 1. Division 01 Section "Allowances" for procedural requirements governing handling and processing of allowances.
  - 2. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
  - 3. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

#### 1.3 DEFINITIONS

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

#### 1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
  - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
    - a. Application for Payment forms with Continuation Sheets.
    - b. Submittals Schedule.
    - c. Items required to be indicated as separate activities in Contractor's construction schedule.
  - 2. Submit the Schedule of Values to Owner at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the Schedule of Values:
    - a. Project name and location.
    - b. Name of Architect.
    - c. Architect's project number.
    - d. Contractor's name and address.
    - e. Date of submittal.
  2. Submit draft of request for payment form.
  3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
    - a. Related Specification Section or Division.
    - b. Description of the Work.
    - c. Name of subcontractor.
    - d. Name of manufacturer or fabricator.
    - e. Name of supplier.
    - f. Change Orders (numbers) that affect value.
    - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
      - 1) Labor.
      - 2) Materials.
      - 3) Equipment.
  4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training in the amount of 5 percent of the Contract Sum.
    - a. Include separate line items under Contractor and principal subcontracts for project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
  5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
  6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
    - a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
  7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

8. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
  - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
10. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

#### 1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Owner and paid for by Owner.
  1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
  1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.
- C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Owner will return incomplete applications without action.
  1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
  2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
  3. Include amounts of Change Orders issued before last day of construction period covered by application.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
  2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
  3. Provide summary documentation for stored materials indicating the following:
    - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Owner by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from Construction Manager for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  2. When an application shows completion of an item, submit final or full waivers.
  3. The list of subcontractors, principal suppliers and fabricators shall be used to designate which entities involved in the Work must submit waivers. The list shall be approved by the Owner.
  4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
  2. Schedule of Values.
  3. Contractor's Construction Schedule (preliminary if not final).
  4. Submittals Schedule (preliminary if not final).
  5. List of Contractor's staff assignments.
  6. Copies of building permits.
  7. Initial progress report.
  8. Certificates of insurance and insurance policies.
  9. Performance and payment bonds.
  10. Data needed to acquire Owner's insurance.
  11. Initial settlement survey and damage report if required.



- I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
  1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
  2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
  
- J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
  1. Evidence of completion of Project closeout requirements.
  2. Final submittal of record documents and operation and maintenance data.
  3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  4. Updated final statement, accounting for final changes to the Contract Sum.
  5. Evidence that claims have been settled.
  6. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
  7. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

## SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. General project coordination procedures.
  - 2. Administrative and supervisory personnel.
  - 3. Project meetings.
  - 4. Requests for Interpretation (RFIs).
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections include the following:
  - 1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
  - 2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

#### 1.3 DEFINITIONS

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

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
  - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
  - 2. Number and title of related Specification Section(s) covered by subcontract.
  - 3. Drawing number and detail references, as appropriate, covered by subcontract.

- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
  - 1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

## 1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's Construction Schedule.
  - 2. Preparation of the Schedule of Values.
  - 3. Installation and removal of temporary facilities and controls.
  - 4. Delivery and processing of submittals.
  - 5. Progress meetings.
  - 6. Preinstallation conferences.
  - 7. Project closeout activities.
  - 8. Startup and adjustment of systems.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

#### 1.6 REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in form specified.
  1. Owner will return RFIs submitted to Owner by other entities controlled by Contractor with no response.
  2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
  1. Project name.
  2. Project number.
  3. Date.
  4. Name of Contractor.
  5. Name of Architect.
  6. RFI number, numbered sequentially.
  7. RFI subject.
  8. Specification Section number and title and related paragraphs, as appropriate.
  9. Drawing number and detail references, as appropriate.
  10. Field dimensions and conditions, as appropriate.
  11. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  12. Contractor's signature.
  13. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
    - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
  1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Owner's Action: Owner will review each RFI, determine action required, and return it. RFIs received after 1:00 p.m. will be considered as received the following working day.
  1. The following RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.

- c. Requests for approval of Contractor's means and methods.
    - d. Requests for coordination information already indicated in the Contract Documents.
    - e. Requests for adjustments in the Contract Time or the Contract Sum.
    - f. Requests for interpretation of Architect's actions on submittals.
    - g. Incomplete RFIs or RFIs with numerous errors.
  2. Owner's action may include a request for additional information, in which case Owner's time for response will date from time of receipt of additional information.
  3. Owner's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Owner in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:
  1. Project name.
  2. Name and address of Contractor.
  3. Name and address of Architect.
  4. RFI number including RFIs that were dropped and not submitted.
  5. RFI description.
  6. Date the RFI was submitted.
  7. Date Owner's response was received.
  8. Identification of related Proposal Request, as appropriate.
  9. Identification of related Proposal Request, as appropriate.
- F. On receipt of Owner's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Owner within seven days if Contractor disagrees with response.

## 1.7 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
  1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner of scheduled meeting dates and times.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, within three days of the meeting.
- B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
  2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. The Contract Documents.
    - b. Options.
    - c. Related RFIs.
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Review of mockups.
    - i. Possible conflicts.
    - j. Compatibility problems.
    - k. Time schedules.
    - l. Weather limitations.
    - m. Manufacturer's written recommendations.
    - n. Warranty requirements.
    - o. Compatibility of materials.
    - p. Acceptability of substrates.
    - q. Temporary facilities and controls.
    - r. Space and access limitations.
    - s. Regulations of authorities having jurisdiction.
    - t. Testing and inspecting requirements.
    - u. Installation procedures.
    - v. Coordination with other work.
    - w. Required performance results.
    - x. Protection of adjacent work.
    - y. Protection of construction and personnel.
  3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
  5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- C. Progress Meetings: Conduct progress meetings at monthly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner, each contractor, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site utilization.
      - 8) Temporary facilities and controls.
      - 9) Progress cleaning.
      - 10) Quality and work standards.
      - 11) Status of correction of deficient items.
      - 12) Field observations.
      - 13) Status of RFIs.
      - 14) Status of proposal requests.
      - 15) Pending changes.
      - 16) Status of Change Orders.
      - 17) Pending claims and disputes.
      - 18) Documentation of information for payment requests.
  3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
  4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
    - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- D. Project Closeout Conference: Schedule and conduct a Project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.

2. Attendees: Authorized representatives of Owner; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    - a. Preparation of record documents.
    - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    - c. Submittal of written warranties.
    - d. Requirements for preparing sustainable design documentation.
    - e. Requirements for preparing operations and maintenance data.
    - f. Requirements for demonstration and training.
    - g. Preparation of Contractor's punch list.
    - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    - i. Submittal procedures.
    - j. Coordination of separate contracts.
    - k. Owner's partial occupancy requirements.
    - l. Installation of Owner's furniture, fixtures, and equipment.
    - m. Responsibility for removing temporary facilities and controls.
  4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: Each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    - c. Review present and future needs of each contractor present, including the following:



- 1) Interface requirements.
  - 2) Sequence of operations.
  - 3) Status of submittals.
  - 4) Deliveries.
  - 5) Off-site fabrication.
  - 6) Access.
  - 7) Site utilization.
  - 8) Temporary facilities and controls.
  - 9) Work hours.
  - 10) Hazards and risks.
  - 11) Progress cleaning.
  - 12) Quality and work standards.
  - 13) Change Orders.
3. Reporting: Record meeting results and distribute copies to Owner and everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

## SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Start-up construction schedule.
  - 2. Contractor's Construction Schedule.
  - 3. Construction schedule updating reports.
  - 4. Daily construction reports.
  - 5. Material location reports.
  - 6. Field condition reports.
  - 7. Special reports.
- B. Related Sections include the following:
  - 1. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
  - 2. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

#### 1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
  - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
  - 2. Predecessor Activity: An activity that precedes another activity in the network.
  - 3. Successor Activity: An activity that follows another activity in the network.
- B. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- C. Event: The starting or ending point of an activity.
- D. Float: The measure of leeway in starting and completing an activity.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
  - 1. PDF electronic file.
- B. Start-up construction schedule.
- C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
  - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- D. Construction Schedule Updating Reports: Submit with Applications for Payment.
- E. Daily Construction Reports: Submit at weekly intervals.
- F. Material Location Reports: Submit at monthly intervals.
- G. Field Condition Reports: Submit at time of discovery of differing conditions.
- H. Special Reports: Submit at time of unusual event.
- I. Qualification Data: For scheduling consultant.

#### 1.5 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
  - 1. Discuss constraints, including area separations and milestones.
  - 2. Review time required for review of submittals and resubmittals.
  - 3. Review requirements for tests and inspections by independent testing and inspecting agencies.
  - 4. Review time required for completion and startup procedures.
  - 5. Review and finalize list of construction activities to be included in schedule.
  - 6. Review submittal requirements and procedures.
  - 7. Review procedures for updating schedule.

#### 1.6 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

## PART 2 - PRODUCTS

### 2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for commencement of the Work to date of Final Completion.
  1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
  1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
  2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
  3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
  4. Startup and Testing Time: Include not less than 5 days for startup and testing.
  5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Owner's administrative procedures necessary for certification of Substantial Completion.
  6. Punch List and Final Completion: Include not more than 30 days for punch list and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
  1. Work Restrictions: Show the effect of the following items on the schedule:
    - a. Coordination with existing construction.
    - b. Limitations of continued occupancies.
    - c. Uninterruptible services.
    - d. Partial occupancy before Substantial Completion.
    - e. Use of premises restrictions.
    - f. Provisions for future construction.
    - g. Seasonal variations.
    - h. Environmental control.

2. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    - a. Subcontract awards.
    - b. Submittals.
    - c. Purchases.
    - d. Mockups.
    - e. Fabrication.
    - f. Sample testing.
    - g. Deliveries.
    - h. Installation.
    - i. Tests and inspections.
    - j. Adjusting.
    - k. Curing.
    - l. Startup and placement into final use and operation.
  3. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
    - a. Structural completion.
    - b. Permanent space enclosure.
    - c. Completion of mechanical installation.
    - d. Completion of electrical installation.
    - e. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
  2. Unanswered Requests for Information.
  3. Rejected or unreturned submittals.
  4. Notations on returned submittals.

## 2.2 START-UP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for commencement of the Work.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

## 2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for commencement of the Work. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
  - 1. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

## 2.4 REPORTS

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

- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

## 2.5 SPECIAL REPORTS

- A. General: Submit special reports directly to Architect within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, review schedule for actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
  - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  - 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
  - 1. Post copies in Project meeting rooms and temporary field offices.
  - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

## SECTION 013300 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
  - 1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
  - 2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
  - 3. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
  - 4. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
  - 5. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

#### 1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Owner's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Owner's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.



- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

#### 1.4 ACTION SUBMITTALS

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

#### 1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings may be provided by Architect for Contractor's use in preparing submittals. Contact Architect for information.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
  4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Owner reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Owner's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Owner will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 15 days for review of each resubmittal.
  4. Sequential Review: Where sequential review of submittals by Owner's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
    - a. Sitework submittals.
    - b. Commercial equipment submittals.
    - c. Structural submittals.
    - d. Mechanical submittals.
    - e. Electrical submittals.
    - f. Data & Communications Systems submittals.
  5. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
  6. Submittals with Color Selections: Deliver to Owner a list of submittals required for the exterior color package and a list required for the interior color package. The Owner needs to coordinate the colors of all exterior and interior items and will hold submittals with color selections until all materials in the exterior color package have been received. Allow 2 weeks after the last item has been submitted for return of exterior color selections. The Owner will hold submittals with color selections until all materials in the interior color package have been received. Allow 3 weeks after the last item has been submitted for return of interior color selections. Careful coordination of the Submittal Schedule by the Contractor is required so as not to delay the Work.
- D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:
  - a. Project name.
  - b. Date.
  - c. Name of Architect.
  - d. Name of Contractor.
  - e. Name of subcontractor.
  - f. Name of supplier.
  - g. Name of manufacturer.
  - h. Submittal number or other unique identifier, including revision identifier.
    - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., ABCD-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., ABCD-061000.01.A).
  - i. Number and title of appropriate Specification Section.
  - j. Drawing number and detail references, as appropriate.
  - k. Location(s) where product is to be installed, as appropriate.
  - l. Other necessary identification.
4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
  - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return without review submittals received from sources other than Contractor.
  - a. Transmittal Form for Paper Submittals: Use Contractor's standard transmittal form. Provide locations on form for the following information:
    - 1) Project name.
    - 2) Date.
    - 3) Destination (To:).
    - 4) Source (From:).
    - 5) Name and address of Architect.
    - 6) Name of Construction Manager.
    - 7) Name of firm or entity that prepared submittal.
    - 8) Names of subcontractor, manufacturer, and supplier.
    - 9) Category and type of submittal.
    - 10) Submittal purpose and description.
    - 11) Specification Section number and title.

- 12) Specification paragraph number or drawing designation and generic name for each of multiple items.
  - 13) Drawing number and detail references, as appropriate.
  - 14) Indication of full or partial submittal.
  - 15) Transmittal number, numbered consecutively.
  - 16) Submittal and transmittal distribution record.
  - 17) Remarks.
  - 18) Signature of transmitter.
- E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  2. Name file with submittal number or other unique identifier, including revision identifier.
    - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., ABCD-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., ABCD-061000.01.A).
  3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
  4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software or electronic form acceptable to Owner, containing the following information:
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name of Construction Manager.
    - e. Name of firm or entity that prepared submittal.
    - f. Names of subcontractor, manufacturer, and supplier.
    - g. Category and type of submittal.
    - h. Submittal purpose and description.
    - i. Specification Section number and title.
    - j. Specification paragraph number or drawing designation and generic name for each of multiple items.
    - k. Drawing number and detail references, as appropriate.
    - l. Location(s) where product is to be installed, as appropriate.
    - m. Related physical samples submitted directly.
    - n. Indication of full or partial submittal.
    - o. Transmittal number, numbered consecutively.
    - p. Submittal and transmittal distribution record.
    - q. Other necessary identification.
    - r. Remarks.
- F. Options: Identify options requiring selection by Architect.

- G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
  - 1. Note date and content of previous submittal.
  - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Owner's action stamp.

## PART 2 - PRODUCTS

### 2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
  - 1. Submit electronic submittals via email as PDF electronic files.
    - a. Owner will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
  - 2. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Owner will return two copies.
  - 3. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Owner will not return copies.
  - 4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
    - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Availability and delivery time information.
  4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams showing factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  5. Submit Product Data before or concurrent with Samples.
  6. Submit Product Data in the following format:
    - a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
  2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
  3. Submit Shop Drawings in the following format:
    - a. PDF electronic file, or,

- b. Three opaque copies of each submittal. Architect will retain two copies; remainder will be returned.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
  1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of applicable Specification Section.
    - e. Specification paragraph number and generic name of each item.
  3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
  4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    - a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Owner will return submittal with options selected.
  6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    - a. Number of Samples: Submit three sets of Samples. Owner will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.

- 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
  - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- F. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- G. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- H. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
- I. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- K. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- L. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- M. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- P. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.



- Q. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- R. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - 1. Name of evaluation organization.
  - 2. Date of evaluation.
  - 3. Time period when report is in effect.
  - 4. Product and manufacturers' names.
  - 5. Description of product.
  - 6. Test procedures and results.
  - 7. Limitations of use.
- S. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- T. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- U. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- V. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

## 2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

### PART 3 - EXECUTION

#### 3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

#### 3.2 OWNER'S ACTION

- A. Action Submittals: Owner will review each submittal, make marks to indicate corrections or revisions required, and return it. Owner will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Owner will review each submittal and will not return it, or will return it if it does not comply with requirements. Owner will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Owner.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Owner without action.

END OF SECTION 013300

## SECTION 014000 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

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

#### 1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Owner.
- C. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

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

#### 1.4 CONFLICTING REQUIREMENTS

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

### 1.5 ACTION SUBMITTALS

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

### 1.6 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Description of test and inspection.
  - 3. Identification of applicable standards.
  - 4. Identification of test and inspection methods.
  - 5. Number of tests and inspections required.
  - 6. Time schedule or time span for tests and inspections.
  - 7. Entity responsible for performing tests and inspections.
  - 8. Requirements for obtaining samples.
  - 9. Unique characteristics of each quality-control service.

### 1.7 CONTRACTOR'S QUALITY-CONTROL

- A. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
  - 1. Project quality-control manager may also serve as Project superintendent.
- B. Testing and Inspection: Include in quality-control plan a comprehensive schedule of Work requiring testing or inspection, including the following:
  - 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
  - 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
  - 3. Owner-performed tests and inspections indicated in the Contract Documents.

- C. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- D. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

## 1.8 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, and telephone number of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Names of individuals making tests and inspections.
  - 6. Description of the Work and test and inspection method.
  - 7. Identification of product and Specification Section.
  - 8. Complete test or inspection data.
  - 9. Test and inspection results and an interpretation of test results.
  - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  - 12. Name and signature of laboratory inspector.
  - 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
  - 1. Name, address, and telephone number of technical representative making report.
  - 2. Statement on condition of substrates and their acceptability for installation of product.
  - 3. Statement that products at Project site comply with requirements.
  - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  - 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  - 6. Statement whether conditions, products, and installation will affect warranty.
  - 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
  2. Statement that equipment complies with requirements.
  3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  4. Statement whether conditions, products, and installation will affect warranty.
  5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

#### 1.9 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- K. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
  1. Contractor responsibilities include the following:
    - a. Provide test specimens representative of proposed products and construction.
    - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    - f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
  2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Owner, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- L. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
  1. Build mockups in location and of size indicated or, if not indicated, as directed by Owner.
  2. Notify Owner seven days in advance of dates and times when mockups will be constructed.



3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Owner's approval of mockups before starting work, fabrication, or construction.
  - a. Allow seven days for initial review and each re-review of each mockup.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed, unless otherwise indicated.

#### 1.10 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated in individual specification sections as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
  1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
  2. Payment for these services will be made by Owner.
  3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
  1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
  4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including

service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

- D. **Manufacturer's Technical Services:** Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. **Testing Agency Responsibilities:** Cooperate with Owner and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
  - 1. Notify Owner and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  - 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
  - 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  - 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  - 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  - 6. Do not perform any duties of Contractor.
- G. **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
  - 1. Access to the Work.
  - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
  - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  - 4. Facilities for storage and field curing of test samples.
  - 5. Delivery of samples to testing agencies.
  - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  - 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
  1. Distribution: Distribute schedule to Owner, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 TEST AND INSPECTION LOG

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

### 3.2 REPAIR AND PROTECTION

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

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 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.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Owner's action on Contractor's submittals, applications, and requests, "approved" is limited to Owner's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Owner. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
- J. Substantial Completion: The stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use. Minor corrections and repairs that can be performed while the Owner has occupied the building and without undue annoyance to personnel will be acceptable under the definition of Substantial Completion. It shall also include

major final cleaning required under the Contract, removal of all surplus equipment and material not required for completion or remaining work, and the placement of remaining materials and equipment in convenient locations as approved by the Owner.

### 1.3 INDUSTRY STANDARDS

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

### 1.4 ABBREVIATIONS AND ACRONYMS

- A. **Industry Organizations:** Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."
- B. **Code Agencies:** Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

BOCA	BOCA International, Inc. (See ICC)	
IBC	International Building Code	
ICBO	International Conference of Building Officials (See ICC)	
ICC	International Code Council www.iccsafe.org	(888) 422-7233 (703) 931-4533
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000

UBC Uniform Building Code  
(See ICC)

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

EPA Environmental Protection Agency (202) 272-0167  
www.epa.gov

OSHA Occupational Safety & Health Administration (800) 321-6742  
www.osha.gov (202) 693-1999

USDA Department of Agriculture (202) 720-2791  
www.usda.gov

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG Americans with Disabilities Act (ADA) (800) 872-2253  
Architectural Barriers Act (ABA) (202) 272-0080  
Accessibility Guidelines for Buildings and Facilities  
Available from Access Board  
[www.access-board.gov](http://www.access-board.gov)

UFAS Uniform Federal Accessibility Standards (800) 872-2253  
Available from Access Board (202) 272-0080  
www.access-board.gov

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

MDEP State of Maine Department of Environmental Protection

MDOT State of Maine Department of Transportation

NEW OFFICE BUILDING  
901 Washington Avenue  
Portland, Maine

J.B. BROWN & SONS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

## SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections include the following:
  - 1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.
  - 2. Division 31 Section "Dewatering" for disposal of ground water at Project site.

#### 1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Pay sewer service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Pay water service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.
- E. Heating Fuel: Fuel required for temporary heating will be the responsibility of the Contractor.
- F. Telephone/Fax Service: Pay service and use charges for telephone or data cable usage, by Contractor, at Project site.

#### 1.4 INFORMATIONAL SUBMITTALS

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



- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage, including delivery, handling, and storage provisions for materials subject to water absorption or water damage, discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water damaged Work.
  - 1. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- D. Dust-Control and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust-control and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
  - 1. Locations of dust-control partitions at each phase of the work.
  - 2. HVAC system isolation schematic drawing.
  - 3. Location of proposed air filtration system discharge.
  - 4. Other dust-control measures.
  - 5. Waste management plan.
  - 6. Provide a negative pressure system for dust control.
- E. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements to protect install concrete and masonry.

## 1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

## 1.6 PROJECT CONDITIONS

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

- B. Frost Protection: Protect footings from freezing temperatures and prevent frost from occurring beneath footings. Frozen water found on soil or concrete surface shall be reason for rejection of protection method. Provide corrective measures within 24 hours after notice of condition is given. Evidence of frost at these locations shall be reason for rejection, removal, and replacement at no additional cost to the Owner.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Vinyl Fencing: Standard 3 foot high, orange construction fence with steel posts.
- B. Lumber and Plywood: Comply with requirements in Division 06 Section "Rough Carpentry."
- C. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36/C 36M.
- D. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
- E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

### 2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly. Furnish and equip offices as follows:
  - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
  - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack board.
  - 3. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
  - 4. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
  - 1. Store combustible materials apart from building.

## 2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control. Heaters shall be located outside the building and combustion gases shall be vented outside the building. Maintain observation of units in operation.
  - 1. Use of gasoline-burning space heaters or salamander-type heating units is prohibited.
  - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
  - 1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

### 3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low

temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Maintain a minimum temperature of 50 deg F in permanently enclosed portions of building for normal construction activities, and 65 deg F for finishing activities and areas where finished Work has been installed.
    - a. Refer to Divisions 02 through 48 for additional temporary heat, ventilation, and humidity requirements for products in those Sections.”
  2. Provide temporary heat to protect all concrete and masonry work during installation as well as other trades needing specific heat requirements to perform and protect their work. See individual specification sections for detailed information.
  3. All concrete slabs on grade, footings and foundations not below the frost line shall be protected from freezing either by heating or protecting with insulation until substantial completion.
- F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
1. Prior to commencing work, isolate the HVAC system in area where work is to be performed in accordance with approved coordination drawings.
    - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
    - b. Maintain negative air pressure within work area using HEPA-equipped air filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
  2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust containment devices.
  3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- H. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
1. Install electric power service overhead, unless otherwise indicated.
  2. Connect temporary service to Owner's existing power source, as directed by Owner.

- I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
  - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- J. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel.
  - 1. At each telephone, post a list of important telephone numbers.
    - a. Police and fire departments.
    - b. Ambulance service.
    - c. Contractor's home office.
    - d. Architect's office.
    - e. Engineers' offices.
    - f. Owner's office.
    - g. Principal subcontractors' field and home offices.
  - 2. Provide an answering machine on superintendent's telephone.

### 3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
  - 1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
  - 2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Parking Areas: Construct and maintain temporary roads and parking areas adequate to support loads and to withstand exposure to traffic during construction period. Locate temporary roads and parking areas within construction limits indicated on Drawings.
  - 1. Provide a reasonably level, graded, well-drained subgrade of satisfactory soil material, compacted to not less than 95 percent of maximum dry density in the top 6 inches.
  - 2. Provide gravel paving course of subbase material not less than 3 inches thick; roller compacted to a level, smooth, dense surface.
  - 3. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
  - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
  - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Provide temporary parking areas for construction personnel.

- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
  - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
  - 2. Remove snow and ice as required to minimize accumulations.
  
- F. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.
  - 1. Engage an experienced sign painter to apply graphics for Project identification signs. Comply with details indicated. Include name of project, and names of Owner, Architect and Contractor.
  - 2. Construct signs of exterior-type Grade B-B high-density concrete form overlay plywood in size of 4 by 8 feet and 3/4 inch thickness, unless otherwise indicated. Support on posts or framing of preservative-treated wood or steel.
  - 3. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer.
  - 4. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
    - a. Provide temporary, directional signs for construction personnel and visitors.
  - 5. Maintain and touchup signs so they are legible at all times.
  
- G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.
  
- H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
  - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

### 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
  
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
  - 1. Comply with work restrictions specified in Division 01 Section "Summary."

- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
  - 1. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- F. Site Enclosure Fence: When excavation begins, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
  - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
- G. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
  - 1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
- J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
  - 1. Prohibit smoking in construction areas.
  - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
  - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
  - 4. Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

### 3.5 MOISTURE AND MOLD CONTROL

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



3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
  - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
  - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
  - 2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
  - 3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000

## SECTION 016000 - PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
  - 1. Division 01 Section "Allowances" for products selected under an allowance.
  - 2. Division 01 Section "Substitution Procedures" for requests for substitutions.
  - 3. Division 01 Section "References" for applicable industry standards for products specified.

#### 1.3 DEFINITIONS

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

#### 1.4 ACTION SUBMITTALS

- A. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

#### 1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
  - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
  - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Owner will determine which products shall be used.
- B. Products with asbestos: Asbestos containing materials are not to be purchased or installed in this project.

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

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

7. Protect stored products from damage and liquids from freezing.

## 1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
  1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
  2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
  1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
  3. Refer to Divisions 02 through 48 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 PRODUCT SELECTION PROCEDURES

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

7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved substitute" or approved," comply with provisions in "Product Substitutions" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Substitutions for Contractor's convenience will not be considered.
3. Products:
  - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Substitutions for Contractor's convenience will be considered, unless otherwise indicated.
  - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in Division 01 Section "Substitution Procedures" for consideration of an unnamed product.
4. Manufacturers:
  - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered, unless otherwise indicated.
  - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in Division 01 Section "Substitution Procedures" for consideration of an unnamed manufacturer.
5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in Division 01 Section "Substitution Procedures" for consideration of an unnamed product or manufacturer.

- C. Visual Matching Specification: Where Specifications require "match Owner's sample", provide a product that complies with requirements and matches Owner's sample. Owner's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.
  
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Owner from manufacturer's full range" or similar phrase, select a product that complies with requirements. Owner will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

## SECTION 017300 - EXECUTION

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

- B. Related Sections:

1. Division 01 Section "Submittal Procedures" for submitting surveys.
2. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
3. Division 07 Section "Penetration Firestopping" for patching penetrations in fire-rated construction.

#### 1.3 DEFINITIONS

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

#### 1.4 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Owner of locations and details of cutting and await directions from the Owner before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
  2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
  3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
  4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

## 1.5 WARRANTY

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

## PART 2 - PRODUCTS

### 2.1 MATERIALS

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



### PART 3 - EXECUTION

#### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Owner promptly.
- B. General: Engage a Layout Engineer to lay out the Work using accepted surveying practices.
  - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - 3. Inform installers of lines and levels to which they must comply.
  - 4. Check the location, level and plumb, of every major element as the Work progresses.
  - 5. Notify Owner when deviations from required lines and levels exceed allowable tolerances.
  - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and

duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Owner.

### 3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
  - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Owner. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Owner before proceeding.
  - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

### 3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
  - 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Owner.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Temporary Support: Provide temporary support of work to be cut.
- C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements of Division 01 Section "Summary."
- E. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or

adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
  5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  6. Proceed with patching after construction operations requiring cutting are complete.
- F. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
  4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- G. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### 3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
  - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. For general construction, each trade shall pick up the debris and rubbish, generated by that trade, and dispose of in dumpsters furnished by the General Contractor.
- E. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- F. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- G. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- H. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls."
- I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.8 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

### 3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.
- C. Protect resilient flooring against mars, marks, indentations, and other 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 flooring manufacturer.
  - 1. Cover products installed on floor surfaces with undyed, untreated building paper until inspection for Substantial Completion.
  - 2. Do not move heavy and sharp objects directly over floor surfaces. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.
- D. Protect roofing materials against cuts, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period.
  - 1. Do not move heavy and sharp objects directly over roof surfaces. Place plywood or hardboard panels over roofing and under objects while they are being moved. Slide or roll objects over panels without moving panels.

### 3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
  - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.

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- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300



## SECTION 017700 - CLOSEOUT PROCEDURES

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Inspection procedures.
  - 3. Warranties.
  - 4. Final cleaning.
  - 5. Repair of the Work.
- B. Related Sections include the following:
  - 1. Division 01 Section "Execution" for progress cleaning of Project site.
  - 2. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 4. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
  - 5. Divisions 02 through 48 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

#### 1.3 ACTION SUBMITTALS

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

#### 1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.

1.5 MAINTENANCE MATERIAL SUBMITTALS

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

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
  3. Submit closeout submittals specified in individual Divisions 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  4. Submit maintenance material submittals specified in individual Divisions 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number where applicable.
    - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner's signature for receipt of submittals.
  5. Submit test/adjust/balance records.
  6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
  2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  3. Complete startup and testing of systems and equipment.
  4. Perform preventive maintenance on equipment used prior to Substantial Completion.

5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."
  6. Advise Owner of changeover in heat and other utilities.
  7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  9. Complete final cleaning requirements, including touchup painting.
  10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Owner, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  2. Results of completed inspection will form the basis of requirements for final completion.

#### 1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
  2. Certified List of Incomplete Items: Submit certified copy of Owner's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Owner. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

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

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order, starting with exterior areas first.
  2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
  3. Include the following information at the top of each page:
    - a. Project name.
    - b. Date.
    - c. Name of Contractor.
    - d. Page number.
  4. Submit list of incomplete items in the following format:
    - a. PDF electronic file. Owner will return annotated file.

#### 1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
  2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
  4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
  - 1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

## PART 3 - EXECUTION

### 3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Remove snow and ice to provide safe access to building.
    - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - h. Sweep concrete floors broom clean in unoccupied spaces.
    - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.

- j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
  - k. Remove labels that are not permanent.
  - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
  - m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - n. Replace parts subject to unusual operating conditions.
  - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - q. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.
    - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report upon completion of cleaning.
  - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
  - s. Leave Project clean and ready for occupancy.
- C. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls."

### 3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
  - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.

2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
  - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

## SECTION 017823 - OPERATION AND MAINTENANCE DATA

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Emergency manuals.
  - 3. Operation manuals for systems, subsystems, and equipment.
  - 4. Maintenance manuals for the care and maintenance of products, materials, and finishes systems and equipment.
- B. Related Sections include the following:
  - 1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
  - 2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
  - 3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
  - 4. Divisions 02 through 48 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

#### 1.3 DEFINITIONS

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

#### 1.4 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual specification sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.



1. Owner will comment on whether content of operations and maintenance submittals are acceptable.
  2. Where applicable, clarify and update reviewed manual content to correspond to modifications and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
1. PDF electronic file. Assemble each manual into a composite electronically-indexed file. Submit on digital media acceptable to Architect.
    - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically-linked operation and maintenance directory.
    - b. Enable inserted reviewer comments on draft submittals.
  2. Two paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Owner will return one copy.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Owner will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Owner will return copy with comments.
1. Correct or modify each manual to comply with Owner comments. Submit copies of each corrected manual within 15 days of receipt of Owners comments and prior to commencing demonstration and training.

## PART 2 - PRODUCTS

### 2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
1. List of documents.
  2. List of systems.
  3. List of equipment.
  4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

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

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  - 1. Title page.
  - 2. Table of contents.
  - 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
  - 1. Subject matter included in manual.
  - 2. Name and address of Project.
  - 3. Name and address of Owner.
  - 4. Date of submittal.
  - 5. Name and contact information for Contractor.
  - 6. Name and contact information for Construction Manager.
  - 7. Name and contact information for Architect.
  - 8. Name and contact information for Commissioning Agent.
  - 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  - 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
  - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  2. File Names and Bookmarks: Enable bookmarking of individual documents based upon file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel upon opening file.
- F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf or post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
  2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
  3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
  4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
  5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
    - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## 2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.

3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

## 2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.

6. Limiting conditions.
  7. Performance curves.
  8. Engineering data and tests.
  9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
  2. Equipment or system break-in procedures.
  3. Routine and normal operating instructions.
  4. Regulation and control procedures.
  5. Instructions on stopping.
  6. Normal shutdown instructions.
  7. Seasonal and weekend operating instructions.
  8. Required sequences for electric or electronic systems.
  9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

## 2.5 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
  2. Manufacturer's name.
  3. Color, pattern, and texture.
  4. Material and chemical composition.
  5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
  2. Types of cleaning agents to be used and methods of cleaning.
  3. List of cleaning agents and methods of cleaning detrimental to product.
  4. Schedule for routine cleaning and maintenance.
  5. Repair instructions.

- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

## 2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - 1. Standard printed maintenance instructions and bulletins.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  - 1. Test and inspection instructions.
  - 2. Troubleshooting guide.
  - 3. Precautions against improper maintenance.
  - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - 5. Aligning, adjusting, and checking instructions.
  - 6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

### PART 3 - EXECUTION

#### 3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
  - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
  - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
  - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.

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2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."
- F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823



## SECTION 017839 - PROJECT RECORD DOCUMENTS

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.
  - 4. Miscellaneous record submittals.
- B. Related Sections include the following:
  - 1. Division 01 Section "Closeout Procedures" for general closeout procedures.
  - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 3. Divisions 02 through 48 Sections for specific requirements for Project Record Documents of the Work in those Sections.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one set of marked-up Record Prints.
- B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one copy of each Product Data submittal.
  - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.
- D. Miscellaneous Record Submittals: Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy of each submittal.

## PART 2 - PRODUCTS

### 2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an acceptable drawing technique.
    - c. Record data as soon as possible after obtaining it.
    - d. Record and check the markup before enclosing concealed installations.
    - e. Cross-reference record prints to corresponding archive photographic documentation.
  2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below first floor.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order.
    - k. Changes made following Owner's written orders.
    - l. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. Record information on the Work that is shown only schematically.
  3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
  4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Identification: As follows:
  - a. Project name.
  - b. Date.
  - c. Designation "PROJECT RECORD DRAWINGS."
  - d. Name of Architect.
  - e. Name of Contractor.

## 2.2 RECORD SPECIFICATIONS

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

## 2.3 RECORD PRODUCT DATA

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

## 2.4 MISCELLANEOUS RECORD SUBMITTALS

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

## PART 3 - EXECUTION

### 3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Owner's reference during normal working hours.

END OF SECTION 017839

## SECTION 017900 - DEMONSTRATION AND TRAINING

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.
- B. Related Sections include the following:
  - 1. Divisions 02 through 48 Sections for specific requirements for demonstration and training for products in those Sections.

#### 1.3 INFORMATIONAL SUBMITTALS

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

#### 1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
  - 1. Inspect and discuss locations and other facilities required for instruction.
  - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  - 3. Review required content of instruction.
  - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

## 1.5 COORDINATION

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

## PART 2 - PRODUCTS

### 2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
  - 1. Fire-protection systems, including fire alarm fire pumps and fire-extinguishing systems.
  - 2. Intrusion detection systems.
  - 3. Heat generation, including boilers pumps and water distribution piping.
  - 4. Refrigeration systems, including condensers pumps and distribution piping.
  - 5. HVAC systems, including air-handling equipment air distribution systems and terminal equipment and devices.
  - 6. HVAC instrumentation and controls.
  - 7. Electrical service and distribution, including transformers switchboards panelboards uninterruptible power supplies and motor controls.
  - 8. Lighting equipment and controls.
  - 9. Communication systems, including intercommunication clocks and programming voice and data and television equipment.

- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  2. Documentation: Review the following items in detail:
    - a. Operations manuals.
    - b. Maintenance manuals.
    - c. Project Record Documents.
    - d. Identification systems.
    - e. Warranties and bonds.
    - f. Maintenance service agreements and similar continuing commitments.
  3. Emergencies: Include the following, as applicable:
    - a. Instructions on meaning of warnings, trouble indications, and error messages.
    - b. Instructions on stopping.
    - c. Shutdown instructions for each type of emergency.
    - d. Operating instructions for conditions outside of normal operating limits.
    - e. Sequences for electric or electronic systems.
    - f. Special operating instructions and procedures.
  4. Operations: Include the following, as applicable:
    - a. Startup procedures.
    - b. Equipment or system break-in procedures.
    - c. Routine and normal operating instructions.
    - d. Regulation and control procedures.
    - e. Control sequences.
    - f. Safety procedures.
    - g. Instructions on stopping.
    - h. Normal shutdown instructions.
    - i. Operating procedures for emergencies.
    - j. Operating procedures for system, subsystem, or equipment failure.
    - k. Seasonal and weekend operating instructions.
    - l. Required sequences for electric or electronic systems.
    - m. Special operating instructions and procedures.
  5. Adjustments: Include the following:

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

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

#### 3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  1. Owner will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
  2. Owner will furnish an instructor to describe Owner's operational philosophy.
  3. Owner will furnish Contractor with names and positions of participants.



- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  - 1. Schedule training with Owner with at least seven days' advance notice.
- C. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, a written, or a demonstration performance-based test.
- D. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

### 3.3 DEMONSTRATION AND TRAINING SCHEDULE

- A. Demonstration of equipment includes, but is not limited to, the following:
  - 1. Operable partitions.
- B. Demonstration and training of equipment includes, but is not limited to, the following:
  - 1. HVAC equipment and systems.
  - 2. Electrical equipment and systems.

END OF SECTION 017900

SECTION 03 30 00  
CONCRETE WORK

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

- A. All cast-in-place concrete work, including formwork, reinforcement, concrete materials, mix design, placement and curing procedures, and finishes.
- B. Related Work:
  - Section 07 26 16: Below Grade Vapor Retarders
  - Section 07 92 00: Joint Sealants

1.02 QUALITY ASSURANCE:

- A. Codes and Standards: Comply with the latest edition of the following except where more stringent requirements are indicated:
  - ACI 117 "Specifications for Tolerances for Concrete Construction and Materials"
  - ACI 301 "Specifications for Structural Concrete for Buildings"
  - Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice"
- B. Testing and Services by Contractor: Performed by an approved testing laboratory at the Contractor's expense:
  - Material Evaluation Tests
  - Concrete Mix Designs
  - Tests not specifically indicated to be done at Owner's expense, including re-testing of rejected materials and installed work.
- C. Materials and installed work may require testing and re-testing at any time during the progress of the work as directed by the Engineer. Allow free access to material stockpiles and facilities. These tests will be done by an independent approved laboratory at the Contractor's expense.
- D. Testing by Owner: Field tests will be done by an independent testing laboratory. Tests may be done for slump, air content, and concrete temperature, and compression test specimens will be taken. See Part 3 - Execution.

- E. Preinstallation Conference: At least 21 days prior to starting concrete work meet at jobsite with General Contractor, concrete and slab subcontractors, concrete supplier, and vapor retarder supplier to review concrete mix designs, installation of vapor retarder, concreting procedures, curing, finishing, and heating (if required).
- F. Do not fabricate or place any reinforcing until shop drawings have been reviewed and accepted by Engineer. Incorrectly fabricated or placed reinforcing shall be removed if directed by the Engineer whether or not concrete has been placed.
- G. Hot and Cold Weather Concreting Procedures: If concreting during hot weather, as defined in ACI 305, or cold weather, as defined in ACI 306, prepare written description of procedures for mixing, delivery, placement, finishing, curing, and protection, including heating methods during cold weather. Base procedures on recommendations in ACI 305 and 306.

If combustion heaters are used, provide vented heaters with a heat exchanger as defined in ACI 360.

Contractor is responsible for adequacy of procedures and quality of concrete placed during hot or cold weather, including the use of admixtures in the concrete mix. Unacceptable concrete may be repaired or removed and replaced, depending on the nature of the deficiency, as directed by the Engineer.

#### 1.03 SUBMITTALS:

- A. Product Data with application and installation instructions for proprietary materials and items, including reinforcing accessories, admixtures, patching compounds, waterstops, joint systems, curing materials, chemical grout, non-shrink grout and others as requested by Engineer.
- B. Shop Drawings for fabrication, bending, and placement of reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures," showing bar schedules, stirrup spacing, diagrams of bent bars, construction joints, and arrangement of reinforcement. Include special reinforcement required and openings through concrete structures.
- C. Samples of materials as specified and as otherwise requested by Engineer, including names, sources, and descriptions.
- D. Mix Designs and Associated Laboratory Test Reports, including aggregate gradation, for each type of concrete.
- E. Material Certificates certifying that each material item complies with, or exceeds, specified requirements, signed by manufacturer and Contractor.

- F. Written description of hot and cold weather concreting procedures as described in Paragraph 1.02 G. above at least 15 days prior to first concrete placement.

Engineer will review and comment on procedures, and may make recommendations, but will neither approve nor reject procedures. The Contractor is entirely responsible for concrete quality as discussed above.

- G. Written description of curing procedures including materials to be used and duration of curing for review at least 15 days prior to placement.

## PART 2 - PRODUCTS

### 2.01 FORM MATERIALS:

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, providing continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient stiffness to withstand pressure of newly-placed concrete without bow or deflection.
- B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material.
- C. Form Coatings: Commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
- D. Form Ties: Factory-fabricated, removable, or snap-off metal form ties designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

Unless otherwise indicated, provide ties so portion remaining within concrete after removal is at least 1" inside concrete, and, when removed, will not leave holes larger than 1" diameter in concrete surface.

### 2.02 REINFORCING MATERIALS:

- A. Reinforcing Bars: ANSI/ASTM A615, Grade 60, deformed.
- B. Tolerances for fabrication: ACI 117

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

For slabs-on-grade, use continuous high-chair upper supports with appropriate sand plates or horizontal runners which will not damage vapor barrier or where base material will not support chair legs. Do not use concrete bricks, concrete blocks, or plastic supports.

For exposed to view concrete surfaces where legs of supports are in contact with forms, provide supports with legs protected by plastic or stainless steel supports.

## 2.03 CONCRETE MATERIALS:

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

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

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

Local aggregates not complying with ANSI/ASTM C33, but which have shown by special test or actual service to produce concrete of adequate strength and durability, may be used when acceptable to the Engineer.

- C. Water: Potable.

- D. Air-Entraining Admixture: ANSI/ASTM C 260. DO NOT use Air-Entraining admixtures for slabs on grade or elevated structural slabs.

- E. Water-Reducing Admixture and Mid-Range Water Reducing (MRWR) Admixture (use at Contractor's option): ANSI/ASTM C 494, Type A, and contain not more than 1% chloride ions.

- F. High-Range Water-Reducing (HRWR) Admixture (use at Contractor's option): ASTM C 494, Type F or Type G and contain not more than 1% chloride ions. DO NOT use high-range water reducing admixtures for slabs on grade or elevated slabs.

- G. Water-Reducing, Accelerator Admixture: ASTM C 494, Type C or E.

H. Calcium chloride not permitted.

#### 2.04 RELATED MATERIALS:

A. Non-Shrink Grout: CRD-C 621, Type D, non-metallic factory pre-mixed grout.

B. Chemical Grout: Equivalent to Hilti HIT HY 150 unless shown otherwise.

C. Moisture-Retaining Cover: ANSI/ASTM C 171, as follows:

For slabs: Waterproof wet strength curing paper consisting of two layers of kraft paper cemented together, reinforced with fiber.

For other concrete: Reinforced Polyethylene Film, min. 4 mils, or Polyethylene-Coated Burlap.

D. Liquid Membrane-Forming Curing Compound: Liquid type, ANSI/ASTM C 309, Type I, unless other type acceptable to Engineer. CURING COMPOUND IS NOT ACCEPTABLE FOR CURING SLABS.

E. Evaporation Retarder: Waterborne, monomolecular film forming, for application to fresh concrete.

F. Bonding Compound: Acrylic emulsion, non-re-wettable type, ASTM C1059, Type II.

G. Joint Filler for Isolation and Expansion Joints: Resilient, non-extruding, pre-molded, bituminous, impregnated fiberboard complying with ASTM D1751, FS HH-F341, Type 1.

H. Bond Breaker: Equivalent to Thompsons Water Seal

#### 2.05 PROPORTIONING AND DESIGN OF MIXES:

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

B. Submit written reports to Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Engineer. Include the following in mix design submittals:

- Identification of aggregate source of supply.
- Results of compliance tests for aggregates.
- Scale weights of each aggregate.
- Absorbed water in each aggregate.
- Brand, type, and amount of cement and each admixture.
- Proportions of each material required per cubic yard.

C. Concrete Classes:

- Class 1: Interior concrete other than slabs
- Class 2: Exterior concrete
- Class 3: Interior slabs on grade
- Class 4: Exterior Slabs

D. Design mixes to provide normal weight concrete with the following properties:

Unless indicated otherwise, slump and air content will be measured at the point of delivery (truck), not at the end of the pump line.

	<b>Class 1</b>	<b>Class 2</b>	<b>Class 3</b>	<b>Class 4</b>
Min. 28 Day Comp. Strength (PSI)	3000	3000	3000	4000
Max. W/C Ratio	0.50	0.50	0.50	0.50
Min. Cement Content	470	470	564	564
Air Content	N/A	6% ( $\pm 1 \frac{1}{2}$ %)	3% MAX*	6% ( $\pm 1 \frac{1}{2}$ %)
Max. Aggregate Size	$\frac{3}{4}$ "	$\frac{3}{4}$ "	$\frac{3}{4}$ "	$\frac{3}{4}$ "
Slump	3" ( $\pm 1$ " )	3" ( $\pm 1$ " )	5" ( $\pm 1$ " )	5" ( $\pm 1$ " )
Slump w/MRWR	6 MAX.	6" MAX.	6" MAX.	6" MAX.
Slump w/HRWR**	9" MAX.	9" MAX.	N/A	N/A

\*Class 3 air content is total measured air, no entrained air is permitted in interior slabs.

\*\*Slump before adding HRWR: 3" ( $\pm 1$ " )

E. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, test results, weather, or other circumstances warrant, at no additional cost to Owner and as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Engineer before using in work.

F. Admixtures: Comply with manufacturer's instructions for use of admixtures.

G. Use water-reducing admixture, high range water-reducing admixture (super plasticizer), accelerating, or retarding admixtures at Contractor's option. HRWR is not permitted in slabs.

- H. Concrete to be pumped: Consider pumpability and workability when designing mix. For pumped concrete to be used in slabs, the use of MRWR is recommended.

#### 2.06 READY-MIXED CONCRETE:

- A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, ACI 301, and as herein specified. Do not exceed total mixing and delivery time of 1-1/2 hours.
- B. Batch Ticket Information: Provide all information as outlined in ASTM C94 Section 13.1 and 13.2. Failure to provide complete batch ticket information may be cause for rejection of concrete. If MRWR is used, clearly indicate on batch ticket.
- C. Addition of Water on Site: One addition of water is permitted onsite provided that Batch Ticket Information as required by 2.06.B above has been provided and such addition does not increase the water-cement ratio or the slump above the maximum permitted herein. Water may not be added for re-tempering. If HRWR is added at the site, do not add water to the concrete. Do not make any additions of water without notifying the Engineer. Additional field tests and compressive test specimens may be required.
- D. Hot weather: During hot weather or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ANSI/ASTM C 94 may be required. When air temperature is between 85° F (30° C) and 90° F (32° C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes and, when air temperature is above 90° F (32° C), reduce mixing and delivery time to 60 minutes. Comply with hot weather concreting procedures for mixing and delivery.
- E. Cold Weather: During cold weather conditions, comply with cold weather concreting procedures for mixing and delivery.
- F. Acceptance of Redi-Mix Concrete: Redi-mix truck deliveries are subject to rejection upon failing to meet the requirements of this specification and/or other referenced ACI and ASTM specifications. If a discrepancy arises between the documents, the Project Specifications shall govern.

### PART 3 - EXECUTION

#### 3.01 FORMS:

- A. Design, erect, support, brace, and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete



structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position, and have correct finish.

- B. Tolerances for formed surfaces: ACI 117
- C. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, and recesses for easy removal.
- E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Close openings with tightly fitted panels securely braced to prevent loss of concrete mortar. Locate openings at inconspicuous locations.
- F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete and remove debris just before concrete is placed. Retighten forms and bracing after concrete placement if required to eliminate mortar leaks and maintain proper alignment.

### 3.02 PLACING REINFORCEMENT:

- A. Comply with CRSI "Manual of Standard Practice" for placing reinforcing.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce bond with concrete.
- C. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
- D. Tolerances for placing reinforcement: ACI 117

- E. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- F. Support reinforcement for slabs-on-grade and slabs on metal deck or formwork with continuous high-chairs placed at a maximum of 3' o.c. Do not "hook" or lift reinforcement into place during concrete placement.
- G. Avoid damaging under-slab vapor retarder when placing reinforcement and concrete. Repair damage before placing concrete.

### 3.03 JOINTS IN WALLS:

- A. Construction Joints: Locate and install construction joints only where control joint locations are shown unless otherwise acceptable to Architect.
- B. Provide keyways at least 1-1/2" deep in construction joints in walls and between walls and footings unless shown otherwise on the Drawings.
- C. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.
- D. Control joints: Locate control joints in walls as shown on the Drawings.

### 3.04 JOINTS IN SLABS-ON-GRADE:

- A. Construction joints in slabs: Required construction joint locations are shown on the Drawings. Other construction joint locations may be used as required by placement sequencing and operations if approved by the Engineer. Continue reinforcement across construction joints.
- B. Apply bond breaker material to face of previous placement (or existing) concrete at construction joints and at perimeter walls.
- C. Control joints in slabs: Locate control joints as shown on the Drawings. Continue reinforcement across joints.
- D. Sawcut control joints as soon as possible after finishing, without raveling joints, using soft-cut saws. Sawcut joints at column lines first, if applicable. Install a new skid for soft-cut saws when a new saw blade is installed.

- E. Where stakes or supports for construction joint forms penetrate vapor retarder, patch and seal penetrations in accordance with vapor retarder manufacturer's instructions.

### 3.05 INSTALLATION OF EMBEDDED ITEMS:

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

### 3.06 PREPARATION OF FORM SURFACES:

- A. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed in accordance with manufacturer's instructions.
- B. Do not allow excess form coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed.
- C. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

### 3.07 CONCRETE PLACEMENT:

- A. General: Comply with ACI 301, and these specifications. Before placing concrete, verify that installation of formwork, reinforcing steel, and items to be embedded or cast in have been completed and that required inspections have been made. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work.
- B. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete to avoid segregation.
- C. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and while preceding layer is still plastic to avoid cold joints.

Do not exceed 4' free fall of concrete without approval of Engineer.

- D. Consolidate placed concrete using mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping.

- E. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibrator to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- F. Maintain reinforcing in proper position during concrete placement operations.
- G. Deposit and consolidate concrete for slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
  - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 2. Maintain reinforcement in position on chairs during concrete placement.
  - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  - 4. Slope surfaces uniformly to drains where required.
  - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
  - 6. Do not place concrete if temperature difference between base material and air is more than 20° F.
  - 7. During cold weather, remove all frost from slab base material and recompact if required.
- H. Cold Weather Placing: Comply with submitted cold weather concreting procedure. Protect concrete work from physical damage or reduced strength, which could be caused by frost, freezing actions, or low temperatures.

Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

- I. Hot Weather Placing: Comply with submitted hot weather concreting procedure. Maintain concrete temperature at time of placement below 90° F (32° C). Mixing water may be chilled or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing.

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

Fog-spray forms and reinforcement just before placing concrete.

Use appropriate admixtures and evaporation retarder when required by high temperatures, low humidity, or other adverse placing conditions.

### 3.08 FINISH OF FORMED SURFACES:

- A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed-to-view or that are to be covered with a coating or covering material applied directly to concrete, such as waterproofing, damp-proofing, painting, or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch tie holes and defective areas with fins or other projections completely removed and smoothed.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.
- D. Finish for Brick Shelf Surfaces: For horizontal and vertical surfaces at brick shelves, provide a ground smooth surface with all projections completely removed and all voids parged and filled in preparation for installation of adhered through – wall masonry flashing. Coordinate acceptance of brick shelf surfaces with mason. All work to prepare shelf will be at no cost to the Owner.

### 3.09 MONOLITHIC SLAB FINISHES:

- A. Float Finish: Apply float finish to all monolithic slab surfaces. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, re-float surface to a uniform, smooth granular texture.

B. Trowel Finish: Apply a smooth, tight trowel finish to monolithic slab surfaces to be covered with resilient or wood flooring, paint or other thin film finish coating system. A burnished finish is not desired.

C. For slabs exposed to view apply a burnished trowel finish.

D. Use operations to produce a concrete surface free of trowel marks, uniform in texture and appearance, and with surface plane tolerances as follows;

Min. Overall Values:  $F_F = 25$   $F_L = 20$

Min. Local Values:  $F_F = 17$   $F_L = 15$

Grind smooth surface defects which would telegraph through applied floor covering system.

E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.

Immediately after floating, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

### 3.10 CONCRETE CURING AND PROTECTION:

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Start curing as soon as free water has disappeared from concrete surface after placing and finishing. Continue curing for at least 7 days in accordance with ACI recommendations. Avoid rapid drying at end of final curing period.

B. Curing Methods: Perform curing of concrete **except for slabs on grade or structural slabs** by moisture curing, by moisture-retaining cover curing, by curing compound, and/or combinations of methods.

1. Provide moisture curing by the following methods:

- Keep concrete surface continuously wet by covering with water.
- Continuous water-fog spray.
- Cover concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

2. Provide moisture-retaining cover curing as follows:

Cover concrete surfaces with moisture-retaining cover placed in widest practicable width, with sides and ends lapped at least 4", and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
  3. Curing compound methods are not acceptable for slabs on grade or structural slabs. For surfaces where this method is acceptable, follow manufacturers' instructions for application methods and rate of application.
- C. **Curing Formed Surfaces:** Cure formed concrete surfaces, including undersides of beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
  - D. **Curing Unformed Surfaces:** Cure unformed surfaces, other than slabs, using curing methods specified above.
  - E. **Curing Slabs-on-Grade and Structural Slabs:** Begin curing immediately after cutting control joints. Provide 7 day cure by covering slab with dry, wet strength curing paper placed in widest practical widths, with all seams lapped 4" and sealed with waterproof tape. Immediately repair any holes or tears during curing period using cover material and waterproof tape. **Do not add additional water for curing.** Limit construction traffic to foot traffic for 3 days. Do not allow lifts on floor during curing period. Do not apply curing compound.
- 3.11 REMOVAL OF FORMS:
- A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50° F (10° C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.
  - B. Formwork supporting weight of concrete, such as beam soffits, slabs, and other structural elements, may not be removed in less than 14 days until concrete has attained at least 80 percent of the design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of location of members.

3.12 MISCELLANEOUS CONCRETE ITEMS:

- A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
- B. Chemical grouting: Drill and prepare holes and install grout in accordance with grout manufacturer's instructions.

### 3.13 CONCRETE SURFACE REPAIRS:

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Engineer.

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

- B. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
- C. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Engineer. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.
- D. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
- E. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.



1. Repair finished, unformed surfaces that contain defects, which affect durability of concrete. Surface defects include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.
  2. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.
  3. Correct low areas in unformed surfaces during, or immediately after, completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Engineer.
  4. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  5. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.  
Use epoxy-based mortar for structural repairs, where directed by Engineer.
- F. Repair cracks in floor slabs, which form due to shrinkage occurring prior to cutting of control joints using epoxy injection.
- G. Repair methods not specified above may be used, subject to acceptance of Engineer.

#### 3.14 QUALITY CONTROL DURING CONSTRUCTION:

A. The Owner will employ a testing laboratory to perform field tests and to submit test reports. Sampling and testing may include the following:

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
2. Slump: ASTM C 143, at point of discharge from truck.
3. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; at point of discharge from truck.
4. Concrete Temperature: ASTM C 1064
5. Compression Test Specimens: ASTM C 31; one set of 4 standard cylinders for each compressive strength test unless field-cured cylinders are required. Mold and store cylinders for laboratory cured test specimens except when field-cured test specimens are required.
6. Compressive Strength Tests: ASTM C 39; 1 specimen tested at 7 days, 2 specimens tested at 28 days, One specimen retained in reserve for later testing if required.

B. FREQUENCY OF TESTING:

1. Slump: Every load as follows:
  - At initial delivery.
  - Following addition of water for slump adjustment.
  - Following addition of HRWR.
  - As required when concrete consistency appears to change.
2. Air content: Every load for air entrained concrete and concrete for slabs.
3. Concrete temperature: Every load if air temperature is 40° F and below or 80°F and above.
4. Compression Test Cylinders: One set of cylinders from a composite sample for each 50 cu. yd. or fraction thereof of each class of concrete placed each day.

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

- D. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
- E. Strength of each concrete mix is satisfactory if every average of three consecutive strength tests equals or exceeds specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.
- F. Test results will be reported in writing to Engineer and Contractor within 24 hours after tests are made. Reports of compressive strength tests shall contain the project identification name and, date of concrete placement, name of concrete testing service type, concrete mix, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.
- G. Additional Tests: The testing service will make additional tests of concrete when test results indicate that specified concrete strengths or other requirements have not been met as directed by Engineer. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as stated in ACI 301.

Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

### 3.15 DEFECTIVE WORK ACCEPTANCE AND REMEDIES:

- A. Defective Work: Any work which fails to comply with the requirements of the Contract Documents or does not comply with the acceptance requirements of Article 1.7 of ACI 301.
- B. Defective work that is repaired to bring the work into compliance may be accepted. Defective work that cannot be brought into compliance may be rejected.
- C. Repair rejected work by removing or replacing, by reinforcing with additional construction required by the Engineer, or by using other accepted methods. Use repair methods that will maintain specified strength and meet applicable requirements for function, durability, dimensional tolerances, and appearances as determined by the Engineer and Architect.
- D. Submit proposed repair methods, materials, and modifications to the Engineer for acceptance. Engineer may make recommendations, accept, or reject proposed

repairs, however, the Contractor is ultimately responsible for, and shall pay all costs related to, bringing the work into compliance.

- E. Concrete members cast in the wrong location may be rejected and shall be removed and replaced if rejected.
- F. Inadequate Concrete Strength: If test results show inadequate concrete strength, the following may be required in addition to required repairs at the Contractor's expense:
- Additional curing of areas with inadequate concrete.
  - Modifications to mix designs for remaining work.
  - Changes in member size or reinforcing for remaining work.

\* END OF SECTION 03 30 00 \*

## SECTION 034500 - PRECAST ARCHITECTURAL CONCRETE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Architectural precast concrete cladding units.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide architectural precast concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:
  - 1. Loads: As indicated on the structural drawings.
  - 2. Design framing system and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements as follows:
    - a. Upward and downward movement of 1/2 inch.
  - 3. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 120 deg F.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.
- C. Shop Drawings: Detail fabrication and installation of architectural precast concrete units. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit. Indicate joints, reveals, and extent and location of each surface finish. Indicate details at building corners.
  - 1. Indicate separate face and backup mixture locations and thicknesses.
  - 2. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.

3. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
  4. Indicate locations, extent, and treatment of dry joints if two-stage casting is proposed.
  5. Include plans and elevations showing unit location and sequence of erection for special conditions.
  6. Indicate location of each architectural precast concrete unit by same identification mark placed on panel.
  7. Indicate relationship of architectural precast concrete units to adjacent materials.
  8. Indicate locations and details of brick units, including corner units and special shapes, and joint treatment.
  9. Indicate locations and details of anchors and joint widths.
  10. Design Modifications: If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.
  11. Comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for its preparation. Show governing panel types, connections, and types of reinforcement, including special reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from architectural precast concrete.
- D. Samples: For each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of 3, illustrating full range of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches.
1. When other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.
- E. Welding certificates.
- F. Material Certificates: For the following items, signed by manufacturers:
1. Cementitious materials.
  2. Reinforcing materials and prestressing tendons.
  3. Admixtures.
  4. Bearing pads.
  5. Structural-steel shapes and hollow structural sections.

## 1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
1. Participates in PCI's plant certification program and is designated a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units or participates in APA's "Plant Certification Program for Production of Architectural Precast Concrete Products" and is designated an APA-certified plant.

- B. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
- C. Design Standards: Comply with ACI 318 and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated.
- D. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."
- E. Welding: Qualify procedures and personnel according to AWS D1.1/D.1.1M, "Structural Welding Code - Steel"; and AWS D1.4, "Structural Welding Code - Reinforcing Steel."

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground.
- B. Support units during shipment on nonstaining shock-absorbing material.
- C. Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.
- D. Place stored units so identification marks are clearly visible, and units can be inspected.
- E. Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses which would cause cracking or damage.
- F. Lift and support units only at designated points shown on Shop Drawings.

#### 1.7 SEQUENCING

- A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

### PART 2 - PRODUCTS

#### 2.1 MOLD MATERIALS

- A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

1. Mold-Release Agent: Commercially produced liquid-release agent that will not bond with, stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.
- B. Surface Retarder: Chemical set retarder, capable of temporarily delaying final hardening of newly placed concrete mixture to depth of reveal specified.

## 2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- C. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

## 2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type III, gray, unless otherwise indicated.
  1. For surfaces exposed to view in finished structure, mix gray with white cement, of same type, brand, and mill source.
- B. Supplementary Cementitious Materials:
  1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
  2. Metakaolin Admixture: ASTM C 618, Class N.
  3. Silica Fume Admixture: ASTM C 1240, with optional chemical and physical requirement.
  4. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.
- D. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.
- E. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.
  1. Water-Reducing Admixtures: ASTM C 494/C 494M, Type A.



2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.
5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
7. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017 M.

## 2.4 STEEL CONNECTION MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.
- B. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.
- C. Zinc-Coated Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M or ASTM A 153/A 153M.
  1. For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03 percent or to between 0.15 and 0.25 percent or limit sum of silicon and 2.5 times phosphorous content to 0.09 percent.
  2. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.
- D. Welding Electrodes: Comply with AWS standards.

## 2.5 BEARING PADS

- A. Provide one of the following bearing pads for architectural precast concrete units as recommended by precast fabricator for application:
  1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, Type A durometer hardness of 50 to 70, ASTM D 2240, minimum tensile strength 2250 psi, ASTM D 412.
  2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Type A durometer hardness of 70 to 90, ASTM D 2240; capable of supporting a compressive stress of 3000 psi with no cracking, splitting, or delaminating in the internal portions of pad. Test one specimen for every 200 pads used in Project.
  3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer; Type A durometer hardness of 80 to 100, ASTM D 2240; complying with AASHTO's "AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications, Division II, Section 18.10.2, or with MIL-C-882E.

4. Frictionless Pads: Tetrafluoroethylene (Teflon), glass-fiber reinforced, bonded to stainless or mild-steel plate, of type required for in-service stress.
5. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

## 2.6 ACCESSORIES

- A. Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install architectural precast concrete units.

## 2.7 GROUT MATERIALS

- A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

## 2.8 CONCRETE MIXTURES

- A. Prepare design mixtures for each type of precast concrete required.
  1. Limit use of fly ash and silica fume to 20 percent of portland cement by weight; limit metakaolin and silica fume to 10 percent of portland cement by weight.
- B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.
- C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.
- D. Normal-Weight Concrete Mixtures: Proportion full-depth mixture by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
  1. Compressive Strength (28 Days): 5000 psi minimum.
  2. Maximum Water-Cementitious Materials Ratio: 0.45.
- E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 117.
- F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.
- G. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

## 2.9 MOLD FABRICATION

- A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.
- B. Maintain molds to provide completed architectural precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.
  - 1. Form joints are not permitted on faces exposed to view in the finished work.
  - 2. Edge and Corner Treatment: Uniformly chamfered.

## 2.10 FABRICATION

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
  - 1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."
- B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.
- C. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.
  - 1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A 775/A 775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
  - 2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
  - 3. Place reinforcement to maintain at least 3/4-inch minimum coverage. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
  - 4. Place reinforcing steel and prestressing strand to maintain at least 3/4-inch minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.

5. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.
- D. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses.
- E. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.
- F. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units.
- G. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 117.
- H. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.
- I. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that will not show in finished structure.
- J. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.
- K. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.
- L. Cast-In Weeps: Where indicated on the drawings, provide weep joints 3/8 inch wide by 3 inches high by thickness of panel. Leave clean open weep for moisture control behind veneer panels.

## 2.11 FABRICATION TOLERANCES

- A. Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

## 2.12 FINISHES

- A. Panel faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved sample and as follows:

1. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.
- B. Finish exposed surfaces of architectural precast concrete units to match face-surface finish.
- C. Finish unexposed surfaces of architectural precast concrete units by float finish.

## 2.13 SOURCE QUALITY CONTROL

- A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."
- B. Strength of precast concrete units will be considered deficient if units fail to comply with ACI 318 requirements for concrete strength.
- C. Testing: If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 requirements, precaster will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42/C 42M.
  1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Architect.
  2. Cores will be tested in an air-dry condition.
  3. Strength of concrete for each series of 3 cores will be considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
  4. Test results will be made in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports will include the following:
    - a. Project identification name and number.
    - b. Date when tests were performed.
    - c. Name of precast concrete fabricator.
    - d. Name of concrete testing agency.
    - e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.
- D. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Do not install precast concrete units until supporting cast-in-place building structural framing has attained minimum allowable design compressive strength or supporting steel or other structure is complete.

#### 3.2 INSTALLATION

- A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.
- B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.
  - 1. Install temporary steel or plastic spacing shims or bearing pads as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
  - 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
  - 3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
  - 4. Unless otherwise indicated, maintain uniform joint widths of 3/4 inch.
- C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.
  - 1. Do not permit connections to disrupt continuity of roof flashing.
- D. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.
  - 1. Protect architectural precast concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
  - 2. Welds not specified shall be continuous fillet welds, using no less than the minimum fillet as specified by AWS.
  - 3. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil- thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780.

4. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and reprime damaged painted surfaces.
  5. Remove, reweld, or repair incomplete and defective welds.
- E. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connections, apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.
- F. Grouting Connections: Grout connections where required or indicated. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

### 3.3 ERECTION TOLERANCES

- A. Erect architectural precast concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

### 3.4 REPAIRS

- A. Repair architectural precast concrete units if permitted by Architect. The Architect reserves the right to reject repaired units that do not comply with requirements.
- B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.
- C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.
- D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.
- E. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

### 3.5 CLEANING

- A. Clean surfaces of precast concrete units exposed to view.

- B. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
  - 1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.
  - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 034500



## SECTION 042000 - UNIT MASONRY

### 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 unit masonry assemblies consisting of the following:
  - 1. Face brick.
  - 2. Mortar and grout.
  - 3. Masonry joint reinforcement.
  - 4. Ties and anchors.
  - 5. Embedded flashing.
  - 6. Miscellaneous masonry accessories.
  - 7. Cavity-wall insulation.
- B. Products installed, but not furnished, under this Section include the following:
  - 1. Steel lintels for unit masonry, furnished under Division 05 Section "Metal Fabrications."
  - 2. Hollow-metal frames in unit masonry and masonry veneer openings, furnished under Division 08 Section "Hollow Metal Doors and Frames."

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Selection: For the following:
  - 1. Face brick, in the form of straps of five or more bricks.
  - 2. Weep holes/vents.
- C. 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. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

- D. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
1. Masonry units.
    - a. Include material test reports substantiating compliance with requirements.
    - b. For bricks, include size-variation data verifying that actual range of sizes falls within specified tolerances.
  2. Cementitious materials. Include brand, type, and name of manufacturer.
  3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
  4. Grout mixes. Include description of type and proportions of ingredients.
  5. Joint reinforcement.
  6. Anchors, ties, and metal accessories.
- E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this Section with minimum 5 years experience.
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.
- C. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- D. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.
- E. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockups for typical exterior wall in sizes approximately 48 inches long by 48 inches high by full thickness, including backup wall system and accessories.
    - a. Include a sealant-filled joint at least 16 inches long in exterior wall mockup.

- b. Include window opening in exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
  - c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
  - d. Include metal studs, sheathing, air barrier system, cavity insulation, veneer anchors, flashing, and weep holes in exterior masonry-veneer wall mockup.
  - e. Notify Architect when backup wall and window installation is complete and prior to installation of brick masonry. Notify Architect again when brick veneer is complete.
2. Clean exposed faces of mockups with masonry cleaner as indicated.
  3. Protect accepted mockups from the elements with weather-resistant membrane.
  4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
    - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

#### 1.5 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 designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### 1.6 PROJECT 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 and hold cover securely in place.
  2. Where 1 wythe of multiwythe 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. 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.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates or setting beds. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with the following requirements:
1. Cold-Weather Construction: When the anticipated daytime low temperature is within the limits indicated, use the following procedures:
    - a. 40 to 32 deg F: Heat mixing water or sand to produce mortar temperatures between 40 and 120 deg F.
    - b. 32 to 25 deg F: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Heat grout materials to produce grout temperatures between 40 and 120 deg F. Heat masonry units to 40 deg F. Maintain mortar and grout above freezing until used in masonry. Use heat on both sides of walls under construction.
    - c. 25 to 20 deg F: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Heat grout materials to produce grout temperatures between 40 and 120 deg F. Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F.
    - d. 20 deg F and Below: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Heat grout materials to produce grout temperatures between 40 and 120 deg F. Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F.
  2. Cold-Weather Protection: When the anticipated daytime low temperature is within the limits indicated, coordinate with the General Contractor to provide the following protection. This is in addition to construction procedures specified above:
    - a. 40 to 32 deg F: Cover masonry with insulating blankets for 48 hours after construction.
    - b. 32 deg F and Below: Provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 72 hours after construction.

3. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.
- D. Hot-Weather Requirements: Coordinate with the General Contractor to protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
1. When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

### 2.2 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

### 2.3 BRICK

- A. General: Provide shapes indicated and as follows:
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. Face Brick: ASTM C 216, Grade SW, Type FBS (extruded).
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 8000 psi.
  2. Initial Rate of Absorption: Less than 18 g/30 sq. in. per minute when tested per ASTM C 67.
  3. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
  4. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet.
  5. Size (Actual Dimensions): 3-5/8 inches wide wide by 2-1/4 inches high by 7-5/8 inches long.
  6. Application: Use where brick is exposed, unless otherwise indicated.
  7. Products:
    - a. Old Port Blend by Morin Brick Company; contact: Paul LaChance; phone: (207) 784-9375.

#### 2.4 MORTAR AND GROUT MATERIALS

- A. General: Mortar and grout may be provided in one of two options; field mix of Portland cement, lime and sand or with specified Portland Cement-Lime Mix.
- B. Portland Cement: ASTM C 150, Type I or II.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.
1. Blue Circle Cement, Inc.: Eaglebond High Strength Type "S".
  2. Ciment Quebec, Inc.: Portland and Lime / Type S.
  3. Dragon Cement and Concrete: Type S Masonry Cement.
- E. Aggregate for Mortar: ASTM C 144.
- F. Aggregate for Grout: ASTM C 404.
- G. Water: Potable.

#### 2.5 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with subparagraphs below, unless otherwise indicated.
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.

2. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
1. Where wythes are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
  2. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire.
- D. Adjustable Masonry-Veneer Anchors
1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
    - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
  2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.
    - a. Anchor Section: Zinc-alloy barrel section with adjustable flanged head with eye and corrosion-resistant, self-drilling screw. Eye designed to receive wire tie and to serve as head for drilling fastener into framing. Barrel length to suit sheathing thickness, allowing screw to seat directly against framing with flanged head covering hole in sheathing.
    - b. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.188-inch- diameter, hot-dip galvanized steel wire.
    - c. Product:
      - 1) Heckmann Building Products Inc.; No. 77 Wing-Nut Pos-I-Tie.

## 2.6 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Refer to Division 07 Section "Sheet Metal Flashing and Trim".
- B. Metal Drip Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, as follows:
1. Metal Drip Flashing: Fabricate from 26 gage stainless steel. Extend at least 4-1/2 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and back edge turned up 4 inches.
  2. Available Product: No. 1008 by Heckman Building Products Inc.

- C. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions with interlocking counterflashing on exterior face, of same metal as reglet.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Fry Reglet Corporation; Fry Reglet MA-4 Masonry Reglet with SpringLok Counterflashing.
  2. Material: Stainless steel, 0.019 inch thick.
  3. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
  4. Accessories:
    - a. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.
  5. Finish: Mill.
- D. Flexible Flashing: For flashing not exposed to the exterior, 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 0.040 inch.
    - a. Available Products:
      - 1) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
    - b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
      - 1) Termination Seal: Bituthene® Liquid Membrane.
- E. 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.

## 2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane or PVC.
1. Holmann & Barnard: #NS – Closed Cell Neoprene.
  2. Sandell: Closed Cell Neoprene.



3. Wire Bond: 3000 Horizontal.

B. Weep/Vent Products: Use the following, unless otherwise indicated:

1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, 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.

a. Available Products:

- 1) Advanced Building Products Inc.; Mortar Maze weep vent.
- 2) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
- 3) Heckmann Building Products Inc.; No. 85 Cell Vent.
- 4) Hohmann & Barnard, Inc.; Quadro-Vent.
- 5) Sandell; Cell Vent.
- 6) Wire-Bond; Cell Vent.

C. Cavity Drainage Material: 1-inch thick, free-draining mesh; made from polyethylene strands and shaped to avoid being clogged by mortar droppings.

1. Available Products:

- a. Mortar Net by Mortar Net USA, LTD.; Model MN 10-1.
- b. Mortar Break by Advanced Building Products; Mortar Break.

## 2.8 CAVITY-WALL INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type X, closed-cell product extruded with an integral skin and shiplapped edges.

1. Available Products: Provide the following or approved substitute.

a. Dow Chemical Company; Sytrofoam CavityMate SC.

- 1) Provide 4 by 8 foot sheets, thickness as indicated on the drawings.

B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

## 2.9 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Available Manufacturers:

- a. 202V Vana-Stop; Diedrich Technologies, Inc.
- b. Sure Klean Vana Trol; ProSoCo, Inc.

## 2.10 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
  - 2. Use portland cement-lime mortar unless otherwise indicated.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide type S mortar for all applications stated unless another type is indicated.
- D. Grout for Unit Masonry: Use mortar mix.

## 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 work.
  - 1. Verify that foundations are within tolerances specified.
  - 2. Verify that built-in items are in proper location and ready for roughing into masonry work.
  - 3. Examine wall framing and sheathing to verify that stud locations are suitable for spacing of veneer anchors and that installation will result in a weatherproof covering.
- 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 the 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.
  - 1. Mix units from several pallets or cubes as they are placed.

### 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 feet, 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 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
- 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, 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 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
- 5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, 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 feet, 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 racking 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.

### 3.5 MORTAR BEDDING AND JOINTING

- A. Lay solid masonry units or 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.
- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
- C. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment is necessary, remove mortar and replace.

### 3.6 CAVITY WALLS

- A. Keep cavities clean of mortar droppings and other materials during construction. Strike joints facing cavities flush.
  - 1. Install the specified cavity drainage material in thickness to fill the cavity above flashings as work progresses.
- B. Installing Cavity-Wall Insulation: At sheathing, place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose.
  - 1. Fill cracks and open gaps in insulation with foam insulation specified in Division 07 section "Thermal Insulation".
  - 2. Install cavity wall insulation behind precast concrete wall panels.

### 3.7 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:
  - 1. Fasten screw-attached anchors through insulation, air/vapor barrier, and sheathing to wall framing with metal fasteners of type indicated.
  - 2. Embed tie sections in masonry joints. Provide air space indicated between back of masonry veneer and face of cavity insulation.
  - 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 16 inches o.c. horizontally, with not less than 1 anchor for each 1.77 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.

### 3.8 CONTROL AND EXPANSION JOINTS

- A. Install control joints in veneer masonry as indicated on the drawings or, if not indicated, at a maximum spacing of 24 feet on center. Locate joints at door and window jambs inasmuch as possible.
  - 1. Provide joints at both sides of windows and doors 6 foot wide or wider.
- B. Form expansion joints in brick made from clay or shale as follows:
  - 1. Build in compressible joint fillers and set back from face of veneer to form open joint 3/4 inch deep and not less than 3/8 inch for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants."

3.9 LINTELS

- A. Install steel lintels where indicated.
- B. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.10 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND 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 vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install through-wall flashing as follows, unless otherwise indicated:
  - 1. Install metal drip flashing on top of base of wall, lintel or masonry unit.
  - 2. At lintels, extend metal drip flashing a minimum of 8 inches into masonry at each end and turn up not less than 2 inches to form end dams.
  - 3. Adhere flexible flashing to vertical leg of metal drip flashing.
  - 4. Extend flexible flashing across thickness of insulation, turned up a minimum of 8 inches and adhering to air barrier membrane. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, flexible flashing strip.
- C. Install reglets as follows, unless otherwise indicated:
  - 1. Install reglet on top of masonry unit.
  - 2. Extend flexible flashing over metal reglet through outer wythe, across air space and insulation, turned up a minimum of 8 inches and adhering to air barrier membrane. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, flexible flashing strip.
  - 3. Provide springlock flashing for installation by roofing contractor.
- D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
  - 1. Use specified weep/vent products to form weep holes.
  - 2. Space weep holes 24 inches o.c., unless otherwise indicated.
  - 3. Provide weep holes not more than 8 inches from end of lintels.
- E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.
- F. Install vents in vertical head joints at the top of each continuous cavity. Use specified weep/vent product to form vents.
  - 1. Space vents 24 inches o.c.

3.11 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 for a minimum of 7 days, 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 nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 4. Protect metal roof and/or floor deck from contact with cleaner by covering with polyethylene film. Should damage occur to metal deck, repair damaged deck finish by re-priming steel deck materials or applying a ZRC coating to galvanized deck materials.

3.12 MASONRY WASTE DISPOSAL

- A. Excess Masonry Waste: Remove excess clean masonry waste and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 05 12 00  
STRUCTURAL STEEL

PART 1 - GENERAL

1.01 SUMMARY:

- A. Section includes: Structural steel as defined in AISC "Code of Standard Practice", and brackets for South Wall Entrance Canopy.
- B. Related work:
  - Section 05 21 00 Steel Joists
  - Section 05 31 00 Metal Deck
- C. Architectural Exposed Structural Steel (AESS): See Structural Drawings for AESS requirements for South Wall Entrance Canopy including galvanizing (Base Bid) and use of stainless steel (Alternate S-1).

1.02 QUALITY ASSURANCE:

- A. Comply with the following, latest edition, except as otherwise indicated.
  - AISC "Code of Standard Practice for Steel Buildings and Bridges".
  - AISC "Allowable Stress Design Specification for Structural Steel Buildings".
  - AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Structural Connections (RCSC).
  - AWS D1.1 "Structural Welding Code".
- B. Fabricator Qualifications: Meet one of the following requirements.
  - 1. AISC or SSFNE member with 10 years experience in fabrication of building types listed in AISC Category I.
  - 2. AISC Certified for Category I Buildings.

If the above requirements cannot be met, the fabricator shall retain an American Welding Society Certified Welding Inspector and submit weld procedures prepared in accordance with the American Welding Society D1.1 Structural Welding Code. The welding procedures shall be reviewed and stamped by the CWI for conformance to AWS D1.1.



The CWI shall insure compliance with the welding procedures in the shop and inspect a minimum of 50% of shop welds. If 10% of the inspected welds are unacceptable during initial inspection, 100% of welds shall be inspected. Submit a report signed by the CWI showing the results of the inspections.

The Owner's independent testing agency may inspect and/or test welding and other fabrication procedures at the plant prior to shipping, however, Engineer may, at any time before final acceptance, reject material not complying with specified requirements.

C. Installer Qualifications: Firm designated as an AISC Certified Erector; or a firm that specializes in or whose primary business is structural steel erection, with a minimum of 10 years experience on similar sized projects.

D. Qualifications for Welding Work: Qualify welding procedures and welding operators in accordance with AWS "Standard Qualification Procedure".

Provide proof that welders to be employed in work have satisfactorily passed AWS qualification tests and that qualifications are current.

E. Provide setting drawings, templates, and directions for installation of anchor rods and other anchorages to be installed by others.

F. Shop drawing review by Engineer will be for structural adequacy only. Dimensions and elevations may or may not be reviewed in whole or in part. The fabricator is entirely responsible for accuracy of detailed dimensions on the shop drawings and for fit up in the field.

### 1.03 SUBMITTALS:

A. Product Data: Manufacturer's data and installation instructions for shrinkage-resistance grout, chemical grout, and primer paint.

B. Shop Drawings: Fabrication and erection drawings including complete details of all members and connections, including all field connections. Distinguish between shop and field welding and bolting. Identify fully tightened and slip-critical connections if any.

C. Welder Qualifications: Proof that all shop and field welders currently meet AWS qualification requirements.

D. Welding Procedures: Written welding procedures for ALL field welding PRIOR to the start of any field welding.

#### 1.04 DELIVERY, STORAGE AND HANDLING:

- A. Deliver anchor rods and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay work.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground. Protect steel members and packaged materials from deterioration.

Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

Clean and relubricate bolts and nuts that become dry or rusty before use.

#### PART 2 - PRODUCTS

##### 2.01 MATERIALS:

- A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.
- B. W-shapes: ASTM A 992.
- C. Other Shapes, Plates, and Bars: ASTM A 36.
- D. Steel Tubes: ASTM A 500, Grade B.  
Steel Pipe: ASTM A53, Type E or S, Grade B.
- E. Stainless Steel Plates, Pipe, and Bars: Type 304 (Alternate S-1)
- F. Anchor Rods: ASTM F1554, Grade 36.
- G. High-Strength Bolts: ASTM A 325, Type 1.  
Heavy Hex Nuts: ASTM A 563.  
Hardened Washers: ASTM F 436.
- H. Electrodes for Welding: Comply with AWS Code.

- I. Structural Steel Primer Paint: Fabricator's standard lead and chromate free, non-asphaltic, rust inhibiting primer.
- J. Shrinkage-Resistant ("Non-Shrink") Grout: ASTM C 1107, pre-mixed, non-metallic, non-corrosive, non-staining.

## 2.02 FABRICATION:

- A. Shop Fabrication and Assembly: Shop fabricate and assemble to greatest extent possible in accordance with AISC Specifications, AISC Code of Standard Practice, and as indicated on final shop drawings. Provide camber in structural members where indicated.

Mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

- B. Connections:
  - 1. Weld or bolt shop connections.
  - 2. Bolt field connections except where field welded connections are shown on the Drawings.
  - 3. Bolted Connections: Comply with AISC "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts".
  - 4. Welded Connections: Comply with AWS D1.1 for procedures, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible. Plane thermally cut edges to be welded to greatest extent possible.
- D. Bolt Holes: Drill or punch standard holes perpendicular to steel surfaces. Drill or punch and cut or thermally cut slotted holes perpendicular to steel surfaces.
- E. Holes in Bearing Plates: Cut, drill, punch, or mechanically thermal cut holes perpendicular to steel surfaces.
- F. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- G. Other Holes: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members.

Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.

Cut, drill, punch, or mechanically thermally cut holes perpendicular to steel surfaces. Do not enlarge holes by burning.

### 2.03 SHOP PAINTING:

- A. General: Shop paint only structural steel intended to be exposed in its final condition, except those members or portions of members to be embedded in concrete or mortar, unless indicated otherwise on the Drawings. Paint embedded steel, which is partially exposed on exposed portions and initial 2" of embedded areas only.
- B. Do not paint surfaces which are to be field welded, connected with slip-critical joints, or which are to receive spray-on fireproofing.
- C. Surface Preparation: Clean in accordance with Steel Structures Painting Council as follows:

SP-1 Solvent Cleaning: Oil and grease removal.

SP-2 Hand Tool Cleaning or SP-3 Power Tool Cleaning: For steel to be enclosed or protected.

SP-6 Commercial Blast Cleaning: For exposed steel or steel subject to prolonged job-site exposure.

- D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's instructions to provide dry film thickness recommended by paint manufacturer but not less than 2.0 mils. Use painting methods which result in full coverage of joints, corners, edges and exposed surfaces.

## PART 3 - EXECUTION

### 3.01 ERECTION:

- A. Check elevations of concrete and masonry bearing surfaces, and locations of anchor rods and similar devices before erection work proceeds. Report discrepancies to Engineer. Do not proceed with erection until corrections have been made, or until compensating adjustments to work have been agreed upon with Engineer.

- B. Provide temporary shoring, guys, braces, and other supports during erection as required to keep structural steel, secure, stable, plumb, and in alignment. Remove temporary supports when permanent steel members, connections, diaphragms, bracing and other structural elements are in place.

Structural stability and safety during construction are the sole responsibility of the Contractor and Erector.

- C. Anchor Rods: Furnish anchor rods and other connectors required for securing structural steel to foundations and other in-place work.

Furnish templates and other devices as necessary for presetting rods and other anchors to accurate locations.

- D. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

Set base plates and bearing plates for structural members on wedges, nuts, shims, or other adjusting devices, or set loose leveling plates in grout. Set leveling plates so that additional shimming or adjustment is not required to plumb supported members.

- E. 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 base or bearing plate prior to packing with grout.

- F. Pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces, protect and cure grout.

Comply with manufacturer's instructions for installation and curing.

- G. Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces, which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

- H. Level and plumb individual members of structure within specified AISC tolerances.

Splice members only where indicated and accepted on shop drawings.

- I. Maintain erection tolerances within AISC "Code of Standard Practice for Steel Buildings and Bridges".

- J. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

Do not use thermal cutting during erection unless approved by Engineer. Finish thermally cut sections to within smoothness limits in AWS D1.1.

### 3.02 FIELD CONNECTIONS:

- A. Bolted Connections: Install bolts according to AISC "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint indicated. Joints are snug tight unless indicated otherwise on the Drawings.
- B. Welded Connections: Comply with AWS D1.1 for welding procedures, surface preparation, tolerances, quality of welds, and for methods used to correct welding work.

Remove slag from all welds, perform visual inspection of all welds, and correct deficiencies.

### 3.03 QUALITY CONTROL:

- A. Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and field welded connections and to perform tests and prepare test reports.

Testing agency shall conduct and interpret tests and state in each report whether or not work complies with requirements, and specifically state any deficiencies.

Provide access for testing agency to places where structural steel work is being conducted so that required inspection and testing can be accomplished.

- B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1
1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:
    - a. Liquid Penetrant Inspection: ASTM E 165.
    - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    - c. Ultrasonic Inspection: ASTM E 164.
    - d. Radiographic Inspection: ASTM E 94.

- D. Owner may require testing of up to 20% of all field welds and up to 100% of all full penetration field welds using methods stated above. If 20% of these tests show deficiencies, Engineer may require additional tests at no cost to the Owner.
- E. Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance of original work, and as necessary to show compliance of corrected work.

#### 3.04 REPAIRS AND PROTECTION:

- A. After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural steel. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.  
  
Apply a compatible primer of same type as shop primer.
- B. Repair damaged galvanized coatings (if any) with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

\* END OF SECTION 05 12 00 \*

SECTION 05 21 00  
STEEL JOIST FRAMING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

- A. Section includes:
  - 1. K Series joists
  - 2. KCS Series joists
  - 3. Special (SP) Joists
  - 4. Joist accessories

1.02 QUALITY ASSURANCE:

- A. Design, fabricate and install joists in compliance with SJI "Standard Specifications, Load Tables and Weight Tables: Steel Joists and Joist Girders." Design special joists for loads shown on the drawings.
- B. Manufacturer Qualifications: SJI Member.
- C. Manufacturer assumes responsibility for design of joist headers shown to be provided by joist manufacturer, including analysis and design by a Registered Professional Engineer.
- D. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with the AWS "Standard Qualification Procedure".

1.03 SUBMITTALS:

- A. Shop Drawings: Submit detailed drawings showing layout of joists, special connections, jointing and accessories. Include mark, number, type, location and spacing of joists and bridging. Indicate that manufacturer is an SJI member, and that joists comply with SJI specifications.
- B. Welder Qualifications: Proof that field welders meet AWS qualification requirements.

1.04 DELIVERY, STORAGE AND HANDLING:



- A. Deliver, store and handle steel joists as recommended in SJI "Specifications". Handle and store joists in a manner to avoid deforming members and to avoid excessive stresses.

## PART 2 - PRODUCTS

### 2.01 MATERIALS:

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Steel for joists: Comply with SJI "Specifications".
- C. Bolts: ASTM A 307, Grade A hex head bolts, carbon steel nuts, and flat unhardened washers.
- D. Steel Prime Paint: Comply with SJI "Specifications", except asphalt type paint not permitted.

### 2.02 FABRICATION:

- A. General: Fabricate steel joists in accordance with SJI "Specifications".
- B. Bridging: Provide diagonal or horizontal bridging complying with SJI "Specifications" for material, size, and type unless indicated otherwise on the Drawings.

Provide bridging anchors for ends of bridging lines terminating at walls or beams.

- C. End Anchorage: Provide end anchorages to secure joists to adjacent construction, complying with SJI "Specifications", unless otherwise indicated. Do not connect bottom chords of joists to columns or walls except where required on the Drawings.
- D. Shop Painting: Remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP2, or power-tool cleaning, SSPC-SP3.

Apply one shop coat of primer to joists and accessories to provide a continuous dry paint film thickness of not less than 1.5 mil.

## PART 3 - EXECUTION

### 3.01 INSPECTION:

- A. Examine supporting members, bearing plates, and conditions under which steel joists are to be installed, with Installer present. Notify Engineer in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

### 3.02 ERECTION:

- A. Place and secure steel joists in accordance with SJI "Specifications", contract drawings, final shop drawings, and as herein specified.
- B. Placing Joists: Do not start placement of steel joists until supporting work is in place and secured. Place joists on supporting work, adjust and align in accurate locations and spacing before permanently fastening.

Provide temporary bridging, connections, and anchors to ensure lateral stability during construction. Comply with OSHA requirements.

- C. Bridging: Install bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams.
- D. Field weld joists to supporting steel framework and loose plates in accordance with SJI "Specifications" for type of joists used. Coordinate welding sequence and procedure with placing of joists.
- E. Bolt joists to supporting steel framework in accordance with SJI "Specifications" for type of joists used.
- F. Touch-Up Painting: After installation, paint field bolt heads and nuts, and welded areas, abraded or rusty surfaces on joists and steel supporting members. Wire brush surfaces and clean with solvent before painting. Use same type of paint as used for shop painting.

### 3.03 FIELD QUALITY CONTROL:

- A. Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

- B. Field welds will be visually inspected according to AWS D1.1.
- C. In addition to visual inspection, field welds may be tested according to AWS D1.1. and the following procedures, as applicable.
  - 1. Radiographic Testing: ASTM E 94 and ASTM E 142.
  - 2. Magnetic Particle Inspection: ASTM E 709.
  - 3. Ultrasonic Testing: ASTM E 164.
  - 4. Liquid Penetrant Inspection: ASTM E 165.
- D. Bolted connections will be visually inspected.
- E. Correct deficiencies in Work that inspections and test reports have indicated are not in compliance with specified requirements.
- F. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

\* END OF SECTION 05 21 00\*

SECTION 05 31 00  
METAL DECKING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

A. Metal Roof Deck

1.02 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of the following codes and standards, except as otherwise indicated or specified:

1. AISI "Specification for the Design of Cold-Formed Steel Structural Members".
2. AWS D1.1 "Structural Welding Code".
3. AWS D1.3 "Structural Welding Code – Sheet Steel".
4. SDI "Design Manual for Floor Decks and Roof Decks", "Specifications for Roof Deck", "Specifications for Floor Decks".

B. Qualification of Field Welding: Qualify welding procedures and personnel in accordance with AWS D1.1 and D1.3.

C. Underwriters' Label: Provide UL labeled floor deck units.

1.03 SUBMITTALS:

A. Product Data: Manufacturer's specifications and installation instructions for each type of decking and accessories.

B. Welder Qualifications: Proof that all welders currently meet AWS qualification requirements.

C. Weld Procedure Specifications (WPS): Weld procedure specifications for deck and related welding. Use Model WPS in AWS D1.1.

D. Shop Drawings: Detailed drawings showing layout and types of deck panels, anchorage details, closure panels, supplementary framing, pans, deck openings, special jointing, accessories, and attachment to other construction.

#### 1.04 DELIVERY, STORAGE, AND HANDLING:

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. 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

#### 2.01 MATERIALS, GENERAL

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

#### 2.02 ROOF DECK:

##### A. Steel Roof Deck:

1. Type B (wide rib), 1 ½" deep, 22 gauge, painted.
2. Material: ASTM A 1008 for painted decks, min. yield 33 ksi; shop primed with gray or white baked-on, lead- and chromate free, rust-inhibitive primer. ASTM A653 for galvanized deck, min. yield 33ksi; G60 zinc coating.
3. Side laps: Overlapped.  
End laps: Nested, 2" lap at ends.  
Minimum end bearing 1 ½"
4. Span condition: Three or more where possible.

#### 2.03 ACCESSORIES:

- A. General: Manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- C. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- D. Closures, Cover Plates, and Miscellaneous Sheet Metal Deck Accessories: Steel sheet, same material thickness, and finish as deck; unless otherwise indicated.

- E. Repair Paint: Lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.

### PART 3 - EXECUTION

#### 3.01 INSPECTION:

- A. Examine supporting structure and field conditions. Notify Architect and Engineer in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected.

#### 3.02 INSTALLATION:

- A. Install deck units and accessories according to manufacturer's instructions, contract drawings, final shop drawings, and as specified herein.

Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlock.

Place deck units flat and square, and fasten to supporting framing without warp or excessive deflection.

- B. Cut and neatly fit deck units and accessories around openings and other work projecting through or adjacent to the decking.
- C. Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work shown.
- D. Weld closures, reinforcement, and other metal accessories into position to provide a complete decking installation.
- E. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.
- F. Install mechanical fasteners in accordance with manufacturer's instructions.
- G. Touch-Up Painting: After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on top and bottom surfaces of decking units and supporting steel members.
  - 1. Touch-up painted surfaces with same type of shop paint used on adjacent surfaces. Touch-up galvanized surfaces using repair paint.

2. In areas where shop painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.

### 3.03 FASTENING DECK UNITS:

#### A. Roof Deck:

1. Fasten to steel supporting members using 5/8" diameter puddle welds in the weld pattern indicated on the Drawings.
2. Side Laps: Fasten using #10 hex head screws as indicated on the Drawings.
3. Perimeter Edges: 5/8" diameter puddle welds to match spacing of weld pattern indicated on the Drawings.

### 3.04 FIELD QUALITY CONTROL:

- A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control inspection of field welds.
- B. Testing agency will report test results promptly and in writing to Contractor and Engineer.
- C. Remove and replace work that does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specific requirements.

\* END OF SECTION 05 31 00 \*

## SECTION 054000 - COLD-FORMED 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. This Section includes the following:
  - 1. Exterior non-load-bearing wall framing.
  - 2. Ceiling joist framing.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Design Responsibility: The contractor is required to provide the complete design and detailing of the wall and roof framing systems to resist specified loads within deflection limits specified where cold-formed metal framing is indicated. Where necessary or desirable, the contractor may substitute structural steel components for increased strength or stiffness. Such substitutions will be included in the design and detailing submittal and shall be provided at no additional cost to the Owner. Size limitations identified on the drawings pertain to both cold-formed metal framing and structural steel components. All design and detailing of structural steel and cold-formed metal framing is subject to approval by the Structural Engineer of record.
- B. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
  - 1. Design Loads: As indicated on the structural drawings or otherwise approved.
  - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Exterior Non-Load-Bearing Curtain-Wall Framing: Horizontal deflection of 1/600 of the wall height for masonry veneer.
    - b. Ceiling Joist Framing: Vertical deflection of 1/360 of the span.
  - 3. Design framing systems to provide for movement of framing members 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 3/4 inch.
- C. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
  2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
1. Include structural analysis calculations signed and sealed by the qualified professional engineer responsible for their preparation.
    - a. Review of structural analysis calculations is for general conformance with requirements and completeness. The responsibility for correctness rests solely with the designer. The Architect reserves the authority to require resubmittal for observed deficiencies, or incompleteness.
  2. Include complete details for all member connections at openings and other discontinuities of the wall system.
  3. Specify connections to supports at top and bottom of wall including spacings at jambs of openings.
- C. Qualification Data: For professional engineer.
- D. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
1. Expansion anchors.
  2. Power-actuated anchors.
  3. Mechanical fasteners.
  4. Vertical deflection clips.
  5. Horizontal drift deflection clips
  6. Miscellaneous structural clips and accessories.

## 1.5 QUALITY ASSURANCE

- A. **Installer Qualifications:** An experienced installer who has completed cold-formed metal framing 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.
- B. **Engineering Responsibility:** Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
  - 1. Provide seal of professional engineer on calculations and shop drawings.
  - 2. Same engineer shall provide on-site review of installation.
- C. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- D. **Testing Agency Qualifications:** An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- E. **Fire-Test-Response Characteristics:** Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- F. **AISI Specifications and Standards:** Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
  - 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."
- G. **SSMA Section Properties:** Provide cold-formed metal framing members with section properties that equal or exceed the properties indicated in SSMA's "Product Technical Information" publication.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:
1. Dale/Incor.
  2. Dietrich Metal Framing; a Worthington Industries Company.
  3. MarinoWare; a division of Ware Industries.
  4. Super Stud Building Products, Inc.
  5. The Steel Network, Inc.
  6. United Metal Products, Inc.

### 2.2 MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: ST33H or ST50H as required by structural performance.
  2. Coating: G90.
- B. Steel Sheet for Vertical Deflection and Miscellaneous Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: 50, Class 1 or 2.
  2. Coating: G90.

### 2.3 EXTERIOR 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: 18 gage.
  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: Matching steel studs.
  2. Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure.

1. Construction: Slotted galvanized steel angle with step bushing to prevent over tightening of fasteners.
  2. Vertical Deflection: 1-1/2 inches total travel.
  3. Products: Subject to compliance with requirements, provide one of the following:
    - a. VertiClip, by The Steel Network. Series: SL, SLT, SLB, AND SLS as required by attachment condition.
    - b. Fast Top Clips by Dietrich, with FastClip deflection screws.
- 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 and lateral loads and transfer them to the primary structure, and as follows:
1. Minimum Base-Metal Thickness: As required to resist design loads.
  2. Flange Width: 1 inch plus the design gap for 1-story structures and 1 inch plus twice the design gap for other applications.
- E. Approved alternates to double studs for openings: ASTM A653/A653M, Grade 50 (340), 50ksi (340MPa), minimum yield strength, 65ksi (450 MPa), minimum tensile strength, G-60 (Z180) hot-dipped galvanized coating.
1. JamStud™ by The Steel Network, Inc.
    - a. Approved engineered connections for openings: StiffClips® as manufactured by The Steel Network, Inc.
  2. HDS by Dietrich.

## 2.4 CEILING JOIST FRAMING

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

## 2.5 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight 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.

## 2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- C. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
  - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
  - 2. Minimum size; No. 10-16 (D=0.19"), with length adequate for 3 threads to project through the connected members.

## 2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.
- B. Shims: Load bearing, high-density multimonomer plastic, nonleaching.
- C. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

### 3.3 INSTALLATION, GENERAL

- A. Cold-formed metal framing is to be field assembled.

- B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install field-fabricated, cold-formed framing and securely anchor to supporting structure.
  - 1. Bolt 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 metal 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 metal framing members by screw fastening only. Wire tying of framing members is not permitted.
    - a. Power-actuated fasteners: In concrete, minimum spacing = 3", minimum edge distance = 3". In structural steel, minimum spacing = 1 1/2", minimum edge distance = 1/2".
    - b. Screws: Minimum spacing and edge distance = 1/2".
- E. Install framing members in one-piece lengths or multiple lengths as required by the design and load requirements.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity 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 and control joints with cold-formed metal framing. Independently frame both sides of joints.
- H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings or as indicated in the shop drawings.
- I. Erection Tolerances: Install cold-formed metal 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 shall not exceed minimum fastening requirements of sheathing or other finishing materials.

### 3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

- B. Fasten both flanges of studs to bottom track, unless otherwise indicated. Space studs as follows:
  - 1. Stud Spacing: As required by design, but not greater than 24 inches on center.
- 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-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 infill studs and anchor to building structure.
  - 4. Connect drift clips to cold formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings. Fasten at each stud intersection.
  - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track.
  - 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

### 3.5 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
  - 1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
  - 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space joists not more than 2 inches from abutting walls, and as follows:
  - 1. Joist Spacing: 16 inches.
- D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.

- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.
  - 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
  - 1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
- G. Secure joists to load-bearing interior walls as indicated in the shop drawings prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

### 3.6 FIELD QUALITY CONTROL

- A. Engineer of cold-form metal framing shall review on-site installation and provide written documentation that installation conforms to design intent. If corrective work is required, same engineer shall specify repair work necessary to provide conforming installation.
- B. Remove and replace work where test results indicate that it does not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.7 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000



## SECTION 055000 - METAL FABRICATIONS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Steel framing and supports for mechanical and electrical equipment.
  - 2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
  - 3. Loose bearing and leveling plates.
- B. Products furnished, but not installed, under this Section include the following:
  - 1. Loose steel lintels.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

#### 1.4 SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details for metal fabrications.
  - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
  - 2. Provide templates for anchors and bolts specified for installation under other Sections.
  - 3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1, "Structural Welding Code--Steel."

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
  - 2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 METALS, GENERAL

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

## 2.3 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- C. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

## 2.4 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.
- D. Anchor Bolts: ASTM F 1554, Grade 36.
  - 1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
- E. Eyebolts: ASTM A 489.
- F. Machine Screws: ASME B18.6.3.
- G. Lag Bolts: ASME B18.2.1.
- H. Wood Screws: Flat head, ASME B18.6.1.
- I. Plain Washers: Round, ASME B18.22.1.
- J. Lock Washers: Helical, spring type, ASME B18.21.1.
- K. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
  - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.
- L. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, 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 according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material for Anchors in Exterior Locations: Alloy Group 1 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.

## 2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- 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 containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
  1. Available Products:
    - a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
    - b. ICI Devco Coatings; Catha-Coat 313.
    - c. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
    - d. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
    - e. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
    - f. Tnemec Company, Inc.; Tneme-Zinc 90-97.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
  1. Available Products:
    - a. Sealmastic, Type 1; W. R. Meadows
    - b. Hydrocide 600; Sonneborn Building Products.
    - c. Karnak 100 AF; Karnac Chemical Corp.
- F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
  1. Available Products:
    - a. Five Star Grout by Five Star Products, Inc.
    - b. Masterflow 928 Grout by Master Builders Technologies.

- c. SonogROUT 10K by Sonneborn.
- d. 14K Hy Flow by Sonneborn.

## 2.6 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 true to line and level 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 and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be 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.
  - 1. 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.

## 2.7 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 retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

## 2.8 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. 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 1/12 of clear span but not less than 8 inches, unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.

## 2.9 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. Prime plates with zinc-rich primer.

## 2.10 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

## 2.11 STEEL AND IRON FINISHES

- A. Galvanizing: Provide coating for iron and steel fabrications applied by the hot-dipped process, Durogalv by Duncan Galvanizing. The galvanizing bath shall contain high grade zinc and other earthy materials. Immediately before galvanizing, the steel shall be immersed in a bath of zinc ammonium chloride. The use of the wet kettle process is prohibited. Comply with ASTM A123 for fabricated products and ASTM A 153 for hardware. Provide thickness of galvanizing specified in referenced standards.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, 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.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## 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 bolts, 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 will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING 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.

3.3 INSTALLING 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 grout.
  - 1. Use nonshrink grout, nonmetallic, in concealed and exposed locations, unless otherwise indicated.
  - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000



## SECTION 055213 - PIPE AND TUBE RAILINGS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
1. Aluminum [**pipe**] [**and**] [**tube**] railings.
  2. Stainless-steel [**pipe**] [**and**] [**tube**] railings.
  3. Steel [**pipe**] [**and**] [**tube**] railings.
- B. Related Sections include the following:
1. Division 05 Section "Metal Stairs" for steel tube railings associated with metal stairs.
  2. Division 05 Section "Decorative Metal Railings" for ornamental railings fabricated from pipes and tubes.
  3. Division 06 Section "Rough Carpentry" for wood blocking for anchoring railings.
  4. Division 09 Section "Access Flooring" for railings included with access flooring.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
1. Aluminum: The lesser of minimum yield strength divided by 1.65 or minimum ultimate tensile strength divided by 1.95.
  2. Stainless Steel: 60 percent of minimum yield strength.
  3. Steel: 72 percent of minimum yield strength.
- B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Handrails:
    - a. Uniform load of 50 lbf/ ft. applied in any direction.
    - b. Concentrated load of 200 lbf applied in any direction.
    - c. Uniform and concentrated loads need not be assumed to act concurrently.
  2. Top Rails of Guards:

- a. Uniform load of 50 lbf/ ft. applied in any direction.
  - b. Concentrated load of 200 lbf applied in any direction.
  - c. Uniform and concentrated loads need not be assumed to act concurrently.
3. Infill of Guards:
- a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
  - b. Uniform load of 25 lbf/sq. ft. applied horizontally.
  - c. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

#### 1.4 SUBMITTALS

- A. Product Data: For the following:
1. Manufacturer's product lines of mechanically connected railings.
  2. Grout, anchoring cement, and paint products.
- B. LEED Submittal:
1. Product Data for Credit MR 4.1[ **and Credit MR 4.2**]: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Samples for Verification: For each type of exposed finish required.
1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
  2. Fittings and brackets.
  3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.

a. Show method of [**finishing**] [**connecting**] members at intersections.

E. Welding certificates.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

## 1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.

B. Welding: Qualify procedures and personnel according to the following:

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

## 1.6 PROJECT CONDITIONS

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

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating railings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

## 1.7 COORDINATION AND SCHEDULING

A. 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.

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Aluminum Pipe and Tube Railings:
  - a. Blum, Julius & Co., Inc.
  - b. Braun, J. G., Company; a division of the Wagner Companies.
  - c. Wagner, R & B, Inc.; a division of the Wagner Companies.
2. Stainless-Steel Pipe and Tube Railings:
  - a. Blum, Julius & Co., Inc.
  - b. Wagner, R & B, Inc.; a division of the Wagner Companies.

## 2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

## 2.3 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.
- B. Extruded Bars and Tubing: ASTM B 221, Alloy 6063-T5/T52.
- C. Extruded Structural Pipe and Round Tubing: ASTM B 429, Alloy 6063-T6.
  1. Provide Standard Weight (Schedule 40) pipe, unless otherwise indicated.
- D. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832.
- E. Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- F. Die and Hand Forgings: ASTM B 247, Alloy 6061-T6.
- G. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.
- H. Woven-Wire Mesh: Intermediate-crimp, **[diamond]** **[square]** pattern, 2-inch woven-wire mesh, made from 0.162-inch nominal diameter wire complying with ASTM B 211, Alloy 6061-T94.

## 2.4 STAINLESS STEEL

- A. Tubing: ASTM A 554, Grade MT **[304]** **[316L]**.
- B. Pipe: ASTM A 312/A 312M, Grade TP **[304]** **[316L]**.

- C. Castings: ASTM A 743/A 743M, Grade [CF 8 or CF 20] [CF 8M or CF 3M].
- D. Plate and Sheet: ASTM A 666, Type [304] [316L].
- E. Woven-Wire Mesh: Intermediate-crimp, [diamond] [square] pattern, 2-inch woven-wire mesh, made from 0.135-inch nominal diameter wire complying with ASTM A 580/A 580M, Type [304] [316].

## 2.5 STEEL AND IRON

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn).
- C. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
  - 1. Provide galvanized finish for exterior installations and where indicated.
- D. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- E. Castings: Either gray or malleable iron, unless otherwise indicated.
  - 1. Gray Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.
  - 2. Malleable Iron: ASTM A 47/A 47M.
- F. Woven-Wire Mesh: Intermediate-crimp, [diamond] [square] pattern, 2-inch woven-wire mesh, made from 0.135-inch nominal diameter wire complying with ASTM A 510.
- G. Wire Cloth: Plain steel, 0.12 inch diameter wire, 1-1/2 inch opening, woven plain weave by McNichols Co. or approved substitute.
- H. Perforated Metal Panel: 12 gage thick plain steel perforated panel with .200 inch square holes on 1/2 inch straight row centers with 18 percent open area. Provide by McNichols or approved substitute.

## 2.6 FASTENERS

- A. General: Provide the following:
  - 1. Aluminum Railings: Type [304] [316] stainless-steel fasteners.
  - 2. Stainless-Steel Railings: Type [304] [316] stainless-steel fasteners.
  - 3. Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
  - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
  - 2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
  - 3. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
- D. Anchors: Provide [**cast-in-place**] [**chemical**] [**or**] [**torque-controlled expansion**] anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

## 2.7 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
  - 1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer.
  - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
  - 1. Available Products:
    - a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
    - b. Carboline Company; Carbozinc 621.
    - c. ICI Devoe Coatings; Catha-Coat 313.
    - d. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
    - e. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
    - f. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
    - g. Tnemec Company, Inc.; Tneme-Zinc 90-97.
- D. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.

- E. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
  - 1. Available Products:
    - a. Five Star Grout by Five Star Products, Inc.
    - b. Masterflow 928 Grout by Master Builders Technologies.
    - c. SonogROUT 10K by Sonneborn.
    - d. 14K Hy Flow by Sonneborn.
- H. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
  - 1. Water-Resistant Product: **[At exterior locations] [and] [where indicated]** provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

## 2.8 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. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. 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.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with **[welded] [nonwelded] [either welded or nonwelded]** connections, unless otherwise indicated.

- H. 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 surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- J. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
  - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- K. Form changes in direction as follows:
  - 1. As detailed.
- L. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- M. Close exposed ends of railing members with prefabricated end fittings.
- N. 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.
- O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.
  - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- P. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- Q. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with steel plate forming bottom closure.



- R. For removable railing posts, fabricate slip-fit sockets from **[steel]** **[stainless-steel]** tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
- S. Expanded-Metal Infill Panels: Fabricate infill panels from expanded metal made from same metal as railings in which they are installed.
1. Edge panels with U-shaped channels made from metal sheet, of same metal as expanded metal and not less than 0.043 inch thick.
  2. Orient expanded metal with long dimension of diamonds **[parallel to top rail]** **[perpendicular to top rail]** **[horizontal]** **[vertical]**.
- T. Perforated-Metal Infill Panels: Fabricate infill panels from perforated metal made from **[steel]** **[galvanized steel]** **[aluminum]** **[stainless steel]** **[same metal as railings in which they are installed]**.
1. Edge panels with U-shaped channels made from metal sheet, of same metal as perforated metal and not less than 0.043 inch thick.
  2. Orient perforated metal with pattern **[parallel to top rail]** **[perpendicular to top rail]** **[horizontal]** **[vertical]** **[as indicated on Drawings]**.
- U. Woven-Wire Mesh Infill Panels: Fabricate infill panels from woven-wire mesh crimped into 1-by-1/2-by-1/8-inch metal channel frames. Make wire mesh and frames from same metal as railings in which they are installed.
1. Orient wire mesh with **[diamonds vertical]** **[wires perpendicular and parallel to top rail]** **[wires horizontal and vertical]**.
- V. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

## 2.9 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

## 2.10 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Mechanical Finish: AA-M12 (Mechanical Finish: nonspecular as fabricated).
- C. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.
- D. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
- E. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
  - 1. Color: [**Light bronze**] [**Medium bronze**] [**Dark bronze**] [**Black**].
  - 2. Color: [**Match Architect's sample**] [**As selected by Architect from full range of industry colors and color densities**].
- F. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with [**AAMA 2604**] [**AAMA 2605**] and with coating and resin manufacturers' written instructions.
  - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

## 2.11 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. 180-Grit Polished Finish: Oil-ground, uniform, directionally textured finish.
- D. 320-Grit Polished Finish: Oil-ground, uniform, fine, directionally textured finish.

- E. Polished and Buffed Finish: Oil-ground, 180-grit finish followed by buffing.
- F. Directional Satin Finish: No. 4.
- G. Dull Satin Finish: No. 6.
- H. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

## 2.12 STEEL AND IRON FINISHES

- A. Galvanizing: Provide coating for iron and steel fabrications applied by the hot-dipped process, Durogalv by Duncan Galvanizing. The galvanizing bath shall contain high grade zinc and other earthy materials. Immediately before galvanizing, the steel shall be immersed in a bath of zinc ammonium chloride. The use of the wet kettle process is prohibited. Comply with ASTM A123 for fabricated products and ASTM A 153 for hardware. Provide thickness of galvanizing specified in referenced standards.
- B. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- C. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- D. For nongalvanized steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.
- E. Preparation for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic-phosphate process.
- F. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed railings:
  - 1. Exterior Railings (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 2. Interior Railings (SSPC Zone 1A): SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
  - 3. Interior Railings [**Indicated to Receive Zinc-Rich Primer**](SSPC Zone 1A): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- G. Apply shop primer to prepared surfaces of railings, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
  - 1. Do not apply primer to galvanized surfaces.
  - 2. Stripe paint corners, crevices, bolts, welds, and sharp edges.

- H. Shop Priming Galvanized Steel: Where galvanized steel is indicated to be primed for field painting, provide factory-applied polyamide epoxy primer over specially prepared galvanized steel, 2.0 mils dry film thickness minimum, Primergalv by Duncan Galvanizing. Apply primer within 12 hours after galvanizing at the galvanizer's plant in a controlled environment meeting applicable environmental regulations, and as recommended by coating manufacturer. Engage the services of a galvanizer who has demonstrated a minimum of five (5) years experience in the successful performance of the processes outlined in this specification in the facility where the work is to be done and who will apply the galvanizing and coating with the same facility as outlined herein.
- I. Painted Finish: Comply with Division 09 painting Sections.
- J. Factory-Applied High-Performance Architectural Finish: Provide factory-applied polyurethane color coating, 2.5 mils dry film thickness minimum, architectural coating over primed galvanized steel as previously referenced, Colorgalv by Duncan Galvanizing. Apply coating at the galvanizer's plant in a controlled environment meeting applicable environmental regulations, and as recommended by coating manufacturer. Engage the services of a galvanizer who has demonstrated a minimum of five (5) years experience in the successful performance of the processes outlined in this specification in the facility where the work is to be done and who will apply the galvanizing and coating with the same facility as outlined herein and will assume single-source responsibility for galvanizing, priming and finish coating.
- K. Power Coat Finish (Based on Duncan Product): High-Performance Polyester Coating over Black (Uncoated) Steel or Aluminum: Duncan Thermoset matching approved samples. Color as selected by the Architect.
1. Factory-applied metal coatings shall be performed in a facility acceptable to Tiger Drylac® U.S.A., Inc.
  2. Materials:
    - a. Powder Coating Topcoat: Polyester resin-based thermosetting powder, Series 28 (58) High Performance Architectural Coating
    - b. Zinc Polyester Primer: Polyester resin based thermosetting zinc powder, 69/90350.
    - c. Coating to be applied only by a TIGER Drylac Series 28 Approved Applicator. Proof of current certification required for a valid Tiger Drylac 10 years warranty to go into effect.
  3. Performance Criteria: Coating must meet or exceed the following performance criteria:
    - a. Adhesion – Method: ASTM D-3359
    - b. Flexibility – Method: ASTM D-522 (Cylindrical Mandrel)
    - c. Hardness – Method: ASTM D-3363 (Pencil)
    - d. Salt Spray – Method: ASTM B-117
    - e. Humidity – Method: ASTM D-4585
    - f. Impact Resistance - Method: ASTM D-2794
  4. Surface will be brush blasted to produce a 1-3 mil profile on the surface to provide adhesion for the Duncan Thermoset. Surface shall exhibit a rugosity (smoothness) not greater than 4 rug (16-20 microns of variation) when measured by a profilometer over a 1 inch straight line on the surface. Profilometer shall be capable of operating in 1 micron increments.
  5. All coating material shall be force cured in a calibrated oven capable of maintaining 500 deg F.
  6. Finish Warranty: Manufacturer to provide standard ten (10) year warranty.
  7. Acceptable finishers include:

- a. Performance Product Painting, Auburn, Maine.
- b. Duncan Group, Everett, MA.

### 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 have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

#### 3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
  - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
  - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
  - 3. 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.
- C. Corrosion Protection: 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.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. 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. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.
- C. 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 1 side, and locate joint within 6 inches of post.

### 3.4 ANCHORING POSTS

- A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with [**nonshrink, nonmetallic grout**] [**or**] [**anchoring cement**], mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with [**nonshrink, nonmetallic grout**] [**or**] [**anchoring cement**], mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post, [**welded to post after placing anchoring material**] [**attached to post with set screws**].
- D. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8-inch buildup, sloped away from post.
- E. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
  - 1. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.
  - 2. For stainless-steel pipe railings, weld flanges to post and bolt to supporting surfaces.
  - 3. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.
- F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

### 3.5 ANCHORING RAILING ENDS

- A. Anchor railing ends to concrete and masonry with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and [**welded to railing ends**] [**or**] [**connected to railing ends using nonwelded connections**].

### 3.6 ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
  - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
  - 2. Use type of bracket with predrilled hole for exposed bolt anchorage.

- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets to building construction as follows:
  - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
  - 2. For hollow masonry anchorage, use toggle bolts.
  - 3. For wood stud partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.
  - 4. For steel-framed [**gypsum board**] [**plaster**] partitions, use hanger or lag bolts set into [**fire-retardant-treated**] wood backing between studs. Coordinate with stud installation to locate backing members.
  - 5. For steel-framed [**gypsum board**] [**plaster**] partitions, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.
  - 6. For steel-framed [**gypsum board**] [**plaster**] partitions, fasten brackets with toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

### 3.7 ADJUSTING AND CLEANING

- A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Touchup Painting: 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.
- C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.
- D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

### 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 061000 - ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Rooftop equipment bases and support curbs.
  - 2. Wood blocking and nailers.
  - 3. Plywood backing panels.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
  - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
  - 3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
  - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
  - 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.



## PART 2 - PRODUCTS

### 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
  - 2. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Moisture Content of Lumber: Provide kiln dried, unless otherwise indicated.

### 2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Products: Available products include the following or approved substitute:
  - 1. MicroPro Smart Sense by Osmose, Inc.
  - 2. MicroPro LifeWood by Osmose, Inc.
- B. Preservative Treatment by Pressure Process: AWWPA U1; Use Category UC3b for exterior construction not in contact with the ground (General Use - Above Ground), and/or Use Category UC4a for items in contact with the ground (Ground Contact and Fresh Water Contact).
  - 1. Preservative Chemicals: Micronized Copper Quaternary or Micronized Copper Azole.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- E. Application: Treat items indicated on Drawings, and the following:
  - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

### 2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of

significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
  2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat items indicated on Drawings, and the following:
1. Plywood backing panels.

#### 2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
  2. Nailers.
  3. Rooftop equipment bases and support curbs.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 15 percent maximum moisture content of any species.
- C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

#### 2.5 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

## 2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  - 1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Cold-Formed Metal Framing: Hilti Kwik-Flex or Elco Dril-Flex; no substitutes,
  - 1. Plywood sheathing: 10-24 x 1-1/4 inch wafer head #3.
  - 2. 2 x wood blocking: 12-24 x 2-1/2 inch wafer head #3.
- F. Lag Bolts: ASME B18.2.1.
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
  - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

## PART 3 - EXECUTION

### 3.1 WOOD BLOCKING, AND NAILER INSTALLATION

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

END OF SECTION 061000

## SECTION 061600 - SHEATHING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Wall sheathing.
  - 2. Miscellaneous plywood sheathing.

#### 1.3 SUBMITTALS

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

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

### PART 2 - PRODUCTS

#### 2.1 WOOD PANEL PRODUCTS, GENERAL

- A. Plywood: DOC PS 1.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- C. Factory mark panels to indicate compliance with applicable standard.

#### 2.2 WALL SHEATHING

- A. Plywood Sheathing: Exposure 1, Structural I (CDX) sheathing.
  - 1. Span Rating: Not less than 24/0 or 32/16.

2. Nominal Thickness: As indicated on the drawings.
- B. Gypsum Wall Sheathing (1/2" Sheathing): Contractor has the option of using any of the following products:
1. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
    - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) GlasRoc Sheathing; CertainTeed (BPB America, Inc.)
      - 2) Dens-Glass Gold; Georgia-Pacific Corporation.
      - 3) E2XP Extended Exposure Sheathing; Gold Bond.
      - 4) Securock Sheathing; United States Gypsum Co.
    - b. Type and Thickness: Regular, 1/2 inch thick.
    - c. Size: 48 by 96 inches minimum.
  2. Cellulose Fiber-Reinforced Gypsum Wall Sheathing: ASTM C 1278/C 1278M, gypsum sheathing.
    - a. Product: Subject to compliance with requirements, provide "Fiberock Sheathing with Aqua-Tough" by United States Gypsum Co.
    - b. Type and Thickness: Regular, 1/2 inch thick.
    - c. Size: 48 by 96 inches minimum.

## 2.3 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
1. For sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
1. For miscellaneous sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

- F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
  - 1. For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.
  - 2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.

## 2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. General: If required by the selected Air Barrier manufacturer, provide the following joint sealant:
- B. Sealant for Glass-Mat Gypsum Sheathing Board: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated, and complying with requirements for elastomeric sealants specified in Division 07 Section "Joint Sealants."
  - 1. Available Product: 895 Silicone building Sealant by Pecora Corporation.
- C. Sheathing Tape for Glass-Mat Gypsum Sheathing Board: 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 board 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.
- 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. NES NER-272 for power-driven fasteners.
  - 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
- D. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

- E. Coordinate 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.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. 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 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
  - 1. Miscellaneous Plywood Sheathing:
    - a. Nail to wood framing.
    - b. Screw to cold-formed metal framing.
    - c. Space panels 1/8 inch apart at edges and ends.

### 3.3 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 boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
- B. Apply fasteners so heads bear tightly against face of sheathing boards 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 boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.
  - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
  - 2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

- D. Seal sheathing joints according to sheathing manufacturer's written instructions.
1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient quantity 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 board joints, and apply and trowel silicone emulsion 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.
  3. Apply sheathing tape to joints between foam-plastic sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

END OF SECTION 061600



## SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Interior standing and running trim.
  - 2. Plastic-laminate countertops.

#### 1.3 SUBMITTALS

- A. Product Data: For panel products, high-pressure decorative laminate and adhesive for bonding plastic laminate.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
  - 1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
  - 2. Show locations and sizes of cutouts and holes for plumbing fixtures installed in architectural woodwork.
- C. Samples for Selection:
  - 1. Plastic laminates.

#### 1.4 QUALITY ASSURANCE

- A. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
  - 1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with such selections and requirements in addition to the quality standard.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork 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.
  - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 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 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. Particleboard: ANSI A208.1, Grade M-2.
- C. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:

- a. Formica Corporation.
- b. Lamin-Art, Inc.
- c. Nevamar Company, LLC; Decorative Products Div.
- d. Panolam Industries International Incorporated. (Pionite)
- e. Westinghouse Electric Corp.; Specialty Products Div.
- f. Wilsonart International; Div. of Premark International, Inc.

- D. Cellular PVC Trim: Extruded, expanded PVC with a small-cell microstructure, made from UV- and heat-stabilized, rigid material.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

- a. Celtec 550 by Lumber Specialties, Inc.
- b. Klear Lumber, LLC.
- c. Koma by Kommerling USA, Inc.
- d. Versatex by Wolfpac Technologies, Inc.
- e. Vycom Corp.; Azek.

2. Density: Not less than 31 lb/cu. ft..
3. Heat Deflection Temperature: Not less than 130 deg F, per ASTM D 648.
4. Coefficient of Thermal Expansion: Not more than  $4.5 \times 10^{-5}$  inches/inch x deg F.
5. Water Absorption: Not more than 1 percent, per ASTM D 570.
6. Flame-Spread Index: 75 or less, per ASTM E 84.

## 2.2 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.
- D. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  1. Wood Glues: 30 g/L.
  2. Contact Adhesive: 250 g/L.

- E. Adhesive for Bonding Plastic Laminate: Contact cement.
  - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

## 2.3 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
  - 1. Edges of PVC Trim: 1/8 inch.
- D. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
  - 1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
  - 1. Seal edges of openings in countertops with a coat of varnish.

## 2.4 INTERIOR STANDING AND RUNNING TRIM FOR PAINT FINISH

- A. Material: Cellular PVC Trim.
- B. Fabricate to details indicated.

## 2.5 PLASTIC-LAMINATE COUNTERTOPS

- A. Grade: Premium.
- B. High-Pressure Decorative Laminate Grade: HGS.

- C. 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 selected by Architect from manufacturer's full range in the following categories:
    - a. Solid colors, matte finish.
    - b. Patterns, matte finish.
- D. Grain Direction: Parallel to cabinet fronts.
- E. Edge Treatment: As indicated.
- F. Core Material: Particleboard.
- G. Core Material at Sinks: Particleboard made with exterior glue.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

#### 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 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 for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 36 inches long, except where shorter single-length pieces are necessary.

1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
  2. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.
- G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
  2. Secure backsplashes to walls with adhesive.
  3. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."
- H. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

### 3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023

## SECTION 066400 - PLASTIC PANELING

### 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 glass-fiber reinforced plastic (FRP) wall paneling and trim accessories.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Selection: For plastic paneling and trim accessories.

#### 1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 25 or less.
  - 2. Smoke-Developed Index: 450 or less.
  - 3. Testing Agency: UL.

### PART 2 - PRODUCTS

#### 2.1 PLASTIC SHEET PANELING

- A. General: Gelcoat-finished, glass-fiber reinforced plastic panels complying with ASTM D 5319 and having a Class A fire rating.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Kemlite Company Inc.; Fire-X-Glasbord with Surfaseal.
  - 2. Nominal Thickness: Not less than 0.09 inch.
  - 3. Surface Finish: Smooth.

4. Color: As selected by Architect from manufacturer's full range.

## 2.2 ACCESSORIES

- A. Trim Accessories: Manufacturer's standard two-piece, snap-on vinyl extrusions designed to cover edges of panels. Provide division bars, inside corners, and caps as needed to conceal edges.
  1. Color: Match panels.
- B. Adhesive: Provide Titebond Solvent-based FRP adhesive.
- C. Sealant: Single-component, mildew-resistant, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Division 07 Section "Joint Sealants."
  1. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Clean substrates of substances that could impair bond of adhesive, including oil, grease, dirt, and dust.
- B. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.
- C. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels.
  1. Mark plumb lines on substrate at trim accessory locations for accurate installation.
  2. Locate trim accessories to allow clearance at panel edges according to manufacturer's written instructions.

### 3.3 INSTALLATION

- A. Install plastic paneling according to manufacturer's written instructions.



- B. Follow adhesive manufacturer's recommendations for appropriate height of adhesive bead left by trowel. Use a "crosshatch" type pattern. Make sure adhesive extends to all edges of the panel. Adhesive should be applied directly to the back of the FRP panel.
- C. Start in corner. Install one piece corner molding. Apply silicone sealant in molding. Slide panel into molding and withdraw 1/8 inch. This will provide the appropriate gap as recommended. Begin in corner nearest molding and with laminate roller begin rolling out towards the edge without the molding.
- D. Continue rolling down and out working your way across the panel away from the previously installed panel or initial molding to remove all trapped air.
- E. Install one piece division bar and caps or next molding by laying down bead of silicone sealant in molding and sliding onto the panel. Withdraw the molding 1/8 inch, again to provide proper spacing. The free edge of the molding may be tacked in place if preferred before installing the next panel.
- F. Apply silicone sealant in all moldings and around all panel edges, fasteners, and fixtures to provide a moisture proof installation.
- G. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 066400

## SECTION 072100 - THERMAL INSULATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Foam-plastic board insulation.
  - 2. Spray polyurethane foam insulation.
- B. Related Sections include the following:
  - 1. Division 04 Section "Unit Masonry" for insulation installed in cavity walls and masonry cells.
  - 2. Division 07 Section "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing" for insulation specified as part of roofing construction.
  - 3. Division 09 Section "Gypsum Board" for insulation in metal-framed assemblies.
  - 4. Division 21 Section "Fire-Suppression Systems Insulation."
  - 5. Division 22 Section "Plumbing Insulation."
  - 6. Division 23 Section "HVAC Insulation."

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

#### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect plastic insulation as follows:
  1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
  3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

#### 2.2 FOAM-PLASTIC BOARD INSULATION

- A. Rigid Insulation: Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84:
  1. Available Products:
    - a. Foamular 250; Owens Corning.
    - b. Styrofoam by Dow Chemical Co.
    - c. Amofoam-CM by Tenneco Building Products
  2. Type IV, 1.60 lb/cu. ft., unless otherwise indicated.
  3. Application: Foundation insulation. Rigid insulation below concrete slab-on-grade.

## 2.3 SPRAYED FOAM INSULATION

- A. Sprayed Polyurethane Foam Sealant for Perimeter of Doors and Windows: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft. density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
  - 1. Products:
    - a. Great Stuff Window & Door by Dow
    - b. Froth-Pak by Insta-Foam Products, Inc.
    - c. Pur-Fill 1G by Todol Products, Inc.
    - d. Handi-Seal Window and Door Sealant by Fomo Products, Inc.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

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

### 3.3 INSTALLATION, GENERAL

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

### 3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

- A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.
  - 1. If not otherwise indicated, extend insulation to top of footing.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
- C. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection course with joints butted. Set in adhesive according to insulation manufacturer's written instructions.
- D. Protect top surface of horizontal insulation from damage during concrete work by applying protection course with joints butted.

### 3.5 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Apply foamed-in-place insulation, by spray or froth method to a uniform monolithic density without voids into miscellaneous voids and cavity spaces where shown.

### 3.6 PROTECTION

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

END OF SECTION 072100

SECTION 072616 - BELOW-GRADE VAPOR RETARDERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Vapor retarders under slabs-on-grade.

1.3 DEFINITIONS

- A. Vapor Retarder: Material with a water vapor transmission rating of not over 0.04g per square foot per hour.
- B. Vapor Barrier: Material with a water vapor transmission rating of not over 0.015g per square foot per hour.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: 12 inch square units for each type of vapor retarder, vapor barrier, or air barrier indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 PROJECT CONDITIONS

- A. Separate and recycle waste materials.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers and Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following products listed in Part 2 of this Section.

### 2.2 VAPOR RETARDERS FOR UNDER SLABS

- A. Vapor Retarder with extremely low permeance for critically sensitive, low permeance floor coverings such as rubber, vinyl, urethane, epoxy and methyl methacrylate, as well as linoleum and wood, having the following qualities:

1. Minimum Permeance: ASTM E-96, not greater than 0.01 perms.
2. Tensile Strength: ASTM E154 or D638, Class A – over 45 lbf/in.
3. Puncture Resistance: ASTM E-154, Class B – over 1700 grams.
4. Water Vapor Barrier: ASTM E-1745, meets or exceeds Class B.
5. Thickness of Barrier (Plastic) ACI 302.1R-96, not less than 15 mils.

- B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Stego Wrap, 15 mil thick vapor retarder by Stego Industries LLC, (877) 464-7834.
2. Vaporguard by Reef Industries.
3. Sealtight Perminator 15 mil Underslab Vapor-Mat by W.R. Meadows, Inc.
4. Viper VaporCheck 16 by Insulation Solutions, Inc.

- C. Vapor-Retarder Tape (for slabs): Stego Warp red polyethylene tape or tape as recommended by the manufacturer.

- D. Double-Stick Edge Tape: Preformed 1-1/2" wide two-sided adhesive. Available products include "Fab Tape" by Reef Industries.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Clean substrates of substances harmful to vapor retarders, including removing projections capable of puncturing vapor retarders, or of interfering with attachment.
- B. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.

### 3.3 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions applicable to products and application indicated.
- B. Extend retarders in thickness indicated to envelop entire area to be covered. Cut and fit tightly around obstructions. Remove projections that interfere with placement.

### 3.4 INSTALLATION OF UNDER-SLAB VAPOR RETARDERS

- A. Moisture vapor retarder system shall be installed at all interior floor slabs and as otherwise indicated in the drawings in strict accordance with the manufacturer's printed instructions and as follows:
  - 1. Snap chalk line along inside perimeter of foundation walls at top of slab elevation.
  - 2. Without wetting, clean a 3" wide band on the surface of the concrete below the chalk line at approximately mid-slab height. Remove dirt, residual form release, or other bond inhibiting surface contaminants. Grind smooth any surface projections within the band.
  - 3. While removing the contact paper on the backside, firmly press 2" wide double-stick edge tape onto wall, parallel to the chalk line on the cleaned band at mid-slab elevation.
  - 4. Remove contact paper on the face side.
  - 5. Apply a 12" wide strip of vapor retarder covering only the bottom 1" of contact surface on the edge tape. Cut, fit, and seal corner details with vapor retarder seaming tape.
  - 6. Align top edge of Iso-Strip isolation joint material to chalk line, and press material onto remaining 1" of exposed perimeter strip adhesive.
  - 7. Roll out vapor retarder material, overlapping edge rolls and all seams by 3". Tape all seams with vapor retarder seaming tape.
  - 8. All tears, punctures, etc. to be repaired and taped as required to maintain the watertight integrity of the vapor retarder system.

### 3.5 PROTECTION

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

END OF SECTION 072616



## SECTION 072700 - AIR BARRIERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Air barriers in wall assemblies.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings for Air Barrier Membrane Mockup: Submit shop drawings for mockup indicating size of mockup, detail of construction, and expansion and control joints. Include relationship with adjacent materials, sequence of installation and materials and methods for sealing penetrations. Obtain approval of shop drawings prior to construction of mockup. Revise to show changes necessary to obtain approval of mockup.
- C. Shop Drawings: Submit shop drawings indicating details of construction, including expansion and control joints. Include relationship with adjacent materials, sequence of installation and materials and methods for sealing penetrations. At a minimum, shop drawings shall include details of the following connections, as applicable to the project:
  - 1. Foundation and walls.
  - 2. Walls and windows or doors.
  - 3. Different wall systems.
  - 4. Wall and roof.
  - 5. Wall and roof over unconditioned space.
  - 6. Walls, floor and roof across construction, control and expansion joints.
  - 7. Wall, floor and roof to utility, pipe and duct penetrations.
- D. Samples for Verification: 12 inch square units for each type of air barrier indicated.
- E. Certifications:
  - 1. Submit certification by air barrier manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC's)
  - 2. Submit certificate of compatibility by air barrier manufacturer, listing all materials on the project that it connects to or that comes in contact with it.

#### 1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Mockups: Before beginning installation of air barrier, build mockups of exterior wall assembly (part of the masonry mockup), incorporating backup wall construction, window, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

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

#### 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

### PART 2 - PRODUCTS

#### 2.1 FLUID-APPLIED MEMBRANE AIR BARRIER

- A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier: Elastomeric, modified bituminous or synthetic polymer membrane.
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Elastomeric Modified Bituminous Membrane:
      - 1) Henry Company; Air-Bloc 06.
      - 2) Meadows, W. R., Inc.; Air-Shield LM.
      - 3) Tremco Incorporated; ExoAir 120.
    - b. Synthetic Polymer Membrane:
      - 1) Grace, W. R. & Co.; Perm-A-Barrier Liquid.
      - 2) Rubber Polymer Corporation; Rub-R-Wall Airtight.
  - 2. Physical and Performance Properties:

- a. Membrane Air Permeance: Not to exceed 0.004 cfm x sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
- b. Membrane Vapor Permeance: Not to exceed 0.08 perm; ASTM E 96.

## 2.2 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Primer: Liquid waterborne primer recommended for substrate by manufacturer of air barrier material.
- C. Modified Bituminous Strip: Vapor-retarding, 40-mil- thick, smooth-surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.
- D. Joint Reinforcing Strip: Air barrier manufacturer's glass-fiber-mesh tape.
- E. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- F. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft. density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
- G. Modified Bituminous Transition Strip: Vapor-retarding, 40-mil- thick, smooth-surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.
  1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
  2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.
  3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
  4. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrates of substances harmful to air barriers, including removing projections capable of puncturing air barriers, or of interfering with attachment.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
  - 1. Install modified bituminous strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.
- G. Bridge and cover isolation joints discontinuous deck-to-wall and deck-to-deck joints with overlapping modified bituminous strips.
- H. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

### 3.3 JOINT TREATMENT

- A. Gypsum Sheathing: Fill joints greater than 1/4 inch with sealant according to ASTM C 1193 and with air barrier manufacturer's written instructions. Apply first layer of fluid air barrier membrane at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air barrier membrane over joint reinforcing strip.

### 3.4 TRANSITION STRIP INSTALLATION

- A. Install strips, transition strips, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.
  - 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
  - 2. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over both substrates.

- B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.
  - 1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials as indicated.
- D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- E. Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition strip so that a minimum of 3 inches of coverage is achieved over both substrates. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.
  - 1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.
- G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.
- H. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, modified bituminous strip.
- I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

### 3.5 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions applicable to products and application indicated.
- B. Extend air barriers in thickness indicated to envelop entire area to be covered. Cut and fit tightly around obstructions. Remove projections that interfere with placement.

### 3.6 INSTALLATION OF FLUID-APPLIED MEMBRANE AIR BARRIER

- A. Apply air barrier membrane to form a seal with strips and transition strips and to achieve a continuous air barrier according to air barrier manufacturer's written instructions.
- B. Apply air barrier membrane within manufacturer's recommended application temperature ranges.
- C. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.
  - 1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- D. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties.
  - 1. Vapor-Retarding Membrane Air Barrier: Apply in wet and dry film thickness as recommended by manufacturer.
- E. Apply strip and transition strip a minimum of 1 inch onto cured air membrane or strip and transition strip over cured air membrane overlapping 3 inches onto each surface according to air barrier manufacturer's written instructions.
- F. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.
- G. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

### 3.7 CLEANING AND PROTECTION

- A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
  - 1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 60 days.
  - 2. Protect air barrier from contact with creosote, uncured coal-tar products, TPO, EPDM, flexible PVC membranes, and sealants not approved by air barrier manufacturer.
- B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
- C. Remove masking materials after installation.

END OF SECTION 072700

## SECTION 074213 - METAL WALL PANELS

### 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. Concealed-fastener, flat-seam metal wall panels.
  - 2. Metal soffit panels.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of wall panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish between factory-, shop- and field-assembled work.
  - 1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:
    - a. Flashing and trim.
    - b. Anchorage systems.
- C. Samples for Selection: For each type of metal wall panel indicated with factory-applied color finishes.
- D. Maintenance Data: For metal wall panels to include in maintenance manuals.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.

- B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal wall panel for period of metal wall panel installation.

#### 1.5 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication, and indicate measurements on Shop Drawings.

#### 1.6 COORDINATION

- A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

#### 1.7 WARRANTY

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



## PART 2 - PRODUCTS

### 2.1 PANEL MATERIALS

- A. Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
  2. Surface: Smooth, flat finish.
  3. Exposed Coil-Coated Finish:
    - a. 2-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  4. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.
- B. Panel Sealants:
1. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer.

### 2.2 MISCELLANEOUS MATERIALS

- A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

### 2.3 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. General: Provide factory-formed metal wall panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
- B. Flat-Seam Metal Wall Panels: Formed with flat-seam at panel edge and flat pan between major rib and panel edge.
1. Material: Zinc-coated (galvanized) steel sheet, 20 gage nominal thickness.

- a. Exterior Finish: 2-coat fluoropolymer.
  - b. Color: As selected by Architect from manufacturer's full range.
2. Panel Coverage: 8 foot long.
  3. Panel Height: As required for face height.

#### 2.4 METAL SOFFIT PANELS

- A. General: Provide factory-formed metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
- B. Flush-Profile Metal Soffit Panels: Solid and perforated panels formed with vertical panel edges and flat pan between panel edges; with flush joint between panels.
  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. AEP-Span.
    - b. ATAS International, Inc.
    - c. Berridge Manufacturing Company.
    - d. CENTRIA Architectural Systems.
    - e. Firestone Metal Products.
    - f. MBCI; Div. of NCI Building Systems.
    - g. McElroy Metal, Inc.
    - h. Merchant & Evans Inc.
    - i. Metal-Fab Manufacturing, L.L.C.
    - j. Petersen Aluminum Corporation.
  2. Material: Zinc-coated (galvanized) steel sheet, 24 gage nominal thickness.
    - a. Exterior Finish: 2-coat fluoropolymer.
    - b. Color: As selected by Architect from manufacturer's full range.
  3. Panel Coverage: 12 inches.
  4. Panel Height: 0.875 inch.

#### 2.5 ACCESSORIES

- A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.
  1. Closures: Provide closures at edges, fabricated of same metal as metal wall panels.

- B. Flashing and Trim: Formed from 24 gage material matching panels. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

## 2.6 FABRICATION

- A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
  - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  - 2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams.
  - 3. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
  - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
  - 5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.
    - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

## 2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.
  - 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
  - 2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
  - 3. Verify that weather-resistant sheathing paper has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
  - 4. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  - 1. Shim or otherwise plumb substrates receiving metal wall panels.
  - 2. Flash and seal metal wall panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.
  - 3. Locate and space fastenings in uniform vertical and horizontal alignment.
  - 4. Install flashing and trim as metal wall panel work proceeds.
  - 5. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
  - 6. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
  - 7. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
  - 8. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.
- B. Fasteners:

1. Steel Wall Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal wall panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.
- E. Flat-Seam Metal Wall Panels: Fasten metal wall panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.
  1. Install clips to supports with self-tapping fasteners.
  2. Seamed Joint: Crimp flat seams with seamer tool so clip and metal panel are completely engaged.

### 3.3 METAL SOFFIT PANEL INSTALLATION

- A. In addition to complying with requirements of "Metal Wall Panel Installation, General" Article, install metal soffit panels to comply with the requirements of this article.
- B. Metal Soffit Panels: Fasten metal wall panels to supports with fasteners at each interlocked joint at location and spacing recommended by manufacturer. Install panels perpendicular to support framing.
  1. Interlock edges of panels. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
  2. Attach panels using manufacturer's standard clips and fasteners, spaced in accordance with approved shop drawings.
  3. Install panels in such a manner that horizontal lines are true and level and vertical lines are plumb.

### 3.4 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
  1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

### 3.5 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.
- B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213

SECTION 075323 - ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

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. Adhered EPDM membrane roofing system.
2. Roof insulation.
3. Walkway pads.
4. Roof drains.
5. Fascia system.
6. Expansion joints.

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

1. Roof drains furnished under Division 22 Section "Plumbing".

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane roofing and base 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. Membrane roofing and base flashings shall remain watertight.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist wind speed of 90 mph (measured 30 feet above the ground).

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Roof plan showing orientation of steel roof deck and orientation of membrane roofing and fastening spacings and patterns for mechanically fastened membrane roofing.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and manufacturer.
- B. Manufacturer's installation rating of the roofing contractor.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.
- D. Warranties: Sample of special warranties.
- E. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

#### 1.6 CLOSEOUT SUBMITTALS

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

#### 1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for membrane roofing system identical to that used for this Project.
- B. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing roofing similar to that required for this Project and who is approved, authorized, or licensed by the roofing system manufacturer to install manufacturer's product. Contractor shall have installed a minimum of 500,000 square feet and have a manufacturer's installation rating of 9.0 or better.
  1. Installer for GAF products shall be a Master Select or Master Certified Contractor.
  2. Work associated with single-ply membrane roofing, including (but not limited to) insulation, flashing, and membrane sheet joint sealers, shall be performed by Installer of this Work.
- C. Source Limitations: Obtain components including roof insulation and fasteners Insert products for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.
- D. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.



- E. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- F. Upon completion of the installation, an inspection shall be made by the system manufacturer to ascertain that the roofing system has been installed according to the applicable manufacturer's specifications and details. No "early bird" warranty will be accepted. The results of the warranty inspection shall be submitted in writing to Owner for their review and records.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. 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.
- B. 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.
- C. 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.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

#### 1.9 PROJECT 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.

#### 1.10 WARRANTY

- A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. A manufacturer's sole source 20-year written Total Roofing System Warranty shall be provided with a peak gust wind speed limitation of 90 mph (measured 30 feet above the ground). Warranty shall cover both labor and materials with no dollar limitation and shall state that the Total roofing System will remain in a watertight condition. The contractor shall provide as part

of the shop drawing submittal process, certification indicating that the manufacturer has reviewed and has agreed to such wind coverage indicated.

1. Total Roofing System is defined as the following materials and provided by the roof system manufacturer: membrane, flashings, counterflashings, adhesives, sealants, insulation, overlayment, fasteners, fastener plates, fastener strips, hard rubber, metal edging, preformed fascia system. Metal termination anchor bars, roof drain flashing and sealants, and any other product utilized in this system installation.
2. The warranty shall be for twenty (20) years starting after final acceptance of the total roofing system by the roof system manufacturer. Defective materials or installation shall be removed, properly disposed of, and replaced at the manufacturer's expense.
3. The warranty shall provide that if within the warranty period the roofing system becomes non-watertight or if the elastomeric sheet splits, tears, or separates at the seams because of defective materials and/or materials and cost thereof shall be the responsibility of the manufacturer. Should the manufacturer or his approve applicator fail to perform repairs within 72 hours of notification, the warranty will not be voided because of work being performed by others to repair the roofing regardless of the manufacturer's warranty to the contrary.
4. The total Roofing System shall be applied by a roofing Contractor approved by the system manufacturer. After inspection and acceptance of the installed roof system, the warranty will be issued.

## PART 2 - PRODUCTS

### 2.1 EPDM MEMBRANE ROOFING

#### A. EPDM: ASTM D 4637, Type I, non-reinforced, uniform, flexible EPDM sheet.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Carlisle SynTec Incorporated.
  - b. Firestone Building Products.
  - c. GAF Materials Corporation.
  - d. Versico Incorporated.
2. Thickness: 60 mils, nominal.
  1. Exposed Face Color: Black.

### 2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

#### A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    - a. Plastic Foam Adhesives: 50 g/L.
    - b. Gypsum Board and Panel Adhesives: 50 g/L.
    - c. Multipurpose Construction Adhesives: 70 g/L.
    - d. Fiberglass Adhesives: 80 g/L.
    - e. Contact Adhesive: 80 g/L.
    - f. Single-Ply Roof Membrane Sealants: 450 g/L.
    - g. Nonmembrane Roof Sealants: 300 g/L.
    - h. Sealant Primers for Nonporous Substrates: 250 g/L.
    - i. Sealant Primers for Porous Substrates: 775 g/L.
    - j. Other Adhesives and Sealants: 250 g/L.
  3. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Sheet Flashing: 60-mil- thick EPDM, partially cured or cured, according to application.
  - C. Protection Sheet: Epichlorohydrin or neoprene non-reinforced flexible sheet, 55- to 60-mil-thick, recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil.
  - D. Bonding Adhesive: Manufacturer's standard.
  - E. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 6-inch- wide minimum, butyl splice tape with release film.
  - F. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.
  - G. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.
  - H. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
  - I. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to roofing system manufacturer.
  - J. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

### 2.3 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by EPDM membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Approvals-approved roof insulation.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
  - 1. Thickness: Two layers of insulation, providing an average R-Value of 30.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

### 2.4 INSULATION ACCESSORIES

- A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation[ **and cover boards**] to substrate, and acceptable to roofing system manufacturer.
- C. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch thick, factory primed.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. Georgia-Pacific Corporation; Dens Deck Prime.

### 2.5 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick, and acceptable to membrane roofing system manufacturer.

### 2.6 FASCIA SYSTEM

- A. Provide fasciae in shapes and sizes indicated. Include anchor plates; cleats or other attachment devices; concealed splice plates; and trim and other accessories indicated or required for complete installation, with no exposed fasteners.
  - 1. Provide scupper components where indicated on the drawings.
- B. Provide exposed fascia components fabricated from the following metal:

1. Extruded aluminum in thickness indicated, but not less than 0.040 inch.
2. Finish: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 1402, Test Method 7. Color as selected by the Architect.
3. Product:
  - a. Hickman: Extruded TerminEdge Roof Edging.
  - b. Metal-Era: Anchor-Tite Fascia System.
  - c. Provide face size as indicated on the drawings.

## 2.7 EXPANSION JOINTS

- A. Deck-To-Deck and Deck-To-Wall Expansion Joints: Provide manufacturers standard joint system consisting of expansion joint support or support sponge, anchor plates, and flashing.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
  1. Verify that roof openings and penetrations are in place and curbs are set and braced and that 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 fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."
- 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 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.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

### 3.3 INSULATION INSTALLATION

- 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.
- 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.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
  - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- G. Loosely Laid Insulation: Loosely lay insulation units over substrate.
- H. 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. Loosely butt cover boards together.
  - 1. Fasten cover boards according to requirements of manufacturer for specified warranty and performance.

### 3.4 ADHERED MEMBRANE ROOFING INSTALLATION

- A. Adhere membrane roofing over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll membrane roofing and allow to relax before installing.
- B. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.
- C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

- E. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeters.
- F. Apply membrane roofing with side laps shingled with slope of roof deck where possible.
- G. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping membrane roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of membrane roofing terminations.
- H. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.
- I. Spread sealant or mastic bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

### 3.5 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. 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.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

### 3.6 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

### 3.7 ROOF DRAIN INSTALLATION

- A. Install roof drain and accessories in strict accordance with manufacturer's written instructions, providing a permanent weather tight installation.
  - 1. Inspect and determine substrate to be in satisfactory condition, with deck fully anchored and aligned at proper location and elevation. All surfaces shall be smooth, dry, clean, free of sharp edges, and other irregularities.

2. Attach deck flange securely to substrate.
3. Assemble and flash gravel stop flange into roof system per roof system and roof drain manufacturer requirements.
4. Securely attach strainer basket.

### 3.8 FASCIA SYSTEM INSTALLATION

- A. Comply with manufacturer's written installation instructions. Anchor products securely to structural substrates to withstand lateral and thermal stresses and inward and outward loading pressures.
- B. Expansion Provisions: Install running lengths to allow controlled expansion for movement of metal components in relation not only to one another but also to adjoining dissimilar materials, including flashing and roofing membrane materials, in a manner sufficient to prevent water leakage, deformation, or damage.

### 3.9 FIELD QUALITY CONTROL

- A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
  1. Notify Architect or Owner 48 hours in advance of the date and time of inspection.
- B. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.
- C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.10 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075323



## SECTION 076200 - SHEET METAL FLASHING AND TRIM

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Formed Products:

- a. Formed wall sheet metal fabrications.

- B. Related Sections:

- 1. Division 07 Section "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing" for installing sheet metal flashing and trim integral with membrane roofing.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

- B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:

- 1. Identification of material, thickness, weight, and finish for each item and location in Project.
  - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
  - 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
  - 4. Details of termination points and assemblies, including fixed points.
  - 5. Details of special conditions.
  - 6. Details of connections to adjoining work.

#### 1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

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

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.
- C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change (Range): 180 deg F, material surfaces.

#### 2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.
  - 1. Finish: 2D (dull, cold rolled).
  - 2. Surface: Smooth, flat.

## 2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal unless otherwise indicated.
- B. Solder:
  - 1. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.
- C. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

## 2.4 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
  - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
  - 2. Obtain field measurements for accurate fit before shop fabrication.
  - 3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
  - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- E. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

## 2.5 WALL SHEET METAL FABRICATIONS

- A. General: Contractor has the option of providing shop-fabricated "Metal Drip Flashing" and "Reglets" as specified in Division 04 Section "Unit Masonry."
- B. Metal Drip Flashing: Fabricate from 26 gage stainless steel. Extend at least 4-1/2 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and back edge turned up 4 inches.
  - 1. At lintels, turn up ends of flashing 2 inches to form pan.
- C. Reglets: Units of type, material, and profile equal to "Fry Reglet MA-4 Masonry Reglet with SpringLok Counterflashing."

## 2.6 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Metal Pan Flashing at Precast Concrete Cap: Fabricate from the following materials:
  - 1. Stainless Steel: 0.019 inch thick.
- B. Fabricate to details indicated on the drawings.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  - 1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
  3. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
  4. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
1. Coat back side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- D. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
  2. Stainless-Steel Soldering: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

### 3.3 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing:
1. Conform to SMACNA figure 4-1, similar. Turn up rear leg of receiver 4 inches at backup wall system and install membrane strip flashing to tie to air barrier system.
- C. Reglet Through-Wall Flashing:
1. Conform to SMACNA figure 4-3, similar. Adhere membrane strip flashing to horizontal receiver and tie to air barrier system. Install spring flashing after membrane roofing has been installed.

3.4 MISCELLANEOUS FLASHING INSTALLATION

- A. Metal Pan Flashing at Precast Concrete Cap: Coordinate installation of masonry and precast concrete to allow installation of metal pan flashing. Conform to details on the drawings for configuration.

3.5 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

## SECTION 079200 - JOINT SEALANTS

### 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. Silicone joint sealants.
  - 2. Latex joint sealants.

#### 1.3 ACTION SUBMITTALS

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

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
- C. Warranties: Sample of special warranties.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

- B. Product Testing: Test joint sealants using a qualified testing agency.
  - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

#### 1.6 PROJECT CONDITIONS

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

#### 1.7 WARRANTY

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



## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
  - 1. Architectural Sealants: 250 g/L.
  - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
  - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

### 2.2 SILICONE JOINT SEALANTS

- A. Sealant Type 1: Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant; ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Dow Corning Corporation; 790 (VOC 43); 756 SMS (VOC 87) for cold applications.
    - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
    - c. Pecora Corporation; 890 (VOC na).
    - d. Sika Corporation, Construction Products Division; SikaSil-C990.
    - e. Tremco Incorporated; Spectrem 1 (VOC 1).
- B. Sealant Type 2: Not Used.
- C. Sealant Type 3: Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant; ASTM C 920, Type S, Grade NS, Class 100/50, for Use T.
  - 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. Dow Corning Corporation; 790 (VOC 43).
    - b. Pecora Corporation; 301 NS (VOC 50).
    - c. Tremco Incorporated; Spectrem 800 (VOC 1).
- D. Sealant Type 4: Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant; ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

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. Dow Corning Corporation; 786(VOC 33) (Food)
  - b. GE Advanced Materials - Silicones; Sanitary SCS1700.
  - c. Tremco Incorporated; Tremsil 200 Sanitary (VOC 1).

## 2.3 LATEX JOINT SEALANTS

- A. Sealant Type 5: Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
  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 Building Systems; Sonolac (VOC 41).
    - b. Bostik, Inc.; Chem-Calk 600.
    - c. Pecora Corporation; AC-20 (VOC 31).
    - d. Tremco Incorporated; Tremflex 834.

## 2.4 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

## 2.5 MISCELLANEOUS MATERIALS

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

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

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

#### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.
    - c. Unglazed surfaces of ceramic tile.
    - d. Exterior insulation and finish systems.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal.
    - b. Glass.
    - c. Porcelain enamel.
    - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or

by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

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

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 joint sealants and of products in which joints occur.

3.5 PROTECTION

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

3.6 JOINT-SEALANT SCHEDULE

- A. Exterior Isolation and Contraction Joints in Cast-in-place Concrete Slabs.
  - 1. Silicone Joint Sealant: Sealant Type 3.
  - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Exterior Control, Expansion, and Soft Joints in Masonry and Between Masonry and Adjacent Work.
  - 1. Silicone Joint Sealant: Sealant Type 1.
  - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Exterior Control, Expansion, and Soft Joints Between Masonry and Metal Door Frames, Windows, Storefronts and Curtain Walls.
  - 1. Silicone Joint Sealant: Sealant Type 1.
  - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Exterior Control Joints at Concrete Foundations.
  - 1. Silicone Joint Sealant: Sealant Type 1.
  - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Under Exterior Door Thresholds.
  - 1. Silicone Joint Sealant: Sealant Type 1.
  - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. Exterior Joints for Which No Other Sealant Type is Indicated.
  - 1. Silicone Joint Sealant: Sealant Type 1.
  - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- G. Concealed Interior Perimeter Joints of Exterior Openings.

1. Silicone Joint Sealant: Sealant Type 1.
  2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- H. Exposed Interior Perimeter Joints of Exterior Openings.
1. Silicone Joint Sealant: Sealant Type 1.
  2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- I. Perimeter Joints Between Interior Wall Surfaces and Frames of Interior Doors and Windows.
1. Latex Joint Sealant: Sealant Type 5.
  2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- J. Vertical Joints on Exposed Surfaces of Walls and Partitions.
1. Latex Joint Sealant: Sealant Type 5.
  2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- K. Joints between Plumbing Fixtures and Walls and Floors and Between Countertops and Walls.
1. Silicone Joint Sealant: Sealant Type 4.
  2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- L. Interior Joints for Which No Other Sealant is Indicated.
1. Latex Joint Sealant: Sealant Type 5.
  2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes hollow-metal door frames.

1.3 COORDINATION

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

1.4 ACTION SUBMITTALS

- A. General: Submittals for Sections 081113, 081416 and 087100 shall be made concurrently.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.
- C. Shop Drawings: Include the following:
  - 1. Elevations of each door design.
  - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
  - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  - 4. Locations of reinforcement and preparations for hardware.
  - 5. Details of each different wall opening condition.
  - 6. Details of anchorages, joints, field splices, and connections.
  - 7. Details of accessories.
  - 8. Details of moldings, removable stops, and glazing.
  - 9. Details of conduit and preparations for power, signal, and control systems.
- D. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Standard Steel Doors and Frames:
    - a. Ceco Door Products; an Assa Abloy Group company.
    - b. Curries Company.
    - c. de La Fontaine, Industries.
    - d. Steelcraft; a division of Ingersoll-Rand.
- B. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

2.2 INTERIOR DOOR FRAMES

- A. Construct interior door frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Standard-Duty Door Frames: SDI A250.8, Level 1.
  - 1. Frames:



- a. Materials: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch unless metallic-coated sheet is indicated.
  - b. Construction: Knocked down.
2. Exposed Finish: Factory primed.

## 2.3 FRAME ANCHORS

### A. Jamb Anchors:

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

### B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

## 2.4 MATERIALS

### A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

### B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

### C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

1. Wipe Coat Galvanneal materials will not be considered acceptable.

### D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

### E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

### F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

### G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

## 2.5 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
  - 1. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
  - 2. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - 1) Three anchors per jamb up to 60 inches high.
      - 2) Four anchors per jamb from 60 to 90 inches high.
      - 3) Five anchors per jamb from 90 to 96 inches high.
      - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
      - 5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
  - 3. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- C. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- D. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
  - 1. Reinforce door frames to receive nontemplated, mortised, and surface-mounted door hardware.
  - 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

## 2.6 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

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

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

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

#### 3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap door frames to receive nontemplated, mortised, and surface-mounted door hardware.

#### 3.3 INSTALLATION

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

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
  - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
  - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
  - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

#### 3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- C. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

## SECTION 081416 - FLUSH WOOD DOORS

### PART 1 - GENERAL

#### 1.1 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. Solid-core doors with wood-veneer faces.
  - 2. Factory finishing flush wood doors.
  - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
  - 4. Factory glazing of wood doors.

#### 1.3 ACTION SUBMITTALS

- A. General: Submittals for Sections 081113, 081416 and 087100 shall be made concurrently.
- B. Product Data: For each type of door indicated. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- 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 doors to be factory finished and finish requirements.
- D. Samples for Verification:
  - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.6 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 the remainder of the construction period.

1.7 WARRANTY

- A. Warranty: Manufacturer's standard form in which 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 in a 42-by-84-inch section.
    - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
  - 2. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Flush Wood Doors:
    - a. Algoma Hardwoods Inc.
    - b. Eggers Industries; Architectural Door Division.
    - c. Marshfield Door Systems, Inc.: Signature Series.
    - d. Mohawk Flush Doors, Inc.
    - e. VT Industries Inc.
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

## 2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."
- B. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.
- C. Particleboard-Core Doors:
  - 1. Particleboard: ANSI A208.1, Grade LD-2.
  - 2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
- D. Structural-Composite-Lumber-Core Doors:
  - 1. Structural Composite Lumber: WDMA I.S.10.
    - a. Screw Withdrawal, Face: 700 lbf.
    - b. Screw Withdrawal, Edge: 400 lbf.
  - 2. Provide doors with structural-composite-lumber cores instead of particleboard cores for the following doors:
    - a. Doors indicated to receive exit devices.
    - b. Doors where oversized glass lites exceed more than 40 percent of the door surface area.

## 2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors:
  - 1. Grade: Premium, with Grade A faces.
  - 2. Species: Select white birch.
  - 3. Cut: Plain sliced (flat sliced).
  - 4. Match between Veneer Leaves: Book match.
  - 5. Assembly of Veneer Leaves on Door Faces: Running match.
  - 6. Pair and Set Match: Provide for doors hung in same opening.
  - 7. Exposed Vertical Edges: Same species as faces - edge Type A.
  - 8. Core: Particleboard except where structural composite lumber is required.
  - 9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.
  - 10. Adhesives: Type I per WDMA TM-6.

## 2.4 LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads.

## 2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
  1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- C. Openings: Cut and trim openings through doors in factory.
  1. Light Openings: Trim openings with moldings of material and profile indicated.
- D. Factory Glazing: Provide glazing for all doors. Provide glass as specified in Division 08 Section "Glazing."

## 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.
- C. Transparent Finish:
  1. Grade: Premium.
  2. Finish: WDMA TR-4 conversion varnish or TR-6 catalyzed polyurethane.
  3. Staining: None required.
  4. Effect: Open-grain finish.
  5. Sheen: Satin.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.



1. Verify that 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 and the referenced quality standard, and as indicated.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. 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 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Exterior storefront framing.
  - 2. Storefront framing for window walls.
  - 3. Exterior manual-swing entrance doors and door-frame units.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
  - 1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
  - 2. Dimensional tolerances of building frame and other adjacent construction.
  - 3. Failure includes the following:
    - a. Deflection exceeding specified limits.
    - b. Thermal stresses transferring to building structure.
    - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
    - d. Noise or vibration created by wind and by thermal and structural movements.
    - e. Loosening or weakening of fasteners, attachments, and other components.
    - f. Sealant failure.
    - g. Failure of operating units.
- B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Structural Loads:
  - 1. Wind Loads: As indicated on Structural Drawings.
- D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
  2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below them to less than 1/8 inch and clearance between members and operable units directly below them to less than 1/16 inch.
- E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
  2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
  3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.
- F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft..
- G. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..
1. Maximum Water Leakage: No uncontrolled water penetrating aluminum-framed systems or water appearing on systems' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior and water that cannot damage adjacent materials or finishes.
- H. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
    - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
    - b. Low Exterior Ambient-Air Temperature: 0 deg F.
  2. Interior Ambient-Air Temperature: 75 deg F.

- I. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 53 when tested according to AAMA 1503.
- J. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.57 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
  - 2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
- C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- D. Other Action Submittals:
  - 1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- E. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Detail fabrication and assembly of aluminum-framed systems.
  - 2. Include design calculations.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For aluminum-framed systems, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.
- C. Warranties: Sample of special warranties.

#### 1.6 CLOSEOUT SUBMITTALS

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

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
  - 1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.
- D. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.
- E. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

#### 1.8 PROJECT CONDITIONS

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

1.9 WARRANTY

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide indicated products by one of the following:
- B. Products:
1. Exterior Aluminum-Framed Storefronts:
    - a. Kawneer: Trifab VG 451 T.
    - b. EFCO: System 403.
    - c. U.S. Aluminum: Series IT451.
    - d. Vistawall: 3000 Thermal MultiPlane.
  2. Exterior Aluminum Windows:
    - a. Kawneer: Trifab VG 451 T
    - b. EFCO: System 403.
    - c. U.S. Aluminum: Series FT451
    - d. Vistawall: 3000 Thermal MultiPlane
  3. Doors and Entrances:

- a. Kawneer: 500 Entrance.
- b. EFCO: Series D500.
- c. U.S. Aluminum: Series 550 Entrance.
- d. Vistawall: 500 Entrance.

## 2.2 MATERIALS

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

## 2.3 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
  1. Construction: Thermally broken.
  2. Glazing System: Retained mechanically with gaskets on four sides.
  3. Glazing Plane: Center.
  4. Exterior Jamb and Head Framing: Provide manufacturer's standard extruded aluminum continuous flat filler for use at jamb and head framing. This extrusion provides the necessary profile for sealing with the building air barrier system. Channel type jamb components will not be acceptable.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
  1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
  2. Reinforce members as required to receive fastener threads.

3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system, fabricated from stainless steel.
- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.
- E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.
  1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- G. Subsills for Exterior Storefronts: Manufacturer's standard thermally broken extruded aluminum sill flashing, color to match framing.

## 2.4 GLAZING SYSTEMS

- A. Glazing: As specified in Division 08 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

## 2.5 ENTRANCE DOOR SYSTEMS

- A. Standard Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
  1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
  2. Door Design: Wide stile; 5-inch nominal width.
    - a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.
  3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.



## 2.6 ENTRANCE DOOR HARDWARE

- A. General: Provide entrance door hardware and entrance door hardware sets indicated in "Entrance Door Hardware Sets" Article for each entrance door to comply with requirements in this Section.
  - 1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products or products equivalent in function and comparable in quality to named products.
  - 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
  - 3. Opening-Force Requirements:
    - a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbfto set the door in motion and not more than 15 lbf to open the door to its minimum required width.
    - b. Accessible Interior Doors: Not more than 5 lbf to fully open door.
- B. Pivot Hinges: BHMA A156.4, Grade 1.
  - 1. Offset-Pivot Hinges: Provide top, bottom, and intermediate offset pivots at each door leaf.
  - 2. Provide electric power transfer for doors with access control.
- C. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- D. Weather Stripping: Manufacturer's standard replaceable components.
  - 1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
- E. Silencers: BHMA A156.16, Grade 1.
- F. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.
- G. Additional Hardware: As specified in Division 08 Section "Door Hardware."

## 2.7 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."
  - 1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

## 2.8 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
  - 1. Profiles that are sharp, straight, and free of defects or deformations.
  - 2. Accurately fitted joints with ends coped or mitered.
  - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
  - 4. Physical and thermal isolation of glazing from framing members.
  - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  - 6. Provisions for field replacement of glazing from exterior.
  - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Storefront Framing: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.
- F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
  - 1. At exterior doors, provide compression weather stripping at fixed stops.
  - 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
  - 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
  - 2. At exterior doors, provide weather sweeps applied to door bottoms.
- H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

2.10 HARDWARE FINISHES

- A. Standard: BHMA A156.18, as indicated in door hardware sets.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide the following finishes:
- |                      |          |
|----------------------|----------|
| 1. Butts and Hinges: | 26D      |
| 2. Weatherstripping  | Aluminum |
| 3. Threshold         | Aluminum |

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. General:
1. Comply with manufacturer's written instructions.
  2. Do not install damaged components.
  3. Fit joints to produce hairline joints free of burrs and distortion.
  4. Rigidly secure nonmovement joints.
  5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
  6. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
  2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- F. Install glazing as specified in Division 08 Section "Glazing."
- G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
  2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible. Provide Rivnuts for fastening hardware.
- H. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

### 3.3 ERECTION TOLERANCES

- A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
  2. Alignment:
    - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
    - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
- B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

### 3.4 ADJUSTING

- A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.

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1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

END OF SECTION 084113

## SECTION 084523 - TRANSLUCENT SKYLIGHT SYSTEM

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes the 2-3/4" insulated translucent sandwich panel skylight system and accessories as shown and specified. Work includes providing and installing:
  - 1. Curved factory prefabricated structural insulated translucent sandwich panels.
  - 2. Aluminum installation system.
  - 3. Aluminum flashing attached to skylights.

#### 1.2 SUBMITTALS

- A. Submit manufacturer's product data. Include construction details, material descriptions, profiles and finishes of skylight components.
- B. Submit shop drawings. Include elevations and details.
- C. Submit manufacturer's color charts showing the full range of colors available for factory-finished aluminum.
  - 1. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below. If finishes involve normal color variations, include sample sets consisting of two or more units showing the full range of variations expected.
    - a. Sandwich panels: 14" x 28" units.
    - b. Factory finished aluminum: 5" long sections.
- D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.
- E. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.
  - 1. Reports required are:
    - a. International Code Council Evaluation Report (ICC-ES)
    - b. Flame Spread and Smoke Developed (UL 723) – Submit UL Card
    - c. Burn Extent (ASTM D 635)
    - d. Color Difference (ASTM D 2244)
    - e. Impact Strength (UL 972)
    - f. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
    - g. Bond Shear Strength (ASTM D 1002)

- h. Beam Bending Strength (ASTM E 72)
- i. Fall Through Resistance (ASTM E 661)
- j. Insulation U-Factor (NFRC 100)
- k. NFRC System U-Factor Certification (NFRC 700)
- l. Solar Heat Gain Coefficient (NFRC or Calculations)
- m. Condensation Resistance Factor (AAMA 1503)
- n. Air Leakage (ASTM E 283)
- o. Structural Performance (ASTM E 330)
- p. Water Penetration (ASTM E 331)
- q. Class A Roof Covering Burning Brand (ASTM E 108)

### 1.3 QUALITY ASSURANCE

#### A. Manufacturer's Qualifications

1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope and location. At least three of the projects shall have been in successful use for ten years or longer.
2. Panel system must be listed by the International Code Council – Evaluation Service, which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an approved agency.
3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC04 “Sandwich Panels” or AC177 “Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems” as regulated by the ICC-ES.

- B. Installer’s Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified skylight systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type.

### 1.4 PERFORMANCE REQUIREMENTS

- A. The manufacturer shall be responsible for the configuration and fabrication of the complete skylight panel system.
1. When requested, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  2. Standard skylight system shall have less than 0.01 cfm/ft<sup>2</sup> air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
  3. Structural Loads; Provide skylight system capable of handling the following loads:
    - a. Live Load: 20 PSF
    - b. Snow Load: 40 PSF; Drift Load: 48PSF
    - c. Wind Load: 35 PSF

### 1.5 DELIVERY STORAGE AND HANDLING

- A. Deliver panel system, components and materials in manufacturer's standard protective packaging.
- B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

## 1.6 WARRANTY

- A. Submit manufacturer's and installer's written warranty agreeing to repair or replace panel system work, which fails in materials or workmanship within one year of the date of delivery. Failure of materials or workmanship shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering and defects in accessories, insulated translucent sandwich panels and other components of the work.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

- A. The basis for this specification is for products manufactured by Kalwall Corporation. Other manufacturers may bid this project provided they comply with all of the performance requirements of this specification and submit evidence thereof. Listing other manufacturers' names in this specification does not constitute approval of their products or relieve them of compliance with all the performance requirements contained herein.
- B. Kalwall Corporation, Tel: (800) 258-9777 – Fax: (603) 627-7905 – Email: [info@kalwall.com](mailto:info@kalwall.com)

### 2.2 PANEL COMPONENTS

#### A. Face Sheets

1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
  - a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
  - b. Face sheets shall not deform, deflect or drip when subjected to fire or flame.
2. Interior and Exterior face sheets:
  - a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 10 and smoke developed no greater than 400 when tested in accordance with UL 723.
  - b. Burn extent by ASTM D 635 shall be no greater than 1”.
3. Exterior face sheets:
  - a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after five (5) years outdoor South Florida weathering at 5° facing south, determined by the average of at least three white samples



with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.

- b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.

4. Appearance:

- a. Exterior face sheets: Smooth, .070 thick and Crystal in color.
- b. Interior face sheets: Smooth, .045 thick and White in color.
- c. Face sheets shall not vary more than  $\pm 10\%$  in thickness and be uniform in color.

B. Grid Core

1. Aluminum I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16".

C. Laminate Adhesive

1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".
2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
  - a. 50% Relative Humidity at 68° F: 540 PSI
  - b. 182° F: 100 PSI
  - c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
  - d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

## 2.3 PANEL CONSTRUCTION

- A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.
  1. Thickness: 2-3/4"
  2. Light transmission: 35%
  3. Solar heat gain coefficient .52
  4. Panel U-factor by NFRC certified laboratory: 2-3/4" aluminum grid .53
  5. Grid pattern: Nominal size 12" x 24"; pattern Shoji.
- B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10' 0" span without a supporting frame by ASTM E 72.

- C. Standard panels shall withstand 1200° F fire for minimum one hour without collapse or exterior flaming.
- D. Skylight System:
  - 1. Skylight system shall pass Class A Roof Burning Brand Test By ASTM E 108.
- E. Skylight System shall meet the fall through requirements of OSHA 1910.23 as demonstrated by testing in accordance with ASTM E 661, thereby not requiring supplemental screens or railings.

## 2.4 BATTENS AND PERIMETER CLOSURE SYSTEM

- A. Closure system:
  - 1. Extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.
  - 2. Curved closure system may be roll formed.
  - 3. Skylight perimeter closures at curbs shall be factory sealed to panels.
- B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.
- C. Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.
- D. Finish:
  - 1. Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to be selected from manufacturer's standards.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Installer shall examine substrates, supporting structure and installation conditions.
- B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Metal Protection:
  - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
  - 2. Where aluminum will contact 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 the skylight system in accordance with the manufacturer's installation recommendations and approved shop drawings.
  - 1. Anchor component parts securely in place by permanent mechanical attachment system.
  - 2. Accommodate thermal and mechanical movements.
  - 3. Set perimeter framing in a full bed of sealant compound, or with joint fillers or gaskets to provide weather-tight construction.
- B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturer's installation instructions.

### 3.4 FIELD QUALITY CONTROL

- A. Water Test: Installer to test skylights according to procedures in AAMA 501.2.
- B. Repair or replace work that does not pass testing or that is damaged by testing and retest work.

### 3.5 CLEANING

- A. Clean the skylight system inside and outside, immediately after installation.
- B. Refer to manufacturer's written recommendations.

END OF SECTION 084523

## 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 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Commercial door hardware for the following:
    - a. Swinging doors.
    - b. Other doors to the extent indicated.
  - 2. Furnish and installation of hardware, access control system and low voltage wiring for a complete, fully functional and programmed access system.
  - 3. Cylinders for doors specified in other Sections.
  - 4. Electrified door hardware.
- B. Related Sections include the following:
  - 1. Division 08 Section "Aluminum-Framed Entrances and Storefronts" for entrance door hardware, except cylinders.
- C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
  - 1. Cylinders for locks specified in the following other Sections:
    - a. Division 08 Section "Aluminum Entrances and Storefronts."

#### 1.3 ACTION SUBMITTALS

- A. General: Submittals for Sections 081113, 081416 and 087100 shall be made concurrently.
- B. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: Details of electrified door hardware, indicating the following:
  - 1. Wiring Diagrams: Power, signal, and control wiring. Include the following:

- a. System schematic.
  - b. Point-to-point wiring diagram.
  - c. Riser diagram.
  - d. Elevation of each door.
2. Details of interface of electrified door hardware and building safety and security systems.
  3. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.
- D. Samples for Verification: Submit minimum 2-by-4-inch plate Samples of each type of finish required, except primed finish.
- E. Other Action Submittals:
1. Door Hardware Sets: Prepared by or under the supervision of Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
    - a. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.
    - b. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
    - c. Content: Include the following information:
      - 1) Identification number, location, hand, fire rating, and material of each door and frame.
      - 2) Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.
      - 3) Complete designations of every item required for each door or opening including name and manufacturer.
      - 4) Fastenings and other pertinent information.
      - 5) Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
      - 6) Explanation of abbreviations, symbols, and codes contained in schedule.
      - 7) Mounting locations for door hardware.
      - 8) Door and frame sizes and materials.
      - 9) Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
        - a) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.
  - 10) List of related door devices specified in other Sections for each door and frame.

- d. Submittal Sequence: Submit initial draft of final schedule along with essential Product Data to facilitate the fabrication of other work that is critical in Project construction schedule. Submit the final door hardware sets after Samples, Product Data, coordination with Shop Drawings of other work, delivery schedules, and similar information has been completed and accepted.
2. Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For electrified door hardware, signed by product manufacturer.
  1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.
- B. Warranty: Special warranty specified in this Section.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed 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.
- B. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
  1. Electrified Door Hardware Consultant Qualifications: A qualified Architectural Hardware Consultant who is experienced in providing consulting services for electrified door hardware installations.
- C. Electrified Door Hardware and Access System Supplier Qualifications: An experienced door hardware supplier who has completed not less than 10 projects with electrified door hardware and access system similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance, and who is acceptable and certified with the manufacturer of primary materials.
- D. Access Control System Hardware: Provided by Owner.

- E. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
  - 1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- F. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- G. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." In addition to Owner Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
  - 1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
  - 2. Preliminary key system schematic diagram.
  - 3. Requirements for key control system.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to electrified door hardware including, but not limited to, the following:
  - 1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
  - 2. Review sequence of operation for each type of electrified door hardware.
  - 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 required testing, inspecting, and certifying procedures.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

#### 1.8 COORDINATION

- A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to

confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

- B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies and access control system.

## 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

- 1. Failures include, but are not limited to, the following:
  - a. Structural failures including excessive deflection, cracking, or breakage.
  - b. Faulty operation of operators and door hardware.
  - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
- 2. Warranty Period: One year from date of Substantial Completion, except as follows:
  - a. Exit Devices: Two years from date of Substantial Completion.
  - b. Manual Closers: 10 years from date of Substantial Completion.

## 1.10 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

## PART 2 - PRODUCTS

### 2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.
  - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
  - 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:



1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements.
- C. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

## 2.2 HINGES, GENERAL

- A. Quantity: Provide the following, unless otherwise indicated:
1. Two Hinges: For doors with heights up to 60 inches.
  2. Three Hinges: For doors with heights 61 to 90 inches.
  3. Four Hinges: For doors with heights 91 to 120 inches.
  4. 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.
- B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- C. Hinge Weight: Unless otherwise indicated, provide the following:
1. Entrance Doors: Heavy-weight hinges.
  2. Doors with Closers: Antifriction-bearing hinges.
  3. Interior Doors: Antifriction-bearing hinges.
- D. Hinge Base Metal: Unless otherwise indicated, provide the following:
1. Exterior Hinges: Stainless steel, with stainless-steel pin.
  2. Interior Hinges: Steel, with steel pin.
  3. Hinges for Fire-Rated Assemblies: Steel, with steel pin.
- E. Hinge Options: Where indicated in door hardware sets or on Drawings:
1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for outswinging exterior doors and outswinging corridor doors with locks.
  2. Corners: Square.
- F. Fasteners: Comply with the following:
1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
  2. Wood Screws: For wood doors and frames.
  3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
  4. Screws: Phillips flat-head; machine screws (drilled and tapped holes) for metal doors and wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

### 2.3 HINGES

- A. Butts and Hinges: BHMA A156.1.
- B. Template Hinge Dimensions: BHMA A156.7.
- C. Available Manufacturers:
  - 1. Hager Companies (HAG).
  - 2. McKinney Products Company; an ASSA ABLOY Group company (MCK).
  - 3. Stanley Commercial Hardware; Div. of The Stanley Works (STH).
- D. The following is a guide for hinge size and type required for this project.

	Manufacturer	Interior:
1-3/4" Doors	Stanley	FBB179-4 1/2"
up to 3'-0" wide	Hager	BB1279-4 1/2"
	McKinney	TA-TB2714-4 1/2"

### 2.4 LOCKS AND LATCHES, GENERAL

- A. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
  - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
- B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- C. Lock Trim:
  - 1. Levers: Cast.
  - 2. Escutcheons (Roses): Forged.
  - 3. Dummy Trim: Match lever lock trim and escutcheons.
- D. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
  - 1. Bored Locks: Minimum 1/2-inch latchbolt throw.
  - 2. Mortise Locks: Minimum 3/4-inch latchbolt throw.
  - 3. Deadbolts: Minimum 1-inch bolt throw.
- E. Backset: 2-3/4 inches, unless otherwise indicated.

- F. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:
  - 1. Strikes for Bored Locks and Latches: BHMA A156.2.
  - 2. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.

2.5 BORED LOCKS AND LATCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Mechanical Locks and Latches:
    - a. Best Lock Corporation (BLC).
    - b. Corbin Russwin Architectural Hardware; Div. of Yale Security Inc. (CR).
    - c. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
    - d. Schlage Lock Company; an Ingersoll-Rand Company (SCH).
- B. Bored Locks: BHMA Grade 1; Series 4000.
  - 1. Provide one of the following manufacturers and designs:
    - a. Best: 9K Series
    - b. Corbin Russwin: CL3300 Series.
    - c. Sargent: 10 Line
    - d. Schlage: D Series
- C. Auxiliary Locks: BHMA Grade 1.
- D. Lock Trim: Comply with the following:
  - 1. Lockset Designs: Provide the lockset design designated below or, if sets are provided by another manufacturer, provide designs that match those designated:
    - a. Best: 15 C
    - b. Corbin Russwin: NZD
    - c. Sargent: LL
    - d. Schlage: Rhodes
- E. Lock Functions: Lock functions as indicated in the hardware schedule shall be as follows:

FUNCTION	SARGENT	SCHLAGE	CORBIN/RUSWIN	BEST
(1) (utility)	04	80	57	D
(2) (office)	05	53	51	AB
(3) (passage)	15	10	10	N
(4) (classroom)	37	70	55	R
(5) (entrance)	16	60	72	C

(6) (privacy) 65 40 20 L

## 2.6 EXIT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Precision Hardware, Inc. (PH).
  2. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
  3. Von Duprin; an Ingersoll-Rand Company (VD).
- B. Products: All exit devices for this project shall be one of the following:
1. Precision Olympian Series
  2. The 80 Series exit device by Sargent & Co.
  3. 98 Series by Von Duprin Division
- C. Exit Devices: BHMA A156.3, Grade 1.
- D. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
- E. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- F. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- G. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- H. Latch Retraction Exit Devices: Where indicated, provide hardware package consisting of Sargent exit device No. 56-8804 with No. 3510 power supply and No 4370 key switch. Equivalent package by other listed manufacturers will be acceptable.
- I. Removable Mullions: Steel, keyed removable mullions. Paint finish to match doors.
- J. Outside Trim: Pull with cylinder; material and finish to match locksets, unless otherwise indicated.

K. The following functions shall be required where specified:

FUNCTION	VON DUPRIN	SARGENT	PRECISION
A	CD99NL-OP	16-8804	1103CD x 1123-38
B	CD99EO	16-8810	1101CD x 1123-38
C	99L	8813ET	1108 x 39L x 1123-38
D	99L-BE	8815ET	1108A x 39L x 1123-38
E	99EO-F	12-8810	FL-1101 x 1123-38
F	99L-F	12-8813ET	FL-1108 x 39L x 1123-38
G	99L-F-BE	12-8815ET	FL-1108A x 39L x 1123-38
H	CD9927EO	16-8710	1201CD x 1123-38
I	9927L	8713ET	1208 x 39L x 1123-38
J	9927L-BE	8715ET	1208A x 39L x 1123-38
K	CD9927EO x LBR	16-PP/PR8710	1201CD x 1123-38 x LBR
L	9927L x LBR	PP/PR8713ET	1208 x 39L x 1123-38 x LBR
M	9927L-BE x LBR	PP/PR8715ET	1208A x 39L x 1123-38 x LBR
N	9927EO-F	12-8710	FL-1201 x 1123-38
O	9927L-F	12-8713ET	FL-1208 x 39L x 1123-38
P	9927L-F-BE	12-8715ET	FL-1208A x 39L x 1123-38
Q	9927EO-F x LBR	12-PP/PR8710	FL-1201 x 1123-38 x LBR
R	9927L-F x LBR	12-PP/PR8713ET	FL-1208 x 39L x 1123-38 x LBR
S	9927-L-F-BE x LBR	12-PP/PR8715ET	FL-1208A x 39L x 1123-38 x LBR
T	EL9927-TL	56-8710-306	ELR-2201-CA03 x 1123-38
U	EL99NL-OP	56-8804	ELR-2103 x 1123-38

## 2.7 LOCK CYLINDERS

- A. Standard Lock Cylinders: BHMA A156.5, Grade 1.
- B. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
  - 1. Number of Pins: Six.
  - 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  - 3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
    - a. High-Security Grade: BHMA A156.5, Grade 1A, listed and labeled as complying with pick- and drill-resistant testing requirements in UL 437 (Suffix A).
- C. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
  - 1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.
- D. Construction Keying: Comply with the following:

1. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
  - a. Replace construction cores with permanent cores as indicated in keying schedule.

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

1. Cylinders: Same manufacturer as for locks and latches.

## 2.8 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference, and as follows:

1. Master Key System: Cylinders are operated by a change key and a master key.
2. Keyed Alike: Key all cylinders to same change key.

B. Keys: Nickel silver.

1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
  - a. Notation: Information to be furnished by Owner.
2. Quantity: In addition to one extra key blank for each lock, provide the following:
  - a. Cylinder Change Keys: Three.
  - b. Master Keys: Five.

## 2.9 KEY CONTROL SYSTEM

A. Key Control Cabinet: BHMA A156.5, Grade 1; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of the number of locks.

1. Wall-Mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.

B. Cross-Index System: Multiple-index system for recording key information. Include three receipt forms for each key-holding hook. Set up by key control manufacturer.

1. Available Manufacturers:
  - a. Key Control Systems, Inc. (KCS).
  - b. Telkee, Inc.; a division of Sunroc Corporation (SUN).

2.10 ELECTRIC STRIKES

- A. Standard: BHMA A156.31, Grade 1.
- B. General: Use fail-secure electric strikes with fire-rated devices.
  - 1. In particular the electric strikes shall carry a listing under the category of "single point locks or latches" for use with single swing fire doors having a 3-hour (A) rating or less.
  - 2. Provide solenoid actuated by a 24 VAC or DC current and face plate shall be in US 26D finish.
  - 3. Manufacture of corrosion resistant metals with a cast stainless steel case and working parts, and stainless steel springs.
  - 4. Provide horizontal adjustment for misalignment, and shall be reversible and capable of accepting locksets specified in the lock or exit device section of the specification.
  - 5. Electric strikes shall fit a cutout in the frame not less than 9" high x 1 3/8" wide with a frame face cutout of 1 1/2" wide and 3 3/4" high.
- C. Available Manufacturers:
  - 1. Adams Rite Manufacturing Co. (ARM).
  - 2. Folger Adam Security Inc.; an ASSA ABLOY Group company (FAS).
  - 3. HES, Inc.; an ASSA ABLOY Group company (HES).
  - 4. Locknetics; an Ingersoll-Rand Company (LSE).
  - 5. Precision Hardware, Inc. (PH).

2.11 OPERATING TRIM

- A. Standard: BHMA A156.6.
- B. Materials: Fabricate from stainless steel, unless otherwise indicated.
- C. Available Manufacturers:
  - 1. Burns Manufacturing Incorporated (BM).
  - 2. Don-Jo Mfg., Inc. (DJO).
  - 3. Hager Companies (HAG).
  - 4. IVES Hardware; an Ingersoll-Rand Company (IVS).
  - 5. Rockwood Manufacturing Company (RM).
- D. Door Pulls, 1 inch diameter.
  - 1. Size: ADA compliant, unless indicated otherwise, provide 10 inches center to center, with 3 1/2 inch projection and 2 1/2 inch clearance.
  - 2. Available Products:
    - a. Hager Companies, H4J.
    - b. IVES Hardware; an Ingersoll-Rand Company; 8103EZ.
- E. Push Bars, 1 inch diameter.

## 2.12 CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Surface-Mounted Closers:
    - a. LCN Closers; an Ingersoll-Rand Company (LCN).
    - b. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
  - C. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
    - 1. Comply with the following maximum opening-force requirements:
      - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
      - b. Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
      - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
  - D. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
  - E. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
    - 1. LCN:
      - a. Exterior: 4040 Series
      - b. Interior: 4040 Series
    - 2. Sargent:
      - a. Exterior: 281
      - b. Interior: 281
  - F. Coordinators: BHMA A156.3.

## 2.13 AUTOMATIC DOOR OPERATORS



- A. Exterior Doors: Provide Horton Model 4100 LE Access Operator. No substitutions.
- B. Interior Doors: Provide Horton Model 7100 Access Operator. No substitutions.
- C. Provide actuating push plates, inside and outside.
- D. Coordinate requirements with electrical contractor.

#### 2.14 PROTECTIVE TRIM UNITS

- A. Size: 1-1/2 inches less than door width on push side and 1/2 inch less than door width on pull side, by height specified in door hardware sets.
- B. Fasteners: Manufacturer's standard machine or self-tapping screws.
- C. Metal Protective Trim Units: BHMA A156.6; beveled top and 2 sides; fabricated from the following material:
  - 1. Material: 0.050-inch- thick stainless steel.
  - 2. Available Manufacturers:
    - a. Burns Manufacturing Incorporated (BM).
    - b. Don-Jo Mfg., Inc. (DJO).
    - c. Hager Companies (HAG).
    - d. IVES Hardware; an Ingersoll-Rand Company (IVS).
    - e. Rockwood Manufacturing Company (RM).
- D. Fabricate protection plates as follows:
  - 1. Push Plates: 16" high by 8" wide.
  - 2. Kick Plates: 10" high by 1-1/2" less than door width for single doors and 1" less than door width for pairs of doors. Kick plates shall be applied to push side of all doors where noted.

#### 2.15 STOPS AND HOLDERS

- A. Stops and Bumpers: BHMA A156.16, Grade 1.
  - 1. Provide wall stops for doors unless floor or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.
  - 2. Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push-pull units if no latch-lock sets) for color and texture.

- B. Wall Stops: Wall type bumpers with concealed type flange shall be used where ever possible.
  - 1. Available Products:
    - a. Ives - 407 1/2
    - b. Door Controls - 3211T
    - c. Rockwood - 409
- C. Floor Stops: Where wall type bumpers cannot be used, provide dome type, floor mounted stops of the proper height as follows:
  - 1. Available Products:
    - a. Ives - 436, 438
    - b. Door Controls - 3310X, 3320X
    - c. Rockwood - 440, 442
- D. Silencers for Metal Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum diameter 1/2 inch; fabricated for drilled-in application to frame.

## 2.16 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
  - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
  - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
  - 2. Steel Machine or Wood Screws: For the following fire-rated applications:
    - a. Mortise hinges to doors.
    - b. Strike plates to frames.

- c. Closers to doors and frames.
- 3. Steel Through Bolts: For the following fire-rated applications unless door blocking is provided:
  - a. Surface hinges to doors.
  - b. Closers to doors and frames.
  - c. Surface-mounted exit devices.
- 4. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
- 5. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

## 2.17 FINISHES

- A. Standard: BHMA A156.18, as indicated in door hardware sets.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide the following finishes:
  - 1. Butts and Hinges: 26D
  - 2. Locks & Lock Trim: 26D
  - 3. Exit Devices: 32D
  - 4. Door Controls - Closers: Sprayed Alum. Finish
  - 5. Door Stops 26D/32D
  - 6. Kickplates 32D
  - 7. Pulls 32D

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and frames, 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. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 Series.
  - 1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.
- B. Wood Doors: Comply with DHI A115-W Series.

### 3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
  - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
  - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
  - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- D. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.
  - 1. Configuration: Provide one power supply for each door opening.

### 3.4 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.

1. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

### 3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

### 3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

### 3.7 DOOR HARDWARE SETS

A. The hardware sets listed below indicate the items of hardware required for each opening. It is the bidder's responsibility to accurately furnish the proper quantities, items, sizes, weights and functions as required by the plans and specifications. If an opening has, through error, been omitted from the following hardware sets, it shall be the bidder's responsibility to supply hardware of equivalent quality and quantity, as that which is specified for a comparable opening.

#### SINGLE ALUMINUM ENTRANCE DOOR

HW1

Doors C101, C102

Exit Device (function U)

Power supply

Key switch (mounted to wall beside door)

Pull

Automatic door operator

Floor Stop

Balance of hardware by aluminum door supplier.

Description of Electric Function: Door to unlock when activated by card reader or by key activation. Card reader system by Owner. Automatic door operator will function when door is unlocked.

#### DOUBLE ALUMINUM ENTRANCE DOOR

HW2

Doors C103

1- Exit Device (function A)  
1- Exit Device (function U)  
Power supply  
Pulls  
Closer with drop plate  
Automatic door operator  
Floor Stops

Balance of hardware by aluminum door supplier.

Description of Electric Function: Electronically control door to unlock when activated by card reader. Card reader system by Owner. Automatic door operator (on same leaf) will function when door is unlocked.

#### DOUBLE ALUMINUM ENTRANCE DOOR

HW3

Doors 105

1- Exit Device (function A)  
1- Exit Device (function U)  
Power supply  
Key switch (mounted to wall beside door)  
Removable mullion  
Closer with drop plate  
Automatic door operator  
Floor Stops

Balance of hardware by aluminum door supplier.

Description of Electric Function: Electronically control door to unlock when activated by card reader or key activation. Card reader system by Owner. Automatic door operator (on same leaf) will function when door is unlocked.

#### SINGLE WOOD VESTIBULE DOORS

HW4

NEW OFFICE BUILDING  
901 Washington Avenue  
Portland, Maine

J.B. BROWN & SONS

Doors 101, 114

Push/Pulls  
Automatic door operator  
Floor Stop

Balance of hardware by aluminum door supplier.

#### DOUBLE WOOD VESTIBULE DOORS

HW5

Doors 107

Hinges  
Push/Pulls  
1 - Closer  
Automatic door operator

#### JANITOR, SPRINKLER

HW6

Doors 106, 113

Hinges  
Lockset (function 1)  
Wall stop  
Silencers

#### ELECTRICAL

HW7

Doors 112

Hinges  
Exit device (function C)  
Electric strike  
Closer  
Wall stop  
Silencers

Description of Electric Function: Electronically control door to unlock when activated by card reader.

#### TOILET VESTIBULE

HW8

NEW OFFICE BUILDING  
901 Washington Avenue  
Portland, Maine

J.B. BROWN & SONS

Doors 108, 109

Hinges  
Push Plate  
Pull  
Closer  
Kick Plate  
Wall Stop  
Silencers

#### OFFICE OR STORAGE

HW9

Doors 102, 103, 104, 110

Hinges  
Locksets (classroom function 4)  
Door Stop  
Silencers

#### TEL/DATA

HW10

Doors 111

Hinges  
Locksets (classroom function 1)  
Electric strike  
Closer  
Door Stop  
Silencers

Description of Electric Function: Electronically control door to unlock when activated by card reader.

END OF SECTION 087100



## SECTION 088000 - GLAZING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
  - 1. Doors.
  - 2. Storefront framing.
  - 3. Glazed entrances.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Design glass, including comprehensive engineering analysis according to ICC's 2003 International Building Code by a qualified professional engineer, using the following design criteria:
  - 1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
  - 2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
  - 3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
  - 4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- C. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For glass and glazing products, from manufacturer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulating glass.
- C. Warranties: Sample of special warranties.

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.
- B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- D. Source Limitations for Glass: Obtain insulating glass from single source from single manufacturer for each glass type.
- E. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- F. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- G. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

1.7 DELIVERY, STORAGE, AND HANDLING

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

1.8 PROJECT CONDITIONS

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

1.9 WARRANTY

- A. Manufacturer's Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
  - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
  - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
  - 1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

## 2.2 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
  - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
  - 2. For uncoated glass, comply with requirements for Condition A.
  - 3. For coated vision glass, comply with requirements for Condition C (other coated glass).

## 2.3 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
  - 1. Sealing System: Dual seal, with silicone primary seal and butyl secondary seal.
  - 2. Spacer: Manufacturer's standard spacer material and construction.
  - 3. Desiccant: Molecular sieve or silica gel, or blend of both.
- B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Insulating-Glass Types" Article.

## 2.4 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
  - 1. Neoprene complying with ASTM C 864.
  - 2. EPDM complying with ASTM C 864.
  - 3. Silicone complying with ASTM C 1115.
  - 4. Thermoplastic polyolefin rubber complying with ASTM C 1115.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned EPDM, silicone, or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
  - 1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

## 2.5 GLAZING SEALANTS

### A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

### B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Dow Corning Corporation; 790.
  - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
  - c. May National Associates, Inc.; Bondaflex Sil 290.
  - d. Pecora Corporation; 890.
  - e. Sika Corporation, Construction Products Division; SikaSil-C990.
  - f. Tremco Incorporated; Spectrem 1.

## 2.6 GLAZING TAPES

### A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

### 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.

## 2.7 MISCELLANEOUS GLAZING MATERIALS

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

## 2.8 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

## 2.9 MONOLITHIC-GLASS TYPES

- A. Tempered Glass: Clear fully tempered float glass.
  - 1. Thickness: 6.0 mm.
  - 2. Provide safety glazing labeling.
  - 3. Application: All interior glass locations.

## 2.10 INSULATING-GLASS TYPES

- A. Insulated Glass: Low-e-coated, clear insulating glass.
  - 1. Overall Unit Thickness: 1 inch.
  - 2. Thickness of Each Glass Lite: 6.0 mm.
  - 3. Outdoor Lite: Float glass.
  - 4. Interspace Content: Air.
  - 5. Indoor Lite: Float glass.
  - 6. Low-E Coating: Pyrolytic or sputtered on second or third surface.
  - 7. Provide tempered glass and safety glazing labeling where required by code.

8. Application: Aluminum storefronts, windows and entrances.
- B. High Performance Insulating-Glass: Based on Heat Mirror® HM SC75/Clear.
1. Overall Unit Thickness and Thickness of Each Lite: 25 and 6.0 mm.
  2. Interspace Content: Air.
  3. Outdoor Lite: Class 1 (clear) float glass.
  4. Indoor Lite: Class 1 (clear) float glass.
  5. Low-E Coating: On suspended interior film.
  6. Visible Light Transmittance: 61 percent minimum.
  7. Winter Nighttime U-Factor: 0.30 maximum.
  8. Solar Heat Gain Coefficient: 0.35 maximum.
  9. Shading Coefficient: 0.41.
  10. Application: Provide at all plan South-facing elevations as indicated on the drawings, the following:
    - a. Exterior aluminum entrances and storefronts.
    - b. Exterior aluminum windows.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

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

#### 3.2 PREPARATION

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

### 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches.
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.



### 3.4 TAPE GLAZING

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

### 3.5 GASKET GLAZING (DRY)

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

3.6 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

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. This Section includes non-load-bearing steel framing members for the following applications:
  - 1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
  - 2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

#### 1.3 SUBMITTALS

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

#### 1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- 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.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Steel Framing and Furring:
    - a. Clark Western Building Systems, UltraSteel™ Framing.
    - b. Dietrich Industries, Inc., UltraSteel™ Framing.
    - c. MarinoWare; Division of Ware Ind.
    - d. National Gypsum Company.

- e. Super Stud Building Products, Inc.
- f. The Steel Network, Inc.
- g. Unimast, Inc.

## 2.2 FRAMING SYSTEMS

- 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 or equivalent per ASTM A1003.
- B. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.
  - 1. Steel Studs and Runners:
    - a. Minimum Base-Metal Thickness: Not less than 0.027 inch or as indicated on Drawings or as indicated by UL assembly.
    - b. Depth: As indicated on Drawings.
  - 2. Dimpled Steel Studs and Runners:
    - a. Minimum Base-Metal Thickness: As indicated on Drawings or not less than 0.025 inch.
    - b. Depth: As indicated on Drawings.
- C. 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.
    - a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
      - 2) MBA Building Supplies; FlatSteel Deflection Track or Slotted Deflecto Track.
      - 3) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.

- 4) Superior Metal Trim; Superior Flex Track System (SFT).
  - 5) Telling Industries; Vertical Slip Track or Vertical Slip Track II.
- D. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges.
1. Depth: 1-1/2 inches.
  2. Clip Angle: 1-1/2 by 1-1/2 inch, 0.068-inch- thick, galvanized steel or BridgeClip by The Steel Network, Inc.
- E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base Metal Thickness: 0.0179 inch.
  2. Depth: As indicated on Drawings.
- F. Cold-Rolled Furring Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges.
1. Depth: 3/4 inch.
  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.

## 2.3 SUSPENSION SYSTEMS

- 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.
  2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
- D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.
1. Depth: 1-1/2 inches.

F. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 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: 0.0179 inch.

G. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
  - b. Chicago Metallic Corporation; 640-C Drywall Furring System.
  - c. USG Corporation; Drywall Suspension System.

## 2.4 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.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

### 3.3 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 bracing at terminations in assemblies.

### 3.4 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.
  1. Space studs as follows:
    - a. Single-Layer Construction: 16 inches o.c., unless otherwise indicated.
- 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 0.312 inch (0.79 mm) (20 gage) studs at each jamb, unless otherwise indicated.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-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.
- D. 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.

### 3.5 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. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.



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- G. 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.

END OF SECTION 092216

## 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. This Section includes the following:
  - 1. Interior gypsum board.
  - 2. Tile backing panels.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Drawings: Submit drawings indicating locations of control joints.

#### 1.4 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

#### 1.5 PROJECT CONDITIONS

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

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

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

### 2.2 GYPSUM BOARD, GENERAL

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

### 2.3 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
  - 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:
    - a. American Gypsum Co.
    - b. BPB America Inc.
    - c. G-P Gypsum.
    - d. Lafarge North America Inc.
    - e. National Gypsum Company.
    - f. Temple.
    - g. USG Corporation.
- B. Type X:
  - 1. Thickness: 5/8 inch.
  - 2. Long Edges: Tapered.

### 2.4 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. CertainTeed Corp.; GlasRoc Tile Backer.

- b. Georgia-Pacific Gypsum LLC; DensShield Tile Backer.
2. Core: 5/8 inch, Type X.
3. Mold Resistance: ASTM D 3273, score of 10.

## 2.5 TRIM ACCESSORIES

### A. Interior Trim: ASTM C 1047.

1. Material:
  - a. Galvanized or aluminum-coated steel sheet or rolled zinc.
  - b. Trim-Tex, Super Seal Tear Away™ L Bead where abutting exterior metal doors and windows.
2. Shapes:
  - a. Cornerbead.
  - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
  - c. Expansion (control) joint.

## 2.6 JOINT TREATMENT MATERIALS

### A. General: Comply with ASTM C 475/C 475M.

### B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

### C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints 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 setting-type taping or drying-type, all-purpose compound.
  - a. Use setting-type taping with mold-resistant gypsum wallboard.
3. Fill Coat: For second coat, use setting-type, sandable topping or drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: Not required.

### D. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

## 2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- 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 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 Joint 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.
  - 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. Pecora Corporation; AC-20 FTR or AIS-919.
    - b. USG Corporation; SHEETROCK Acoustical Sealant.
  - 2. Provide sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- 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 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. 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- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- 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. 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 recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

### 3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Type X: Vertical and horizontal surfaces, unless otherwise indicated.
- 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 vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
  - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

### 3.4 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

### 3.5 INSTALLING TRIM ACCESSORIES

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

### 3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Where indicated on Drawings.
3. Level 3: Where indicated on Drawings.
4. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
5. Level 5: Not required.

- E. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

### 3.7 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.

1. Complete the following in areas to receive gypsum board ceilings:
  - a. Installation, insulation, and leak and pressure testing of water piping systems.
  - b. Installation of air-duct systems.
  - c. Installation of air devices.
  - d. Installation of mechanical system control-air tubing.
  - e. Installation of ceiling support framing.

### 3.8 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
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 093000 - TILING

### 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. Ceramic tile.
  - 2. Crack isolation membrane.
  - 3. Metal edge strips.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- C. Product Certificates: For each type of product, signed by product manufacturer.
- D. Material Test Reports: For each tile-setting and -grouting product.

#### 1.4 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.
  - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

## 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

## PART 2 - PRODUCTS

### 2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
  - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

### 2.2 TILE PRODUCTS

- A. Porcelain Tile: [**Unglazed**] [**Glazed**] paver tile.
  - 1. Manufacturer: Subject to compliance with requirements, provide product by the following:
    - a. Daltile; Division of Dal-Tile International Inc.
  - 2. Composition: Porcelain.
  - 3. Face Size: 3 by 3 inches.
  - 4. Thickness: [**1/4 inch (6.35 mm)**] [**3/8 inch (9.5 mm)**] [**1/2 inch (12.7 mm)**].
  - 5. Face: Plain with square or cushion edges.
  - 6. Tile Color and Pattern: ????????????
  - 7. Grout Color: As selected by Architect from manufacturer's full range.

- B. Ceramic Floor Tile: Factory-mounted unglazed ceramic mosaic tile.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Olean; Division of Dal-Tile International Inc.; Unglazed Ceramic Mosaics, matte finish.
    - b. Daltile; Division of Dal-Tile International Inc.; Unglazed, matte finish.
  2. Composition: Porcelain.
  3. Module Size: 2 by 2 inches.
  4. Thickness: 1/4 inch.
  5. Face: Plain with cushion edges.
  6. Surface: Smooth, without abrasive admixture.
  7. Finish: Mat, opaque glaze.
  8. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
  9. Grout Color: As selected by Architect from manufacturer's full range.
- C. Glazed Wall Tile: Provide flat tile complying with the following requirements:
1. Module Size: 4-1/4 by 4-1/4 inches.
  2. Thickness: 5/16 inch.
  3. Face: Plain with cushion edges.
  4. Tile Type/Products: Available products include the following:
    - a. American Olean Matte and Brite.
    - b. Dal-Tile: Semi-gloss.
  5. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
    - a. Base Cove: Cove, module size 4-1/4 by 4-1/4 inch.
    - b. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose, module size 2 by 6 inches.
    - c. External Corners for Thin-Set Mortar Installations: Surface bullnose.
    - d. Internal Corners: Field-buttet square corners. For coved base and cap, use angle pieces designed to fit with stretcher shapes.

### 2.3 WATERPROOF AND CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and ANSI A118.12, and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.
1. Products: Subject to compliance with requirements, provide the following:

- a. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane. (2.39 g/L)
- b. MAPEI Corporation; Mapelastic HPG with MAPEI Fiberglass Mesh. (31 g/L)

## 2.4 SETTING MATERIALS

### A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Bonsal American; an Oldcastle company.
  - b. Bostik, Inc.
  - c. C-Cure.
  - d. Custom Building Products.
  - e. Laticrete International, Inc.
  - f. MAPEI Corporation.
2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

## 2.5 GROUT MATERIALS

### A. Polymer-Modified Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Bonsal American; an Oldcastle company.
  - b. Bostik, Inc.
  - c. C-Cure.
  - d. Custom Building Products.
  - e. Laticrete International, Inc.
  - f. MAPEI Corporation.
2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

## 2.6 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard sanded acrylic caulking containing a mildew-cide or antimicrobial protection.
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
  2. Sealant Primers for Nonporous Substrates: 250 g/L.
  3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.
- D. Products: Available products include the following:
1. Keracaulk™ S by Mapei
  2. CeramaSeal by Bostik Findley

## 2.7 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.
1. Provide Schiene by Schluter or approved substitute.

## 2.8 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
    - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
  3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
  4. Verify that joints and cracks in tile substrates are coordinated with 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. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

### 3.3 TILE INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to

minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

- E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
  - 1. Ceramic Mosaic Tile: 1/16 inch.
  - 2. Glazed Wall Tile: 1/16 inch.
- F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- G. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

### 3.4 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.
- C. Locations: Install over all cracks, control and construction joints in concrete floor.

### 3.5 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  - 1. Remove latex-portland cement grout residue from tile as soon as possible.
  - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
  - 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.



3.6 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Tile Installation F113: Thin-set mortar; TCA F113.

- a. Tile Type: Ceramic and porcelain floor tile.
- b. Thin-Set Mortar: Latex- portland cement mortar.
- c. Grout: Polymer-modified unsanded grout.

B. Interior Wall Installations, Metal Studs or Furring:

1. Tile Installation W245: Thin-set mortar on coated glass-mat, water-resistant gypsum backer board; TCA W245.

- a. Tile Type: Ceramic wall tile.
- b. Thin-Set Mortar: Latex- portland cement mortar.
- c. Grout: Polymer-modified unsanded grout.

END OF SECTION 093000

## SECTION 095113 - ACOUSTICAL PANEL CEILINGS

### 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 acoustical panels and exposed suspension systems for ceilings.

#### 1.3 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.

#### 1.4 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.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.

#### 1.6 CLOSEOUT SUBMITTALS

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

#### 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
  - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
  - 3. Hold-Down Clips: Equal to 2.0 percent of quantity installed.

#### 1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

#### 1.9 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.

#### 1.10 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.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
  - 2. Smoke-Developed Index: 50 or less.

- C. Fire-Resistance Ratings: Comply with ASTM E 119; 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 the listings of another qualified testing agency.

## 2.2 ACOUSTICAL PANELS, GENERAL

- A. 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.

- B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, 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.

- C. 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.

- D. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Where indicated, provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

## 2.3 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Armstrong World Industries, Inc.; Second Look II, No. 1761.
2. BPB USA; Baroque Customline No. BQCL-224.
3. USG Interiors, Inc.; Radar ClimaPlus Illusion Two-24, No. 2842.

- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
  2. Pattern: CE (perforated, small holes and lightly textured) and K (surface scored).
- C. Color: White.
- D. LR: Not less than 0.80.
- E. NRC: Not less than 0.55.
- F. CAC: Not less than 35.
- G. Edge/Joint Detail: Reveal sized to fit flange of exposed suspension system members.
- H. Thickness: 3/4 inch.
- I. Modular Size: 24 by 48 inches.
- J. Antimicrobial Treatment: Broad spectrum fungicide and bactericide based.

#### 2.4 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 635.
- 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.
1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
  2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.
- E. Hanger Rods or Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- F. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.

- G. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- H. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- I. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.
- J. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.
  - 1. Available Products: UHDC by Armstrong or L15 by USG.

## 2.5 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Prelude 15/16" Exposed Tee System (7300 Series); Armstrong World Industries, Inc.
  - 2. S11 System; Celotex Corporation.
  - 3. 1200 System; Chicago Metallic Corporation.
  - 4. DX 24 System; USG Interiors, Inc.
- B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished 15/16-inch- wide metal caps on flanges.
  - 1. Structural Classification: Intermediate-duty system.
  - 2. End Condition of Cross Runners: Override (stepped) or butt-edge type, as standard with manufacturer.
  - 3. Face Design: Flat, flush.
  - 4. Cap Material: Steel cold-rolled sheet.
  - 5. Cap Finish: Painted white.

## 2.6 METAL EDGE MOLDINGS AND TRIM

- A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
  - 1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
  - 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

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

#### 3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

#### 3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
  - 1. Hangers shall be single lengths of wire without splices; coordinate lengths in deep ceiling cavities.
  - 2. 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.
  - 3. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 4. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 5. 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.
  - 6. 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.
  - 7. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved.

- Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
8. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
  9. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
  10. Do not attach hangers to steel deck tabs.
  11. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  12. 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.
  13. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Suspension system shall be reinforced to support diffusers, light fixtures and any additional members. Install hanger wires to grid at each corner of light fixtures. Coordinate location with electrical and other trades.
1. Each individual fixture and attachment with combined weight of 56 pounds or less shall have two 12-gage wire hangers attached at diagonal corners of the fixture. These wires shall be slack. Fixtures and attachments with a combined weight of greater than 56 pounds shall be independently supported from the structure at all four corners.
- E. 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.
- F. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- G. 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. Arrange directionally patterned acoustical panels as follows:
    - a. As indicated on reflected ceiling plans.
    - b. Install panels with pattern running in one direction parallel to long axis of space.
  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.
4. Install hold-down clips in areas within 10 feet of exterior doors or vestibule doors; space as recommended by panel manufacturer's written instructions, unless otherwise indicated or required.

#### 3.4 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before Contractor installs acoustical panel ceilings, conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of acoustical panels until deficiencies have been corrected.
  1. Complete the following in areas to receive gypsum board ceilings:
    - a. Installation of 80 percent of lighting fixtures, powered for operation.
    - b. Installation, insulation, and leak and pressure testing of water piping systems.
    - c. Installation of air-duct systems.
    - d. Installation of air devices.
    - e. Installation of mechanical system control-air tubing.

#### 3.5 CLEANING

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

END OF SECTION 095113

## 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 base.
  - 2. Resilient molding accessories.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Selection: For each type of product indicated.
- C. Product Schedule: For resilient products. Use same designations indicated on Drawings.

#### 1.4 MAINTENANCE MATERIAL SUBMITTALS

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

#### 1.5 DELIVERY, STORAGE, AND HANDLING

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

#### 1.6 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
  2. During installation.
  3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

## PART 2 - PRODUCTS

### 2.1 RESILIENT BASE

- A. Resilient Base:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Armstrong World Industries, Inc.
    - b. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
    - c. Endura Rubber Flooring; Division of Burke Industries, Inc.
    - d. Flexco, Inc.
    - e. Roppe Corporation, USA.
- B. Resilient Base Standard: ASTM F 1861.
1. Material Requirement: Type TV (vinyl, thermoplastic).
  2. Manufacturing Method: Group I (solid, homogeneous) or Group II (layered).
  3. Styles:
    - a. Cove (base with toe) at sheet flooring.
    - b. Straight (flat or toeless) at carpet.
- C. Minimum Thickness: 0.125 inch.
- D. Height: 6 inches.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.
- H. Finish: Satin.
- I. Colors and Patterns: As selected by Architect from full range of industry colors.

## 2.2 RESILIENT MOLDING ACCESSORY

- A. Material: Vinyl.
- B. Profile and Dimensions:
  - 1. Transition Strip between VCT and Carpet/Ceramic Tile.
  - 2. Reducer Strip between Concrete and VCT.
  - 3. Reducer Strip between Concrete and Carpet.
- C. Colors and Patterns: As selected by Architect from full range of industry colors.

## 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 manufacturer for applications indicated.
- B. 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.
    - b. Rubber Floor Adhesives: Not more than 60 g/L.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

- C. Do not install resilient products until they are same temperature as the space where they are to be installed.
  - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

### 3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as 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.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Job-Formed Corners:
  - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
  - 2. Inside Corners: Use straight pieces of maximum lengths possible.

### 3.4 RESILIENT ACCESSORY INSTALLATION

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

### 3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:

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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 resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products until Substantial Completion.

END OF SECTION 096513

## SECTION 096519 - RESILIENT TILE 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. Vinyl composition floor tile.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Selection: For each type of floor tile indicated.
- C. Product Schedule: For floor tile. Use same designations indicated on Drawings.

#### 1.4 CLOSEOUT SUBMITTALS

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

#### 1.5 MATERIALS MAINTENANCE SUBMITTALS

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

#### 1.6 DELIVERY, STORAGE, AND HANDLING

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

## 1.7 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

## PART 2 - PRODUCTS

### 2.1 VINYL COMPOSITION FLOOR TILE

- A. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Armstrong World Industries, Inc.; Imperial Texture Standard Excelon.
  - 2. Mannington Mills, Inc.; Essentials.
  - 3. Tarkett, Inc.; Expressions.
- B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.
- C. Wearing Surface: Smooth.
- D. Thickness: 0.125 inch.
- E. Size: 12 by 12 inches.
- F. Colors and Patterns: As selected by Architect from full range of industry colors.

### 2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile 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. VCT and Asphalt Tile Adhesives: Not more than 50 g/L.
2. 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. Urethane Waterproofing and Tile-Setting Adhesive: Manufacturer's standard proprietary product consisting of 1-part liquid-applied urethane in a consistency suitable for trowel application and intended for use as both waterproofing and tile-setting adhesive in a 2-step process.
  1. Product: Hydroment Ultra-Set; Bostik.
- D. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

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

#### 3.2 PREPARATION

- A. Prepare substrates according to 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 manufacturer. Do not use solvents.
  3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
  4. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are same temperature as space where they are to be installed.
  - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

### 3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  - 1. Lay tiles 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 direction alternating in adjacent tiles (basket-weave pattern).
- 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, nonstaining marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to 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.
- I. Provide waterproofing to set tiles in an 8 by 8 foot square area under drinking fountains, or as indicated on the drawings.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of 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 two coats.

END OF SECTION 096519

## SECTION 096813 - TILE CARPETING

### 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 modular carpet tile.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.
- B. 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.
- C. Product Schedule: For carpet tile. Use same designations indicated on Drawings.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.
- E. 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.
- F. Warranty: Special warranty specified in this Section.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling."

## 1.6 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.

## 1.7 WARRANTY

- A. 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, dimensional stability, excess static discharge, and delamination.
  - 3. Warranty Period: 10 years from date of Substantial Completion.

## 1.8 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 CARPET TILE

- A. Product: To be determined.

## 2.2 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.
  - 1. VOC Limits: Provide adhesives with VOC content not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

## 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. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
  - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
  - 2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
  - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. 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. 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.

- D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- E. 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 carpet tile manufacturer.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. 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.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. 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.
- G. 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

## SECTION 099123 - INTERIOR PAINTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
  - 1. Steel.
  - 2. PVC trim.
  - 3. Gypsum board.
  - 4. Cotton or canvas insulation covering.
- B. This Section includes exposed interior items and surfaces with low VOC coatings complying with ME DEP regulations.

#### 1.3 ACTION SUBMITTALS

- A. Product List: For each product indicated, include the following:
  - 1. Product data.
  - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
  - 3. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
  - 4. Include printed statement of VOC content for each product.
- B. Samples for Selection: For each type of topcoat product indicated.

#### 1.4 MAINTENANCE MATERIAL SUBMITTALS

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



1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced Applicator who has completed painting system applications similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain primers and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. 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:
  - 1. Akzo Nobel Paints, LLC (Glidden Professional, Devoe Coatings, Flood Stains)
  - 2. Benjamin Moore & Co.
  - 3. Sherwin-Williams Company (The).
- B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in other Part 2 articles for the paint category indicated.

2.2 PAINT, GENERAL

- A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. VOC Compliance for Interior Paints and Coatings: Provide the manufacturer's formulation for the products specified below that are VOC compliant with the State of Maine Department of Environmental Protection Regulation, "Chapter 151: Architectural and Industrial Maintenance (AIM) Coatings" and the following chemical restrictions expressed in grams per liter:
1. Flat Paints and Coatings: VOC content of not more than 100 g/L.
  2. Non-Flat Paints and Coatings: VOC content of not more than 150 g/L.
  3. Non-Flat Paints and Coatings - High Gloss: VOC content of not more than 250 g/L.
  4. Anticorrosive (Rust Preventative) Coatings: VOC content of not more than 400 g/L.
  5. Fire Resistive Coatings: VOC content of not more than 350 g/L.
  6. Industrial Maintenance Coatings (IMC): VOC content of not more than 340 g/L.
  7. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
  8. Quick-Dry Enamels: VOC content of not more than 250 g/L.
  9. Quick-Dry Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
  10. Specialty Primers, Sealers, and Undercoaters: VOC content of not more than 350 g/L.
  11. Stains: VOC content of not more than 250 g/L.
  12. Wood Preservatives: VOC content of not more than 350 g/L.
- C. Colors: Provide color selections made by the Architect. Allow for up to 5 different color selections.

## 2.3 PRIMERS/SEALERS

### A. Low-VOC Latex Primer/Sealer:

1. Moore: Pristine Eco Spec Interior Latex Primer Sealer, No. 231
2. Glidden Professional: 9116-1200 LifeMaster No VOC Interior Primer. (0 g/L)
3. SW: Harmony® Interior Latex Primer, B11W900 Series. (0 g/L)

### B. High-Build Primer/Sealer:

1. Glidden Professional: 1040-1200, High Build Surfacer Interior Primer Sealer. (VOC 100g/L)
2. SW: PrepRite High Build Interior Latex Primer/Surfacer B28W601 (VOC 74 g/L).
3. Moore: Super Spec Satin-Fil 172 (VOC 31g/L)

## 2.4 METAL PRIMERS

### A. Rust-Inhibitive Primer (Water Based):

1. Devoe Coatings: 4020-1000 Devflex 4020PF DTM Primer & Flat Finish. (91 g/L)
2. Moore: IMC Acrylic Metal Primer M04. (51 g/L)

3. S-W: IMC Pro-Cryl Universal Primer, B66-310 Series. (100 g/L)

## 2.5 LATEX PAINTS

### A. Low-VOC Latex (Flat):

1. Glidden Professional: 9100-XXXXN LifeMaster No VOC Interior Flat Paint (0 g/L)
2. Moore: Eco Spec Interior Latex Flat, No. 219.
3. S-W: Harmony® Interior Latex Flat B5 Series. (0 g/L)

### B. Low-VOC Latex (Low Luster):

1. Glidden Professional: 9300-XXXX LifeMaster No VOC Interior Eggshell Paint (0 g/L)
2. Moore: Pristine Eco Spec Interior Latex Eggshell, No. 223
3. SW: Harmony® Interior Latex Eg-Shel, B9 Series. (0 g/L)

### C. Low-VOC Latex (Semigloss):

1. Glidden Professional: 9200-XXXXN LifeMaster No VOC Interior Semi-Gloss Paint (0 g/L)
2. Moore: Pristine Acrylic Semi-Gloss, No. 214
3. SW: Harmony® Interior Latex Semi-Gloss, B10 Series. (0 g/L)

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  1. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
  1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions applicable to substrates indicated.

- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
  - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- E. PVC Substrates:
  - 1. Sand surfaces that will be exposed to view, and dust off.
  - 2. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- F. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
- G. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  - 4. Apply an additional coat of primer on metal surfaces that have been shop primed.
- B. Tinting: Tint primer of colors such as reds, yellows, and oranges with a gray basecoat system designed to help provide color coverage.
  - 1. Do not tint prime or base coat for multi-colored finishes.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance. Give special attention to ensure edges,

corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces. When using colors such as red, yellow or orange, an extra coat of finish may be necessary. Notify Architect when additional coats do not fix the problem.

- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
  - 1. Mechanical, Plumbing and Fire Protection Work:
    - a. Uninsulated metal piping.
    - b. Uninsulated plastic piping.
    - c. Pipe hangers and supports.
    - d. Tanks that do not have factory-applied final finishes.
    - e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
    - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    - g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
  - 2. Electrical Work:
    - a. Switchgear.
    - b. Panelboards.
    - c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

### 3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.5 INTERIOR PAINTING SCHEDULE

- A. VOC Compliance, General: Provide the manufacturers' formulations for the products specified below that comply with the VOC requirements for the State of Maine Department of Environmental Protection in paragraph 2.2 of this Section.
- B. Steel Substrates: Including, but not limited to steel doors and frames, handrails and guardrails, lintel plates and angles, metal fabrications; see Division 05 Section "Metal Fabrications", and miscellaneous metal items.
  - 1. Low-VOC Latex Over DTM Primer System:
    - a. Prime Coat: DTM anticorrosive metal primer.
    - b. Intermediate Coat: Low-VOC latex paint matching topcoat.
    - c. Topcoat: Low-VOC latex semi-gloss paint.
- C. PVC Substrates: Including interior trim.
  - 1. Low-VOC Latex System:
    - a. Prime Coat: Interior latex-based wood primer.
    - b. Intermediate Coat: Low-VOC latex paint matching topcoat.
    - c. Topcoat: Low-VOC latex (semigloss) paint.
- D. Gypsum Board Substrates:
  - 1. Low-VOC Latex System:
    - a. Prime Coat: Low-VOC latex primer/sealer.
    - b. Intermediate Coat: Low-VOC latex paint matching topcoat.
    - c. Topcoat: Low-VOC latex (eggshell) paint.
- E. Fiberglass-Faced Gypsum Board Substrates:
  - 1. Low-VOC Latex System:
    - a. Prime Coat: High-Build Primer/Sealer.
    - b. Intermediate Coat: Low-VOC latex paint matching topcoat.
    - c. Topcoat: Low-VOC latex (eggshell) paint.
- F. Cotton or Canvas Insulation-Covering Substrates: Including pipe and duct coverings.
  - 1. Low-VOC Latex System:
    - a. Prime Coat: Low-VOC latex primer/sealer.
    - b. Intermediate Coat: Low-VOC latex paint matching topcoat.
    - c. Topcoat: Low-VOC Latex flat paint.

END OF SECTION 099123

## SECTION 101400 - SIGNS

### 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 types of signs:
  - 1. Panel signs.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Samples for Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available.

#### 1.4 CLOSEOUT SUBMITTALS

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

#### 1.5 QUALITY ASSURANCE

- A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.
- B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.
- C. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.
- D. Design Concept: The Drawings indicate sizes, profiles, and dimensional requirements of signs and are based on the specific types and models indicated. Sign units by other manufacturers may be considered provided deviations in dimensions and profiles do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

1.7 COORDINATION

- A. Coordinate placement of anchorage devices with templates for installing signs.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).

2.2 PANEL SIGNS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Mohawk Sign Systems.
  - 2. Welch Architectural Signage.
- B. Substrate: Fabricate signs from 1/8 inch thick matte clear acrylic with edges mechanically and smoothly finished to eliminate cut marks. Background color to be subsurface.
  - 1. Background Color: As selected by the Architect from manufacturer's standard colors.
  - 2. Edge Condition: Straight.
  - 3. Corner Condition: Rounded to 3/8 inch radius.
  - 4. Size: 6 by 6 inch, unless noted otherwise.
- C. Copy: Helvetica.
- D. Letterform: route copy into face of substrate 1/32 inch deep. Chemically weld (inlay) computer precision cut tactile copy into routed letter openings so that tactile copy is embedded in substrate and remains at least 1/32" above surface of substrate.
  - 1. Height: 5/8 inch minimum letter height.
- E. Braille: Use engrave process for all Braille areas. Engrave Braille dots into surface of clear material.
- F. Symbols of Accessibility:
  - 1. Accessible elements: Provide international symbol of accessibility.



- a. Provide male and female symbols as required for toilets.

- G. Provide characters complying with ADA Accessibility Guidelines and ICC/ANSI A117.1. Text shall be accompanied by Grade 2 braille.

## 2.3 FINISHES

- A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Architect from the manufacturer's standards.

## 2.4 ACRYLIC SHEET FINISHES

- A. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five years for application intended.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
  - 1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
  - 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.
- B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
  - 1. Two-Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
  - 2. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.

### 3.2 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

3.3 PANEL SIGN SCHEDULE

- | A. Types:             | Sizes:          | Quantity:         |
|-----------------------|-----------------|-------------------|
| HC Accessible Symbols | Provide 4" x 4" | 4                 |
| Mens Restrooms        | Provide 8" x 6" | one for each room |
| Womens Restrooms      | Provide 8" x 6" | one for each room |
| Exit                  | Provide 6" x 6" | one for each exit |
- B. Rooms with more than one entrance door shall have a sign at each door.
- C. Final room names and numbers will be verified during the submittal.
- D. Allow for 10 informational signs, 6 by 6 inch, with minimum of 15 characters each and room number.

END OF SECTION 101400

## SECTION 102113 - TOILET COMPARTMENTS

### 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. Steel toilet compartments configured as toilet enclosures and urinal screens.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Show locations of cutouts for compartment-mounted toilet accessories.
  - 2. Show locations of reinforcements for compartment-mounted grab bars.
  - 3. Show locations of centerlines of toilet fixtures.
- C. Samples for Selection: For each type of unit indicated. Include Samples of hardware and accessories involving material and color selection.
- D. Product Certificates: For each type of toilet compartment, from manufacturer.
- E. Maintenance Data: For toilet compartments to include in maintenance manuals.

#### 1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Aluminum Extrusions: ASTM B 221.
- B. Steel Sheet: Commercial steel sheet for exposed applications; mill phosphatized and selected for smoothness.
  - 1. Electrolytically Zinc Coated: ASTM A 879/A 879M, 01Z.
  - 2. Hot-Dip Galvanized: ASTM A 653/A 653M, either hot-dip galvanized or galvanized.
- C. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless-Steel Castings: ASTM A 743/A 743M.

### 2.2 STEEL UNITS

- 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. Accurate Partitions Corporation.
  - 2. Bradley Corporation; Mills Partitions.
  - 3. Flush Metal Partition Corp.
  - 4. General Partitions Mfg. Corp.
  - 5. Global Steel Products Corp.
  - 6. Hadrian Manufacturing Inc.
  - 7. Knickerbocker Partition Corporation.
  - 8. Metpar Corp.
  - 9. Sanymetal; a Crane Plumbing company.
- B. Toilet-Enclosure Style: Overhead braced.
- C. Urinal-Screen Style: Wall hung, flat panel.
- D. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.
  - 1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch for doors and panels and 1-1/4 inches for pilasters.
  - 2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units.
  - 3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.

- E. Urinal-Screen Construction:
  - 1. Flat-Panel Urinal Screen: Matching panel construction.
- F. Facing Sheets and Closures: Electrolytically coated or hot-dip galvanized-steel sheet with nominal base-metal (uncoated) thicknesses as follows:
  - 1. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than 0.036 inch.
  - 2. Pilasters, Unbraced at One End: Manufacturer's standard thickness, but not less than 0.048 inch.
  - 3. Panels: 0.036 inch.
  - 4. Doors: Manufacturer's standard thickness, but not less than 0.030 inch.
  - 5. Flat-Panel Urinal Screens: Thickness matching the panels.
- G. Pilaster Shoes: Stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.
- H. Brackets (Fittings):
  - 1. Full-Height (Continuous) Type: Manufacturer's standard design; aluminum.
- I. Steel-Sheet Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-on finish, including thermosetting, electrostatically applied, and powder coatings. Comply with coating manufacturer's written instructions for applying and baking. Apply one color in each room.
  - 1. Color: As selected by Architect from manufacturer's full range.

## 2.3 ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
  - 1. Material: Stainless steel.
  - 2. Hinges: Manufacturer's standard continuous, cam type that swings to a closed or partially open position.
  - 3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
  - 4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
  - 5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
  - 6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

## 2.4 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- B. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide, in-swinging doors for standard toilet compartments and 36-inch- wide, out-swinging doors with a minimum 32-inch- wide, clear opening for compartments designated as accessible.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
  - 1. Maximum Clearances:
    - a. Pilasters and Panels: 1/2 inch.
    - b. Panels and Walls: 1 inch.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.2 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113

## SECTION 102800 - TOILET 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. Toilet accessories.
  - 2. Custodial accessories.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
  - 1. Construction details and dimensions.
  - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
  - 3. Material and finish descriptions.
  - 4. Features that will be included for Project.
  - 5. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
  - 1. Identify locations using room designations indicated.
  - 2. Identify products using designations indicated.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

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



1.6 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

1.7 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- C. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- D. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.2 TOILET ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated in this section or substitute product by one of the following:
  - 1. A & J Washroom Accessories, Inc.
  - 2. American Specialties, Inc.
  - 3. Bradley Corporation.
  - 4. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
- B. Toilet Tissue (Roll) Dispenser:
  - 1. Basis-of-Design Product: Bobrick No. B-2888.
  - 2. Description: Roll-in-reserve dispenser with hinged front secured with tumbler lockset.
  - 3. Mounting: Surface mounted.
  - 4. Operation: Noncontrol delivery with standard spindle.
  - 5. Capacity: Designed for 4-1/2- or 5-inch- diameter tissue rolls.
  - 6. Material and Finish: Stainless steel, No. 4 finish (satin).

C. Paper Towel (Folded) Dispenser:

1. Basis-of-Design Product: Bobrick No. B-262.
2. Mounting: Surface mounted.
3. Minimum Capacity: 400 C-fold or 525 multifold towels.
4. Material and Finish: Stainless steel, No. 4 finish (satin).
5. Lockset: Tumbler type.
6. Refill Indicators: Pierced slots at sides or front.

D. Liquid-Soap Dispenser:

1. Basis-of-Design Product: Bobrick No. B-2112.
2. Description: Designed for dispensing soap in liquid or lotion form.
3. Mounting: Horizontally oriented, surface mounted.
4. Capacity: 40 oz.
5. Materials: Stainless-steel piston, springs, and internal parts designed to dispense soap in measured quantity by pump action; and stainless-steel cover with unbreakable window-type refill indicator.
6. Lockset: Tumbler type.
7. Refill Indicator: Window type.

E. Grab Bar:

1. Basis-of-Design Product: Bobrick No. B-5806 Series.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.
  - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/4 inches.
5. Configuration and Length: As indicated on Drawings.

F. Sanitary-Napkin Disposal Unit:

1. Basis-of-Design Product: Bobrick No. B-254.
2. Mounting: Surface mounted.
3. Door or Cover: Self-closing, disposal-opening cover.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

G. Mirror Unit:

1. Basis-of-Design Product: Bobrick No. B-165.
2. Frame: Stainless-steel channel.
  - a. Corners: Welded and ground smooth.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.

- a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
  - b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
4. Size: 24 by 36 inches.

## 2.3 CUSTODIAL ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated in this section or substitute product by one of the following:
1. A & J Washroom Accessories, Inc.
  2. American Specialties, Inc.
  3. Bradley Corporation.
  4. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
- B. Mop and Broom Holder:
1. Basis-of-Design Product: Bobrick No. B-223 x 36.
  2. Description: 0.0375-inch thick, stainless-steel hat channel with four spring-loaded, rubber, cam-type, mop/broom holders.
  3. Length: 36 inches.
  4. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
  5. Material and Finish: Stainless steel, No. 4 finish (satin).

## 2.4 FABRICATION

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

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

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

END OF SECTION 102800

## SECTION 104413 - FIRE EXTINGUISHER CABINETS

### 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. Fire protection cabinets for the following:
    - a. Portable fire extinguishers.
- B. Related Sections:
  - 1. Division 10 Section "Fire Extinguishers."

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
  - 1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
  - 2. Show location of knockouts for hose valves.
- B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

1.6 COORDINATION

- A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire hoses, hose valves, and hose racks indicated are accommodated.
- C. Coordinate sizes and locations of fire protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- B. Stainless-Steel Sheet: ASTM A 666, Type 304.
- C. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.2 FIRE PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following.
  - 1. J.L. Industries: Cosmopolitan Series C8137F17.
  - 2. Larsen's: Architectural Series SS 2409-6R.
  - 3. Potter-Roemer: Alta Series 7062-A-4.
- C. Cabinet Construction: Nonrated.
- D. Cabinet Material: Enameled steel sheet.
  - 1. Shelf: Same metal and finish as cabinet.
- E. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.

1. Rolled-Edge Trim: 2-1/2-inch backbend depth.

F. Cabinet Trim Material: Stainless-steel sheet.

G. Door Material: Stainless-steel sheet.

H. Door Style: Fully glazed panel with frame.

I. Door Glazing: Clear tempered glass, 3 mm.

J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide projecting door pull and friction latch.
2. Provide manufacturer's standard hinge permitting door to open 180 degrees.

K. Finishes:

1. Manufacturer's standard baked-enamel paint for the following:

- a. Interior of cabinet and door.

2. Stainless Steel: No. 4.

L. Accessories:

1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.

- a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."

- 1) Location: Applied to cabinet glazing.
- 2) Application Process: Pressure-sensitive vinyl letters.
- 3) Lettering Color: Red.
- 4) Orientation: Vertical.

## 2.3 FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
  2. Fabricate door frames of one-piece construction with edges flanged.
  3. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

#### 2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

#### 2.5 STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
  1. Color and Gloss: As selected by Architect from manufacturer's full range.

#### 2.6 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
  1. Run grain of directional finishes with long dimension of each piece.
  2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
  3. Directional Satin Finish: No. 4.



### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine roughing-in for hose and cabinets to verify actual locations of piping connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Prepare recesses for semirecessed fire protection cabinets as required by type and size of cabinet and trim style.

#### 3.3 INSTALLATION

- A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
  - 1. Fire Protection Cabinets: 54 inches above finished floor to top of cabinet.
- B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
  - 1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire protection cabinets.

#### 3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

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- E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

## SECTION 104416 - FIRE EXTINGUISHERS

### 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 portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.
- B. Related Sections:
  - 1. Division 10 Section "Fire Extinguisher Cabinets."

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

#### 1.6 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
  - 1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.7 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Failure of hydrostatic test according to NFPA 10.
    - b. Faulty operation of valves or release levers.
  2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Amerex Corporation.
    - b. Ansul Incorporated; Tyco International Ltd.
    - c. Badger Fire Protection; a Kidde company.
    - d. Buckeye Fire Equipment Company.
    - e. J. L. Industries, Inc.; a division of Activar Construction Products Group.
    - f. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
    - g. Larsen's Manufacturing Company.
    - h. Potter Roemer LLC.
  2. Valves: Manufacturer's standard.
  3. Handles and Levers: Manufacturer's standard.
  4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
  - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers in cabinets.

END OF SECTION 104416

## **SECTION 31 10 00 - SITE CLEARING**

### **PART 1 - GENERAL**

#### 1.01 DESCRIPTION OF WORK:

Provide all labor, tools, equipment and materials necessary to protect designated structures, trees and other vegetation within clearing limits and clear the area indicated on the drawings and as necessary to complete the work.

1. Protecting trees and vegetation beyond the clearing limit as necessary.
  2. Remaining trees and other vegetation within the clearing limits.
  3. Grubbing.
  4. Stripping and stockpiling topsoil.
- A. Coordinating this work with surveyor and protect property monuments and ground control for new work.
  - B. Coordinating site clearing with installation of temporary erosion control measures.
  - C. Coordinating with Owner prior to conducting site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.
  - D. Restoring damaged improvements to their original condition, as acceptable to property owners.

#### 1.02 RELATED SECTIONS:

- A. Section 31 20 00 - Earthwork
- B. Section 31 25 13 – Temporary Erosion Control

#### 1.03 QUALITY ASSURANCE:

- A. General: Comply with requirements of Section 01 40 00 - Quality Assurance.

### **PART 2 - PRODUCTS (Not Applicable)**

### **PART 3 - EXECUTION**

#### **3.01 PROTECTION OF EXISTING TREES AND VEGETATION:**

- A. Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.
- B. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
- C. Provide protection for roots over 1-1/2 inches in diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
- D. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in a manner acceptable to Owner. Employ a licensed arborist to repair damages to trees and shrubs.

#### **3.02 SITE CLEARING:**

- A. Remove trees, shrubs, grass and other vegetation, improvements, or obstructions as required to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. "Removal" includes digging out and off-site disposal of stumps and roots. Stumps and roots may be ground and used on site as erosion control berms.
- B. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
- C. Use only hand methods for grubbing inside drip lines of trees indicated to be saved or protected.

#### **3.03 TOPSOIL STRIPPING:**

- A. Topsoil is defined as friable loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, other objects over 2 inches in diameter, weeds, roots, and other objectionable material.
- B. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.
- C. Leave topsoil in place within drip lines of trees specified to remain to prevent damage to root system.

- D. Stockpile topsoil in storage piles in areas indicated or specified as stockpile areas. Construct storage piles to provide free drainage of surface water. Cover storage piles, if required, to prevent wind erosion, or seed with temporary seed mix.
- 3.04 DISPOSAL OF WASTE MATERIALS:
- A. Remove and legally dispose of all unsuitable material, waste materials, and spoil from the site.
- B. Burning will not be permitted.
- 3.05 TRAFFIC: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction. Comply with contractor site utilization areas for access to work areas.
- 3.06 PROTECTION OF EXISTING IMPROVEMENTS: Protect improvements on adjoining properties and on Owner's property.
- 3.07 RESTORE DAMAGED IMPROVEMENTS: to their original condition, as acceptable to property owners.
- 3.08 INSTALL APPROPRIATE SOIL EROSION MEASURES: prior to commencement of work.

\* END OF SECTION 31 10 00 \*



## **SECTION 31 20 00 - EARTHWORK**

### **PART 1 - GENERAL**

#### 1.01 DESCRIPTION OF WORK:

- A. Work Includes: All excavating, filling, backfilling, removal of materials, shoring and bracing, and dewatering.

Earthwork for utilities is included in this section.

#### 1.02 PROTECTION:

- A. Paved Surfaces: Do not operate equipment on paved surfaces which will damage these surfaces. If damaged, the repair will be at the cost of the contractor.
- B. Maintain excavations with approved barricades, lights, and signs to protect life and property until excavation is filled and graded to a condition acceptable to the Engineer.
- C. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

#### 1.03 QUALITY ASSURANCE:

- A. Testing and Inspection Service by Owner: Owner will engage soil testing and inspection service for quality control testing during earthwork operations. See Section 01 40 00 for general requirements. Contractor will pay for all aggregate gradation testing. Owner will pay for moisture maximum density tests and field compaction tests as stated in Section 01 40 00.

#### 1.04 SUBMITTALS:

- A. Test Reports: Submit the following reports:
- Reports on Material Gradations
  - One optimum moisture-maximum density curve for each type of soil encountered

#### 1.05 JOB CONDITIONS:

- A. Site Information: Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn therefrom by Contractor. Data is made available for convenience of Contractor. Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner. See Geotechnical Report by S.W. Cole. It is the design intent to comply with the recommendations.

- B. Existing Utilities: Locate existing utilities in areas of work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.

Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult Owner immediately for directions. Cooperate with Owner in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of Owner.

Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when permitted in writing by Owner and then only after acceptable temporary utility services have been provided.

Keep existing sewers and sewer services in operation for the duration of the work. Maintain and operate new and existing sewers until the entire sewer system is complete and operating.

Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with Owner for shutoff of services if lines are active.

- C. Use of Explosives: Not permitted unless required by change order for rock excavation.

## **PART 2 - PRODUCTS**

### 2.01 MATERIALS:

A. General:

1. Suitable Materials: Materials shown on the Drawings, or specified herein.
2. Unsuitable Materials: Materials containing clay, vegetation, organic matter, debris, pavement, stones, or boulders over 6 inches in greatest dimension, and frozen material. Any material which, in the opinion of the Engineer, will not provide a suitable foundation or subgrade.
3. On-Site Materials: Any suitable material from on-site excavation must meet the gradation for its intended use.
4. Material for embankments and general fills may contain pieces of excavated ledge having a greatest dimension of up to 12 inches if approved by the Engineer.
5. Inspection: The Engineer may inspect off-site sources of materials and order tests of these materials to verify compliance with these specifications.

- B. Gravel: Hard, durable stone with coarse to fine sand. Sieve analysis by weight:

<u>Sieve Size</u>	<u>% Passing</u>
3"	100
1/4"	30 - 70
40	0 - 30
200	0 - 5

- C. Sand: Sieve analysis by weight:

<u>Sieve Size</u>	<u>% Passing</u>
3/8"	100
No. 4	95 - 100
No. 16	50 - 85
No. 100	2 - 10

- D. 3/4" Crushed Stone: Durable, clean angular rock fragments obtained by breaking and crushing rock material. Sieve analysis by weight:

<u>Sieve Size</u>	<u>% Passing</u>
1"	100
3/4"	95-100
1/2"	35-70
3/8"	0-25

- E. Structural Fill: Durable, clean angular rock fragments obtained by breaking and crushing rock material. Sieve analysis by weight:

<u>Sieve Size</u>	<u>% Passing</u>
4"	100
3"	90-100
1/4"	25-90
#40	0-30
#200	0-5

- F. Aggregate Base: Hard, durable crushed gravel, containing only particles passing the 2" sieve. Sieve analysis by weight:

<u>Sieve Size</u>	<u>% Passing</u>
1/2"	45-70
1/4"	30-55
No. 40	0-20
No. 200	0-5

- G. Aggregate Subbase and Gravel: Hard durable gravel containing only particles passing the 6" sieve. Sieve analysis for portion passing 3 inch sieve:

<u>Sieve Size</u>	<u>% Passing</u>
1/4"	25-70
No. 40	0-30
No. 200	0-7.0

- H. Refill Material: Crushed stone for refilling excavation below grade or rock excavation unless otherwise directed by the Engineer.

- I. Granular Fill: Sand or gravel of hard, durable particles, free from clay, organic material, vegetation, and debris.

Unsuitable Material for Granular Fill: Pieces of concrete, masonry, and pavement; stones having a dimension of 6 inches or more; material that cannot be properly compacted.

Obtain approval from the Engineer before using any material as granular fill.

- J. Select Backfill: Use gravel as specified above.

### **PART 3 - EXECUTION**

#### **3.01 EXCAVATION:**

- A. General: Remove all materials encountered to the limits shown on the drawings, or designated in the specifications.

Do not perform excavation for structure, rock excavation, or excavation below grade until material to be excavated has been cross-sectioned and classified by Engineer.

- B. Classifications: Excavation will be classified as earth excavation or rock excavation when unanticipated rock excavation is encountered in work.

Do not perform rock excavation until material to be excavated has been cross-sectioned and classified by Engineer. Rock excavation will be paid on basis of contract conditions relative to changes in work.

- C. Earth Excavation: Removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, and other materials encountered that are not classified as rock excavation or unauthorized excavation.

- D. Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

- E. Rock Excavation: Removal and disposal of materials that cannot be excavated without drilling and blasting, or the use of special equipment, except such materials that are classified as earth excavation.

Typical materials classified as rock are solid rock, rock in ledges, and rockhard cementitious aggregate deposits one cubic yard or more in volume.

Intermittent drilling or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.

- F. Rock Excavation Does Not Include:

Removal of material which can be removed with a hand pick or power shovel. Loose or previously blasted rock or broken stone in rock fills or elsewhere.

Over excavate rock encountered near the bottom of excavations as directed by Engineer if partial bearing of foundation on rock may result. Refill material, if required, will be paid for as Select Backfill.

- G. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations, and grades as shown.

- H. Excavation in Paved Areas: Cut pavement prior to excavation to provide a clean, uniform edge. Minimize disturbance of remaining pavement. Cut and remove the minimum amount of pavement required to do the work.

Use shoring and bracing where sides of excavation will not stand without undermining pavement.

- I. Excavation for Trenches: Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room.

Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations. Beyond building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freeze-ups.

Where rock is encountered, carry excavation 6" below required elevation and backfill with a 6" layer of bedding material prior to installation of pipe.

Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.

- J. Unauthorized Excavation: Removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, including refilling, is at Contractor's expense.
- K. Refilling Unauthorized Excavation:
1. Trenches: Use crushed stone or gravel.
  2. Earth Excavation for Structures: Use gravel.
  3. Elsewhere: Backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.
  4. Rock excavation for structures: Use concrete having 28-day compressive strength of 2000 psi or granular material as directed by the Engineer.
- L. Excavation Below Grade: When excavation has reached required subgrade elevations, notify Engineer who will make an inspection of conditions. If unsuitable materials exist at required subgrade elevations, carry excavations deeper and replace excavated material as directed by Engineer.

Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.

- M. Material Storage: Stockpile suitable excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.

Locate and retain soil materials away from edge of excavations.

### 3.02 STABILITY OF EXCAVATIONS:

- A. General: Slope sides of excavations to comply with OSHA regulations and local codes. Shore and brace where sloping is not possible.

Maintain sides and slopes of excavations in safe condition until completion of backfilling.

- B. Shoring and Bracing: Provide materials for shoring and bracing to comply with OSHA requirements and local codes.

Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

### 3.03 DEWATERING:

- A. General: Perform all work in the dry. Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.

Do not allow water to accumulate in excavations. Provide and maintain pumps and dewatering system components necessary to convey water away from excavations.

Convey water removed from excavations and rain water to collecting or run-off areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.

- B. Payment: Costs of dewatering are incidental to other work. No payment will be made for dewatering, including dewatering required for excavation below normal grade.

3.04 BACKFILL AND FILL:

- A. General: Place acceptable soil material in layers to required elevations as shown on the Drawings and as listed below.

Fill, backfill, and compact to produce minimum subsequent settlement of the material and provide adequate support for the surface treatment or structure to be placed on the material. Place material in approximately horizontal layers beginning at lowest area to be filled. Do not impair natural drainage.

- B. Backfill excavations as promptly as work permits, but not until completion of the following:

Acceptance of construction below finish grade, including dampening, waterproofing, and perimeter insulation.

Inspection, testing, approval, and recording locations of underground utilities and pipe.

Removal of concrete formwork.

Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.

Removal of trash and debris.

Permanent or temporary horizontal bracing is in place on horizontally supported walls.

Use care in backfilling to avoid damage or displacement of underground structures and pipe.

- C. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of materials. Plow, strip or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

- D. Placement: Place backfill and fill materials in layers not more than 12" in loose depth for material compacted by heavy compaction equipment and not more than 6" in loose depth for material compacted by hand operated tampers. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

Place backfill and fill materials evenly adjacent to structures to required elevations. Take care to prevent wedging action of backfill against structures by carrying material uniformly around structure to approximately same elevation in each lift.

Backfill cast-in-place concrete structures when the concrete has developed adequate strength. Do not allow heavy machinery within 5 feet of structure during backfilling and compacting.

- E. Pipe Bedding: Bed pipe in stone.

- F Replacement of Unsuitable Materials:

1. Below Normal Grade: See Paragraph 3.01
2. Above Normal Grade: Replace unsuitable material with suitable on-site material or common borrow. If additional material is required, use Select Backfill. Payment for Select Backfill will be made on the basis of contract conditions relative to change in the work.

3.05 COMPACTION:

- A. Methods: Use methods which produce the required degree of compaction throughout the entire depth of material placed without damage to new or existing facilities and which are approved by the Engineer. Adjust moisture content of soil as required. Remove and replace material which is too wet to compact to required density.
- B. Degree of Compaction: Compact to the following minimum densities:

Fill & Backfill Location	Density
Under Structure Foundations	95% of max.
Top 2 Feet Under Pavement	95%
Below Top 2 Feet Under Pavement	93%
Trenches Through Unpaved Areas	90%
Embankments	90%
Pipe Bedding	90%
Within 10 Feet of Structure Foundation Walls, Tank Walls, & Retaining Walls	91-93%
Subfloor Fill Not Supporting Footings	92%

Maximum Density: ASTM D1557, modified



Field Density Tests: ASTM D1556 (sand cone), ASTM D2167 (rubber balloon), or ASTM D2922 (nuclear)

- C. Testing: Determine actual in-place densities using field tests as directed by the Engineer. Tests will be made by an independent laboratory. Costs for initial tests will be paid by Owner; see Section 01 40 00.

Perform additional work to obtain proper compaction if in-place densities do not meet the specified densities. Retesting may be required by the Engineer.

- D. Minimum Number of Tests:

1. Footing Subgrade: For each strata of soil on which footings will be placed, conduct at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be related tested strata, when acceptable to Engineer.
2. Paved Areas and Building Slab Subgrade: Make at least one field density test of subgrade for every 2,000 square feet of paved area or building slab, but in no case less than 3 tests. In each compacted fill layer, make one field density test for every 2,000 square feet of overlaying building slab or paved area, but in no case less than 3 tests.
2. Foundation Wall Backfill Outside of Structure: Make at least two field density tests at locations and elevations as directed.

### 3.06 GRADING:

- A. Grading: Uniformly grade areas within limits of grading, including adjacent transition areas. Smooth finished surface within specified tolerances and compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
- B. Grading Outside Building Lines: Grade areas adjacent to structure line to drain away from structures and to prevent ponding.
- C. Finish surfaces free from irregular surface changes as follows:
1. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 1/2" above or below required subgrade elevation.
  2. Fill Under Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2" when tested with a 10' straightedge.
  3. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10' above or below required subgrade elevations.

- 4. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.10' above or below required subgrade elevation.
- D. Compaction: After grading, compact subgrade surfaces to the percentage of maximum density for each area classification.
- E. Pavement Base: Place on prepared subgrade in layers of uniform thickness conforming to indicated cross-section and thickness.

3.07 PAVEMENT SUBBASE COURSE:

- A. General: Subbase course consists of placing subbase material, in layers of specified thickness, over subgrade surface to support a pavement base course.
- B. Grade Control: During construction, maintain lines and grades, including crown and cross-slope of subbase course.
- C. Placing: Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.

When a compacted subbase course is shown to be 6" thick or less, place material in a single layer. When shown to be more than 6" thick, place material in equal layers, except no single layer more than 6" or less than 3" in thickness when compacted.

3.08 BUILDING SLAB DRAINAGE COURSE:

- A. General: Drainage course consists of placement of drainage fill material, in layers of indicated thickness, over subgrade surface to support concrete building slabs.
- B. Placing: Place drainage fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations. When a compacted drainage course is shown to be 6" thick or less, place material in a single layer. When shown to be more than 6" thick, place material in equal layers, except no single layer more than 6" or less than 3" in thickness when compacted.

3.09 MAINTENANCE:

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

- B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

3.10 DISPOSAL OF EXCESS AND WASTE MATERIALS:

- A. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of it off Owner's property.
- B. Removal to Designated Areas on Owner's Property: Transport acceptable excess excavated material to designated soil storage areas on Owner's property. Stockpile soil or spread as directed by Engineer.

3.10 GEOTEXTILES:

- A. Install as shown on the Drawings in accordance with manufacturer's recommendations.

\* END OF SECTION 31 20 00 \*

## **SECTION 31 25 13 - TEMPORARY EROSION CONTROL**

### **PART 1 - GENERAL**

#### 1.01 DESCRIPTION OF WORK:

- A. Provide and maintain erosion control devices to control erosion that occurs during construction operations, prior to completion of permanent erosion control devices.
- B. Related Work Specified Elsewhere: Other specifications sections which directly relate to the work of this section include, but are not limited to the following:
  - 1. Stripping of Topsoil: Section 31 10 00 - Site Clearing.
  - 2. Establishment of Subgrade Elevation: Section 31 20 00 - Earthwork

#### 1.02 QUALITY ASSURANCE:

- A. Prior to the start of construction, meet with the Engineer to discuss erosion control requirements.
- B. Payment of fines issued to Owner as a result of poor erosion control by the Contractor.

#### 1.03 SUBMITTALS:

- A. Prepare an Erosion Control Program and submit to Engineer for approval prior to construction startup.

### **PART 2 - MATERIALS**

- 2.01 Use the following materials in construction of erosion control devices. Other materials require approval of the Engineer.
  - A. Baled Hay: Securely tied and staked twice per bale.
  - B. Sand Bags: Heavy cloth bags of approximately 1 cubic foot capacity filled with sand or gravel.
  - C. Mulches:
    - 1. Asphalt emulsion, loose hay, straw, pine straw or needles, sawdust, wood chips, wood excelsior, or wood fiber cellulose.
    - 2. Type and use as specified in the Maine Erosion and Sediment Control Handbook For Construction: Best Management Practices prepared by the Cumberland County

Soil and Water Conservation District and the DEP, March 1991, hereinafter referred to as the BMP's.

D. Mats and Nettings:

1. Twisted craft paper, yarn, juts, excelsior, wood fiber mats, glass fiber, and plastic film.
2. Type and use shall be as specified by the Environmental Quality Handbook.

E. Seed:

1. Standard conservation mix of 100% annual rye grass or field brome grass.
2. Equivalent seed mixture as approved by the Engineer.

F. Sod:

1. Grown from certified seed of adapted varieties to produce high quality sod free of any serious thatch, weeds, insects, diseases, and other pest problems.
2. At least one year old and not older than three years. Cut with a 1/2-inch to 1-inch layer of soil.

G. Drains:

1. Flexible drains consisting of collapsible neoprene pipe, minimum 8-inch diameter, or an approved equal.
2. Corrugated metal pipe and inlet or a gauge consistent with the loading conditions, minimum 12-inch diameter or approved equal.

H. Siltation Fence: Mirafi Environfence or approved equal.

**PART 3 - EXECUTION**

3.01 TEMPORARY DEVICES: Use the following devices to control erosion. Other devices require approval of the Engineer.

- A. Temporary Erosion Checks: Construct temporary erosion checks at 100-foot minimum intervals in ditches or where designated by the Engineer using baled hay and temporary siltation fence.
- B. Temporary Berms: Construct temporary barriers along the toe of embankments using side drains as required.
- C. Temporary Slope Drains: Drains shall be collapsible pipe with corrugated metal pipe inlet.

- D. Sedimentation Basins: Barriers and berms shall be used to construct sedimentation basins to prevent off-site transport of silt with site runoff. Basins shall be sized to limit pass-through flow velocities to 0.01 feet per minute.

3.02 APPLICATION RATES:

- A. Seed for Temporary Cover: 40 pounds per acre
- B. Loose Hay or Straw: 2 tons per acre

3.03 REMOVAL OF TEMPORARY EROSION CONTROL:

- A. Temporary materials and devices shall be removed when permanent soil stabilization has been achieved. Materials in good condition may be reused on the site if approved by the Engineer. Materials unsuitable for reuse shall become the property of the Contractor and shall be disposed of in a manner and location approved by the Engineer.

\* END OF SECTION 31 25 13 \*

## **SECTION 32 12 16 – ASPHALT PAVING**

### **PART 1 - GENERAL**

#### 1.01 RELATED DOCUMENTS

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

#### 1.02 SUMMARY

- A. Section Includes:

1. Hot-mix asphalt patching.
2. Hot-mix asphalt paving.
3. Hot-mix asphalt paving overlay.
4. Pavement-marking paint.

- B. Related Sections:

1. Division 02 Section "Structure Demolition" for demolition, removal, and recycling of existing asphalt pavements, and for geotextiles that are not embedded within courses of asphalt paving.
2. Division 31 Section "Earthworks" for aggregate subbase and base courses and for aggregate pavement shoulders.

#### 1.03 DEFINITION

- A. Hot-Mix Asphalt Paving Terminology: MDOT "Standard Specifications" section 401.08.

#### 1.03 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
2. Job-Mix Designs: For each job mix proposed for the Work.

- B. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

- C. Material Certificates: For each paving material, from manufacturer.

- D. Material Test Reports: For each paving material.

#### 1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: MDOT Standard Specifications Section 401.08
- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.
- C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Standard Specifications Highways and Bridges of MDOT for asphalt paving work.
  - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.
- D. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
    - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
    - b. Review condition of subgrade and preparatory work.
    - c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
    - d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

#### 1.07 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
  - 1. Prime Coat: Minimum surface temperature of 50 deg F (15.6 deg C).
  - 2. Tack Coat: Minimum surface temperature of 50 deg F (15.6 deg C).
  - 3. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
  - 4. Asphalt Surface Course: Minimum surface temperature of 50 deg F (15.6 deg C) at time of placement.



- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4.4 deg C) for oil-based materials, 55 deg F (12.8 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

## **PART 2 – PRODUCTS**

### 2.01 MATERIALS

- A. Comply with material requirements, MDOT “Standard Specifications”.
- B. Water: Potable.

### 2.02 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.
- B. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.
  - 1. Color: White and Blue as indicated.
- C. Glass Beads: AASHTO M 247, Type 1.

### 2.03 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:
  - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
  - 2. Base Course: 19.0 mm
  - 3. Surface Course: 9.5 mm

## **PART – EXECUTION**

### 3.01 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
  - 1. Completely proof-roll subgrade in one direction repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
  - 2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).

3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.
  - D. Verify that utilities, traffic loop detectors, and other items requiring a cut and installation beneath the asphalt surface have been completed and that asphalt surface has been repaired flush with adjacent asphalt prior to beginning installation of imprinted asphalt.

### 3.02 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
  1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- C. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

### 3.03 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.
  1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch (6 mm).
  1. Clean cracks and joints in existing hot-mix asphalt pavement.
  2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
  3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

### 3.04 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
  - 1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.
- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
  - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

### 3.05 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
  - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
  - 2. Place hot-mix asphalt surface course in single lift.
  - 3. Spread mix at minimum temperature of 250 deg F (121 deg C).
  - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
  - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.
  - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

### 3.06 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
  - 1. Clean contact surfaces and apply tack coat to joints.
  - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
  - 3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).

4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

### 3.07 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
  1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
  1. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent nor greater than 100 percent.
  2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

### 3.08 ASPHALT CURBS

- A. Construct hot-mix asphalt curbs over compacted pavement surfaces. Apply a light tack coat unless pavement surface is still tacky and free from dust. Spread mix at minimum temperature of 250 deg F (121 deg C).
  - 1. Asphalt Mix: Same as pavement surface-course mix.
- B. Place hot-mix asphalt to curb cross section indicated or, if not indicated, to local standard shapes, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.

### 3.09 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
  - 1. Base Course: Plus 1/2 inch (13 mm)., no minus
  - 2. Surface Course: Plus 1/4 inch (6 mm), no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
  - 1. Base Course: 1/4 inch (6 mm)
  - 2. Surface Course: 1/8 inch (3 mm)
  - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

### 3.10 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to age for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).
  - 1. Broadcast glass beads uniformly into wet pavement markings at a rate of 6 lb/gal. (0.72 kg/L).

### 3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to AASHTO T 168.
  - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
  - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
    - a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than 3 cores taken.
    - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- E. Replace and compact hot-mix asphalt where core tests were taken.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

### 3.12 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
  - 1. Do not allow milled materials to accumulate on-site.

\* END OF SECTION 32 12 16 \*

## **SECTION 32 14 10 - PRECAST CONCRETE PAVERS**

### **PART 1 - GENERAL**

#### **1.1 APPLICABLE PUBLICATIONS:**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

#### **1.1.1 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS:**

ASTM C150-82	Cement, Portland
ASTM C595-82	Blended Hydraulic Cements
ASTM C936-82	Standard Specifications for Solid Concrete Interlocking Paving Units

#### **1.1.2 AMERICAN CONCRETE INSTITUTE (ACI) PUBLICATION:**

ACI 301-81	Structural Concrete for Buildings
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#### **1.1.3 PRESTRESSED CONCRETE INSTITUTE (PCI):**

PCI MNL116	1985 Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products
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#### **1.2 SUBMITTALS:**

##### **1.2.1 MANUFACTURER'S CATALOG DATA:**

- A. Provide catalog information on all products/accessories within this section.

##### **1.2.2 SAMPLES:**

- A. Provide color catalog showing paver manufacturer's standard colors.
- B. Provide one (1) paver of each type/color to be used for this work.
- C. Sample Paving Panels: Construct a 3' x 3' sample panel of each paver material. Panel shall be constructed of the indicated paver, setting

materials, bond pattern, joint treatment, etc., as indicated on the drawings.

1. Panel shall not be constructed in a location becoming part of the final pavement and shall remain undisturbed until all paving is complete. Remove panel upon completion of paving.
2. Obtain the Architect's approval of sample before starting paving work. The approved samples shall become the standard for entire job.

### 1.2.3 CERTIFICATES:

- A. Manufacturer's certification that products meet specification requirements.
- B. Proven Field Performance — Satisfactory field performance is indicated with units similar in composition, and made with the same manufacturing equipment as those to be supplied for this project. Pavers shall not exhibit objectionable deterioration such as cracking and spalling for one (1) year after date of installation.

### 1.3 WORK INCLUDED:

- A. Supply and place 2" bituminous paving as setting bed.
- B. Supply and install concrete paving stones and accessories in quality, shape, and thickness as specified. Color to be as selected by the Landscape Architect.

### 1.4 DELIVERY AND STORAGE:

- A. Paving stones shall be delivered and unloaded at job site with or without pallets and bound in such a manner that no damage occurs to the product during handling, hauling and unloading.

## PART 2 - PRODUCTS

### 2.1 MATERIALS:

#### 2.1.1 CONCRETE PAVERS:

Concrete Pavers: Pavers shall be modular 4x8, color – light gray field with dark gray soldier course.



A. Physical Requirements:

1. Compressive Strength — At the time of delivery to the work site, the average compressive strength shall not be less than 8000 PSI with no individual unit strength less than 7200 PSI with testing procedures in accordance with ASTM Standard C-140.
2. Absorption — The average absorption shall not be greater than five percent (5%) with no individual unit absorption greater than seven percent (7%).

2.1.2 PAVER EDGE RESTRAINT:

Provide paver edge restraints at all free (non-contained) paver edges. Edging shall be P.V.C. sections: Rigid for straight runs; flexible for curves and radiuses. All sections shall have pre-drilled holes for anchoring spikes. Provide 10" hot dipped galvanized coated anchoring spikes. Maximum hole spacing shall be 1' o.c. Provide P.V.C. pipe connectors as recommended by the manufacturer. Acceptable products/manufacturers are:

"Pave Edge" by Pave Tech., Inc.

NOTE: Where edge restraint is used, the base material shall extend to 6" beyond the paver edge.

PART 3 - EXECUTION

3.1 INSTALLATION:

3.1.1 SUBGRADE, BASE, AND SETTING BED REQUIREMENTS:

- A. Subgrade: Subgrade to be compacted to a 95% density, with particular attention being paid to trenches and filled foundation areas. Refer to the requirements in Section 312000 — "Earthwork"
- B. Base: Base requirements shall be as per plans and as specified. Base requirements shall be from crushed road base, compacted to 96% density. Base shall be fine graded and compacted to 3½" below desired finished grade for 6 cm stone, and 4¼" below desired finished grade for 8 cm stones. Maximum allowable tolerance for both subgrade and base is ¼".

3.1.2 PAVING UNITS:

The handling of paving units shall not cause chipping or cracking of the concrete. Members injured in any manner by handling or installation methods shall not be patched but shall be replaced with new members at the expense of the Contractor. The handling of the paving members shall be by means of suitable equipment and the following:

- A. The contractor shall have experience in installation of concrete pavers.
- B. Pavers shall be laid hand tight with care taken to maintain straight and true lines. Joints between pavers shall be no greater than 1/8" in width.
- C. Paving stones shall be taken in a random fashion from 3 or more pallets at the same time to blend color variations.
- D. Any necessary cutting shall be accomplished with a masonry saw to insure all cuts fit neatly and accurately without damaged edges. Care shall be taken during the layout to minimize cutting.
- E. Care should be taken when transporting material over uncompacted paving stones to prevent damage to the pavement or premature compaction of the sand bedding.
- F. Upon completion of work covered in this Section, the Contractor shall clean up all work areas by removing debris, surplus material, and equipment from the site.
- G. Install grid pavers in strict accordance with this specification and the manufacturer's written requirements.

### 3.2 INSPECTION:

- 3.2.1 Verify that earthwork is completed to correct line and grade.
- 3.2.2 Check that subgrade is smooth, compacted, and free of frost or excessive moisture.
- 3.2.3 Do not commence work until conditions are satisfactory.

### 3.3 VISUAL INSPECTION:

- 3.3.1 All units shall be sound and free of defects that would interfere with the proper placing of the unit or impair the strength or permanence of the construction.
- 3.3.2 Replace defective work which is found unacceptable to the Landscape Architect.

### 3.4 EDGE RESTRAINTS

Install restraints at all free (non-contained) paver edges. Install in strict accordance with manufacturer's recommendations.

END OF SECTION 02510

## **SECTION 32 15 01 – GRANITE CURBING**

### **PART 1 – GENERAL**

#### 1.01 GENERAL PROVISIONS

- A. The Conditions of the Contract and all sections of divisions are hereby made a part of this section.

#### 1.02 DESCRIPTION OF WORK

- A. Work included: Provide labor, materials, and equipment necessary to complete the work of this section, and without limiting the generality thereof furnish and install the following:

1. Section 31 10 01 - Site Clearing
2. Section 31 20 01 – Earthwork
3. Section 32 12 16 – Asphalt Paving
4. Coordinate setting of curbs with related work.

#### 1.03 QUALITY ASSURANCE AND SUBMITTALS

- A. General: Comply with the requirements of Section 01 60 00
- B. Reference Standards: Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, most restrictive requirements govern.
1. American Society for Testing Materials (ASTM):  
  
C 131 Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.  
  
C 615 Structural granite
  2. State of Maine Department of Transportation (MDOT): Standard Specifications for Highways and Bridges (1995 Edition)
- C. Product Data: Submit product data for curbing and accessory materials.
1. Include certificate of compliance for materials.

#### 1.04 JOB CONDITIONS

- A. Weather Limitations: Comply with requirements in MDOT.

- B. Work on Public Ways: Comply with all regulations and requirements of local/state agencies having jurisdiction.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver curbing to job adequately protected from damage during transit.
- B. Protect curbing against staining, chipping and other damage. Cracked, badly chipped, or stained units will be rejected and not employed in the Work.

### **PART 2 – PRODUCTS**

#### 2.01 GRANITE CURBING

- A. Granite: Provide structural granite conforming to ASTM C 615, Class I Engineering Grade, suitable for curbstone use.
  - 1. Provide material that is light gray, free from seams which impair structural integrity and with percentage of wear less than 32 percent as determined by ASTM C 131.
- B. Curbing: Provide curbing complying with MDOT Specifications Section 712.04, Vertical Curb, Type 1 and sloped Granite Curbing complying with MDOT Material Specifications 712.04.
  - 1. Provide radius curbing where indicated.
  - 2. Provide with split-face and sawn top.

### **PART 3 – EXECUTION**

#### 3.01 SETTING CURBING

- A. Install as indicated on Drawings and except as otherwise specified or indicated in compliance with MDOT 609.03.
- B. Set curbing in 18-inch wide trench, with trench bottoms at 6 inches below bottom of curb. Fill excavation to required level with base course material conforming to requirements of Section 31 20 00 – Earthwork.
- C. Set curb with vertical face plumb, curb top parallel to adjacent surface.
- D. Set curb accurately to line and grade. Fit units as closely together as possible. Do not field cut curbing.

1. Do not exceed 1/2 inch width for expansion joints.
- E. Backfill material on each side of curb as specified for adjacent surface, thorough compacted by power tampers. Exercise extreme care not to destroy alignment.
1. Reset any curb section disturbed during backfilling or otherwise reset to proper line and grade and properly backfill.

\*END OF SECTION 32 15 01\*

**SECTION 32 92 00 - LAWNS AND GRASSES**

**PART 1 - GENERAL**

1.01 GENERAL PROVISIONS:

- A. The Conditions of the Contract and all Sections of Division are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

- A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this Section, and without limiting the generality thereof furnish and install the following:

1. Topsoil.
2. Seeding.
3. Sodding.

- B. Related Work Specified Elsewhere: Carefully examine all Contract Documents for requirements which affect the work of this Section. Other specifications sections which directly relate to the work of this section include, but are not limited to the following:

1. Stripping of Topsoil: Section 31 10 00 - Site Clearing.
2. Establishment of Subgrade Elevation: Section 31 20 00 - Earthwork.

1.03 QUALITY ASSURANCE; SUBMITTALS:

- A. General: Comply with requirements of Section 01 40 00-Quality Assurance and Section 01 33 00-Submittals.

- B. Reference Standards: Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, most restrictive requirements govern.

1. American Society for Testing and Materials (ASTM): C136 Sieve Analysis of Fine and Coarse Aggregates, E11 Wire-Cloth Sieves for Testing Purposes

- C. Manufacturers Product Data: Submit manufacturer's product data for following materials:

1. Aluminum Sulfate
2. Fertilizer

- D. Certificates of Compliance: Submit labels from manufacturer's container certifying that product meets specified requirements, for the following materials:

1. Grass Seed
2. Ground Limestone
3. Commercial Fertilizer

1.04 INSPECTION AND TESTING:

- A. Work will be subject to inspection at all times by Engineer. Owner reserves the right to engage an independent testing laboratory in accordance with the requirements of Section 01 40 00, Testing Laboratory Services, to analyze and test materials used in the construction of the work. Where directed by Engineer, the testing laboratory will make material analyses and will report to Engineer whether materials conform to the requirements of this specification.
1. Cost of initial tests and material analyses made by the Testing Laboratory will be borne by the Owner. Costs of retesting resulting from initial tests indicating non-compliance shall be borne by Contractor.
  2. Testing equipment will be provided by and tests performed by Testing Laboratory. Upon request by Engineer, Contractor shall provide such auxiliary personnel and services needed to accomplish the testing work and to repair damage caused thereby to the permanent work.
- B. Testing, analyses, and inspection required by Contractor for own information or guidance shall be at Contractor's expense.

1.05 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver seed in original sealed containers, labeled with analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging, location of packaging, and name of seed grower. Damaged packages will not be accepted.
- B. Deliver fertilizer in sealed waterproof bags, printed with manufacturer's name, weight, and guaranteed analysis.

1.06 PLANTING SEASON:

- A. Planting season for seeding shall be as follows:

<u>Item</u>	<u>Planting Period</u>	
	<u>Spring</u>	<u>Fall</u>
Seed Mix - Lawn Grass	5/1 to 7/1	8/20 to 10/1

- B. Perform planting only when weather and soil conditions are suitable for planting the material specified in accordance with locally accepted practice.



C. Planting season may be extended with written permission of Engineer.

1.07 ACCEPTANCE:

A. Acceptance:

1. Engineer will inspect all work for Substantial Completion upon written request of Contractor. Request shall be received at least ten calendar days before anticipated date of inspection.
2. Acceptance of material by Engineer will be for general conformance to specified requirements, and shall not relieve Contractor of responsibility for full conformance to Contract Documents.
3. Upon completion and reinspection of all repairs or renewals necessary in the judgement of Engineer, Engineer will recommend to Owner that the work of this Section be accepted.

B. Seeded areas will be accepted only when in compliance with all the following conditions:

1. Roots are thoroughly knit to the soil;
2. All areas show a uniform stand of specified grass in healthy condition;
3. At least 60 days have elapsed since completion of work under this Section.

**PART 2 - PRODUCTS**

2.01 SEED:

A. Seed Mixture: Standard grade seed of the most recent season's crop, dry and free of mold, mixture as follows:

<u>Name of Seed</u>	<u>% by Weight in Mixture</u>	<u>Minimum % Purity</u>	<u>Minimum % Germination</u>
Pennlawn Creeping Red Fescue	50	98	90
Kentucky 31 Tall Fescue	30	95	90
Common Perennial Ryegrass	10	95	90
Red Top	5	90	95
Ladino Clover	5	85	96

2.02 TOPSOIL:

- A. Obtain topsoil from a previously established stockpile on the site, to extent available. Obtain additional topsoil from Engineer approved off-site sources. If on site topsoil is used, modify soil to meet the standards.
- B. Topsoil, whether stripped from site or supplied from off-site, shall be a sandy loam or loam soil as defined by the USDA Soil Conservation Service, Soil Classification System, and shall have the following mechanical analysis:

<u>Textural Class</u>	<u>% of Total Weight</u>	<u>Average</u>
Sand (0.05-2.0 mm dia. range)	45 to 75	60
Silt (0.002-0.05 mm dia. range)	15 to 35	25
Clay (less than 0.002 mm dia. range)	5 to 10	7

- 1. 95% of topsoil shall pass a 2.0 mm sieve.
- 2. Topsoil shall be free of stones 1 inch in longest dimension, earth clods, plant parts, and debris.
- 3. Organic matter content shall be 4 to 8% of total dry weight.
- C. Provide topsoil having a pH value range of 6.0 to 6.5. If the soil does not fall within the pH range specified, it may be amended to bring the pH within the specified limit.

2.03 PEAT MOSS:

- A. Provide horticultural grade, sphagnum peat moss containing partially decomposed fibrous or cellular stems and leaves of any of the many species of sphagnum mosses from fresh water sources, conforming to following requirements:
  - 1. Homogeneous material free of decomposed colloidal residue lumps, roots, stones, and other foreign matter; and of such consistency that peat can pass a 1/2 inch mesh and can be readily incorporated with the topsoil.
  - 2. pH not less than 3.5 nor greater than 6.0 at 25 deg. C.
  - 3. Organic matter content not less than 90%, by weight, on an oven-dry basis.
  - 4. Ash content not more than 10%, by weight, on an oven-dry basis.
  - 5. Moisture absorption capacity not less than 800%, by weight, on an oven-dry basis.

2.04 LIMESTONE:

- A. Ground Limestone: An agricultural limestone containing minimum of 85% total carbonates, by weight, graded within the following limits:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
No. 10	100
No. 20	90
No. 100	60

2.05 WATER:

- A. Water shall be suitable for irrigation and free from ingredients harmful to seeded areas.

2.06 ALUMINUM SULFATE:

- A. Aluminum sulfate shall be unadulterated and shall be delivered in containers with the name of the material and manufacturer, and net weight of contents.

2.07 COMMERCIAL FERTILIZER:

- A. Provide fertilizer conforming to the following:
1. When applied as a topsoil amendment, provide fertilizer having an analysis that will deliver appropriate amounts of nitrogen, phosphorus, and potassium as required to remedy deficiencies revealed by testing the topsoil.
  2. When used as a top dressing for the maintenance of sod, conform to following:
    - a. 50% of nitrogen from natural organic source of ureafoam.
    - b. Available phosphorus derived from superphosphate, bone meal, or tankage.
    - c. Potassium derived from muriate of potash containing 60% potash.
- B. Deliver fertilizer in manufacturer's standard container printed with manufacturer's name, material weight, and guaranteed analysis.
- C. Fertilizers with N-P-K analysis other than that stated above may be used provided that the application rate per square foot of nitrogen, phosphorus, and potassium is equal to that specified.

**PART 3 - EXECUTION**

3.01 PREPARATION OF SUBGRADE:

- A. Examine subgrade to assure that rough grading and all other subsurface work in lawn areas and other areas to be seeded is done prior to start of seeding.
- B. Loosen existing subgrade or scarify to a minimum depth of 3 inches prior to spreading topsoil. Bring subgrade to true and uniform grade. Clear of stones greater than 3 inches, stocks, and other extraneous material.

3.02 SPREADING OF TOPSOIL:

- A. Spread topsoil until it is possible to follow immediately or within 24 hours with seeding operations. If topsoil is spread prior to this time, cultivate to loosen soil prior to seeding.
- B. Do not place soil when subgrade or topsoil materials are frozen, excessively wet, or excessively dry.
- C. Spread topsoil in a uniform layer, to a thickness which will compact to depth required to bring final lawn and grass surfaces to required elevation. Unless otherwise indicated, provide minimum topsoil depth of 6 inches.
- D. Grade and smooth surfaces, eliminating all sharp breaks by rounding, scraping off bumps and ridges, and filling in holes and cuts.

3.03 APPLICATION OF FERTILIZER AND CONDITIONERS:

- A. Apply fertilizer and conditioners at following rates:
  - 1. Peat Moss: 1 inch thick.
  - 2. Limestone: As required by test results of topsoil.
  - 3. Fertilizer: As required by test results of topsoil.
- B. Mixing with Topsoil:
  - 1. Spread fertilizer and conditioners over entire lawn areas at application rates indicated above.
  - 2. Uniformly and thoroughly mix material into top 4 inches of topsoil by discing, rototilling, or other approved method.

3.04 FINISH GRADING:

- A. Provide final surface of topsoil immediately before seeding with +1/2 in. of required elevation, with no ruts, mounds, ridges, or other faults, and no pockets or low spots in which water can collect. Remove stones, roots, and other debris greater than 1 in. in any dimension, which are visible at the surface, and fill resulting holes with topsoil, leaving a uniform planar surface.

B. Finish grade surface with a drag or rake. Round out all breaks in grade, smooth down all lumps and ridges, fill in all holes and crevices. Rolling with a light roller is acceptable, if surface is scarified afterward.

C. In event of settlement, readjust work to required finished grade.

3.05 SEED APPLICATION:

A. Broadcast seed by means of an approved mechanical spreader, to give a uniform application at the following rates:

<u>Seed</u>	<u>Application Rate lb/1,000 s.f.</u>
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Seed Mixture - Lawn Grass	4.5
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B. Apply seed in two equal applications for uniform coverage; direction of travel of spreader for second pass perpendicular to that of the first pass. Do not seed when it is raining or snowing, or when wind velocity exceeds 5 mph.

1. At Contractor's option, and with the permission of Engineer, seed may be spread by hydroseeding method, utilizing power equipment commonly used for that purpose. Mix and apply seed, lime, fertilizer, and mulch to achieve application quantities specified herein for the conventional seeding method, with mulch applied at the rate of 1,200 lb/acre. Other provisions specified for conventional seeding also apply to hydroseeding.

C. Protect seeded slopes greater than 1:2 against erosion with erosion netting or other methods acceptable to Engineer.

D. Following seeding, lightly rake the area to mingle seed with top 1/8 to 1/4 in. of soil, then fine grade. Remove stones and other debris greater than 1 in. in any dimension which are visible on surface. Roll surface with hand roller having a weight of 60 to 90 lb/ft of width, and a minimum diameter of 2 feet.

E. Following seeding and raking, water entire area by use of lawn sprinklers, or other approved means. Continue initial watering until equivalent of a 2-in. depth of water has been applied to entire seeded surface, at rate which will not dislodge the seed. Repeat watering thereafter as frequent as required to prevent drying of the surface, until grass attains an average height of 1/4 in. Watering methods and apparatus which may cause erosion of the surfaces are not permitted.

3.06 MAINTENANCE:

A. Except as otherwise specified below, include all operations required to produce an established lawn, including but not limited to:

1. Fertilizing

2. Mowing

3. Replanting
  4. Watering
  5. Weeding
- B. Begin maintenance of seeded areas upon completion of seeding and continue until acceptance of the building, until mowing as specified below is completed, or until average height of grass is 1-1/2 in., whichever occurs later.
- C. After grass has sprouted, replace seeded areas which fail to show a uniform stand of grass as often as necessary to establish acceptable stand of grass.
1. Scattered bare spots shall not exceed 72 square inches each.
- D. Do first mowing when average height of grass is 2-1/2 in., with mower set to cut at a height of 1-1/2 in. Perform subsequent mowings at not over two week intervals, with height of cut set at 1-1/2 in. With prior permission of owner, mowings during periods of slow growth or dormancy may be spaced at greater intervals.
- E. Remove weed and growth other than varieties of grass named in grass seed formula. Removal may be accomplished by use of suitable herbicides or by physical removal, in which case remove both top growth and roots, and reseed bare spots exceeding specified limits.
- F. If lawn or grass is established in the fall maintenance is required to continue into spring months. Provide an extra application of lime and fertilizer to lawn and grass in the spring. Spread lime and fertilizer in a uniform layer over entire lawn surface, at following rates:

<u>Material</u>	<u>Application Rate</u>
Lime	100 lb/1000 sf
Fertilizer	20 lb/1000 sf

\* END OF SECTION 32 92 00 \*

## **SECTION 32 93 00 - PLANTS**

### **PART 1 - GENERAL**

#### 1.01 DESCRIPTION OF WORK

- A. General: Provide and install all trees and shrubs as shown on drawings. This work includes preparation of subsoil, planting, protection and maintenance of the plant materials.

#### 1.02 RELATED SECTIONS

- A. Section 31 20 00 - Earthwork
- B. Section 32 92 00 - Lawns and Grasses

#### 1.03 QUALITY ASSURANCE

- A. Standards: ANSI - Z60.1 "American Standards for Nursery Stock".
- B. Subcontract landscape work to a single firm specializing in landscape work.
- C. Do not make substitutions. If specialized landscape materials is not obtainable, submit proof or non-availability to Engineer, together with proposal for use of equivalent material.

Analysis and Standards: Package standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

Topsoil: Before delivery of topsoil, furnish Engineer with written statement giving location of properties from which topsoil is to be obtained, names and addresses of owners, depth to be stripped, and crops grown during past 2 years.

- D. Trees, Shrubs, and Plants: Provide trees and shrubs of quantity, size, genus, species, and variety shown and scheduled for landscape work.
- E. Label at least one tree and one shrub of each variety with a securely attached waterproof tag bearing legible designation of botanical and common name.

#### 1.04 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Plant and Material Certifications:
  - 1. Manufacturer's or vendor's certified analysis for soil amendments and fertilizer materials.

2. Label data substantiating that plants, trees, shrubs and planting materials comply with specified requirements.
- C. Planting Schedule: Indicate dates for each type of landscape work during normal seasons for such work in area of site. Correlate with specified maintenance periods to provide maintenance from date of substantial completion. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.
- D. Maintenance Instructions: Typewritten instructions recommending procedures to be established by Owner for maintenance of landscape work for one full year. Submit prior to expiration of required maintenance period(s).

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Trees and Shrubs: Provide freshly dug trees and shrubs or those in containers for at least one season. Provide protective covering during delivery, cover to protect from wind exposure during delivery. Do not drop balled and burlapped stock during delivery.
- B. Deliver trees and shrubs after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture.
- C. Do not remove container-grown stock from containers until planting time.

#### 1.06 JOB CONDITIONS

- A. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.
- B. Do not install plants when ambient temperatures go below 35 degrees F. or above 90 degrees F.
- C. Do not install plants when wind velocity exceeds 30 mph.

#### 1.07 SEQUENCING AND SCHEDULING

- A. Planting Time: Proceed with, and complete landscape work as rapidly as portions of site become available.
- B. Plant or install materials during normal planting seasons for each type of plant material required.
- C. Correlate planting with specified maintenance periods to provide maintenance from date of substantial completion.



#### 1.08 PROJECT WARRANTY

- A. Warranty trees and shrubs, for a period of one year after date of substantial completion, against defects including death and unsatisfactory growth, except for defects resulting from neglect by Owner, abuse or damage by others, or unusually phenomena or incidents which are beyond Landscape Installer's control.
- B. Remove and replace trees, shrubs, or other plants found to be dead or in unhealthy condition during warranty period. Make replacements during growth season following end of warranty period.
- C. A warranty inspection will be conducted at end of extended warranty period, if any, to determine acceptance or rejection.

### **PART 2 - PRODUCTS**

#### 2.01 TOPSOIL

- A. General: Use topsoil as provided in Section 32 92 00 - Lawns and Grasses.

#### 2.02 SOIL AMENDMENTS

- A. Lime: Natural dolomitic limestone containing not less than 85 percent of total carbonates with a minimum of 30 percent magnesium carbonates, ground so that not less than 90 percent passes a 10-mesh sieve and not less than 50 percent passes a 100-mesh sieve.
- B. Aluminum Sulfate: Commercial grade.
- C. Peat Humus: Finely divided peat, so completely decomposed and free of fibers that its biological identity is lost. Provide in granular form, free of hard lumps and with pH range suitable for intended use.
- D. Bonemeal: Commercial, raw, finely ground; 4 percent nitrogen and 20 percent phosphoric acid.
- E. Superphosphate: Soluble mixture of treated minerals; 20 percent available phosphoric acid.
- F. Sand: Clean, washed sand, free of toxic materials.
- G. Perlite: Conforming to National Bureau of Standards PS 23.
- H. Vermiculite: Horticulture grade, free of toxic substances.
- I. Sawdust: Rotted sawdust, free of chips, stones, sticks, soil, or toxic substances and with 7.5 pounds of nitrogen uniformly mixed into each cubic yard of sawdust.

- J. Manure: Well rotted, unleached stable or cattle manure containing not more than 25 percent by volume of straw, sawdust or other bedding materials and containing no chemicals or ingredients harmful to plants.
- K. Mulch: Organic mulch free from deleterious materials and suitable for top dressing of trees or shrubs, and consisting of ground or shredded bark.
- L. Commercial Fertilizer: Complete fertilizer of neutral character, with some elements derived from organic sources and containing following percentages of available plant nutrients:
  - 1. For trees and shrubs, provide fertilizer with not less than 5 percent total nitrogen, 10 percent available phosphoric acid and 5 percent soluble potash.
- M. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of plants.

## 2.03 PLANT MATERIALS

- A. Quality: Provide trees, shrubs, and other plants of size, genus, species, and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1 "American Standard for Nursery Stock".
- B. Deciduous Trees: Provide trees of height and caliper scheduled or shown and with branching configuration recommended by ANSI Z60.1 for type and species required. Provide single stem trees except where special forms are shown or listed.
  - 1. Provide balled and burlapped (B&B) deciduous trees.
  - 2. Container grown deciduous trees will be acceptable in lieu of balled and burlapped deciduous trees subject to specified limitations of ANSI Z60.1 for container stock.
- C. Deciduous Shrubs: Provide shrubs of the height shown or listed and with not less than minimum number of canes required by ANSI Z60.1 for type and height of shrub required.
  - 1. Container grown deciduous shrubs will be acceptable in lieu of balled and burlapped deciduous shrubs subject to specified limitations for container grown stock.
- D. Coniferous and Broadleafed Evergreens: Provide evergreens of sizes shown or listed. Dimensions indicate minimum height. Provide normal quality evergreens with well balanced form.
  - 1. Provide balled and burlapped (B&B) evergreens.
  - 2. Container grown evergreens will be acceptable, subject to specified limitations for container grown stock.
- E. Miscellaneous Landscape Materials:

1. Anti-Erosion Mulch: Provide clean, seed-free salt hay or threshed straw of wheat, rye, oats, or barley.
2. Wrapping: Tree-wrap tape not less than 4 inches wide, designed to prevent borer damage and winter freezing.
3. Stakes and Guys: Provide stakes and deadmen of sound new hardwood, treated softwood, or redwood, free of knot holes and other defects. Provide wire ties and guys of 2-strand, twisted, pliable galvanized iron wire, not lighter than 12 ga. with zinc-coated turnbuckles. Provide not less than 1/2 inch diameter rubber or plastic hose, cut to required lengths and of uniform color, material, and size to protect tree trunks from damage by wires.

### **PART 3 - EXECUTION**

#### **3.01 PREPARATION OF PLANTING SOIL**

- A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful or toxic to plant growth.
- B. Mix specified soil amendments and fertilizers with topsoil at rates specified. Delay mixing of fertilizer if planting will not follow placing of planting soil within a few days.
- C. For planting beds and lawns, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.
  1. Mix lime with dry soil prior to mixing of fertilizer.
  2. Prevent lime from contacting roots or acid-loving plants.
  3. Apply phosphoric acid fertilizer (other than that constituting a portion of complete fertilizers) directly to subgrade before applying planting soil and tilling.

#### **3.02 PREPARATION OF PLANTING BEDS**

- A. Loosen subgrade of planting bed areas to a minimum depth of 6 inches using a culti-mulcher or similar equipment. Remove stones measuring over 1-1/2 inches in any dimension. Remove sticks, stones, rubbish, and other extraneous matter.
- B. Spread planting soil mixture to minimum depth required to meet lines, grades, and elevation shown, after light rolling and natural settlement. Place approximately 1/2 of total amount of planting soil required. Work into top of loosened subgrade to create a transition layer, then place remainder of the planting soil.

#### **3.03 EXCAVATION FOR TREES AND SHRUBS**

- A. Excavate pits and trenches with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage. Loosen hard subsoil in bottom of excavation.
  - 1. For balled and burlapped (B&B trees and shrubs), make excavations at least half again as wide as the ball diameter and equal to the ball depth, plus following allowance for setting of ball on a layer of compacted backfill:  
  
Allow for 3 inch thick setting layer of planting soil mixture.
  - 2. For container grown stock, excavate as specified for balled and burlapped stock, adjusted to size of container width and depth.
- B. Dispose of subsoil removed from planting excavations. Do not mix with planting soil or use as backfill.
- C. Fill excavations for trees and shrubs with water and allow water to percolate out prior to planting.

#### 3.04 PLANTING TREES AND SHRUBS

- A. Set balled and burlapped (B&B) stock on layer of compacted planting soil mixture, plumb and in center of pit or trench with top of ball at same elevation as adjacent finished landscape grades. Remove burlap from sides of balls; retain on bottoms. When set, place additional backfill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately 2/3 full, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill.
- B. Set container grown stock, as specified, for balled burlapped stock, except cut cans on 2 sides with an approved can cutter; remove bottoms of wooden boxes after partial backfilling so as not to damage root balls.
- C. Dish top of backfill to allow for mulching.  
  
Mulch pits, trenches, and planted areas. Provide not less than 4" thickness of mulch, and work into top of backfill and finish level with adjacent finish grades.
- D. Prune, thin out, and shape trees and shrubs in accordance with standard horticultural practice. Prune trees to retain required height and spread. Do not cut tree leaders. Remove only injured or dead branches from flowering trees, if any. Prune shrubs to retain natural character.
- E. Remove and replace excessively pruned or misformed stock resulting from improper pruning.
- F. Wrap tree trunks of 2 inches caliper and larger. Start at ground and cover trunk to height of first branches and securely attach. Inspect tree trunks for injury, improper pruning and insect infestation and take corrective measures before wrapping.

- G. Guy and stake trees immediately after planting, as indicated.

### 3.05 MAINTENANCE

- A. Begin maintenance immediately after pruning.
- B. Maintain trees, shrubs, and other plants until final acceptance.
- C. Maintain trees, shrubs, and other plants by pruning, cultivating, and weeding as required for healthy growth. Restore planting saucers. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical position as required. Restore or replace damaged wrappings. Spray as required to keep trees and shrubs free of insects and disease.

### 3.06 CLEANUP AND PROTECTION

- A. During landscape work, keep pavements clean and work area in an orderly condition.
- B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

### 3.07 INSPECTION AND ACCEPTANCE

- A. When landscape work is completed, including maintenance, Engineer will, upon request, make an inspection to determine acceptability.
  - 1. Landscape work may be inspected for acceptance in portions provided each portion of work offered for inspection is complete, including maintenance.

When inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by Engineer and found to be acceptable. Remove rejected plants and materials promptly from project site.

\* END OF SECTION 32 93 00 \*

## **SECTION 33 30 00 - SEWERS AND DRAINS**

### **PART 1 - GENERAL**

#### 1.01 DESCRIPTION OF WORK:

- A. Provide sanitary sewer and storm drain system as shown on the drawings. This section includes sanitary sewer pipe and house service pipes.

Sanitary sewer pipe  
Storm drain pipes  
Underdrains

- B. Earthwork: Section 31 20 00 (includes excavation, bedding, backfill).
- C. Manholes and Catchbasins: Section 33 39 00.
- D. Concrete: Section 03 30 00

#### 1.02 QUALITY ASSURANCE:

- A. Remove damaged pipe from job site.
- B. Meet City of Portland Standards.

#### 1.03 SUBMITTALS:

- A. Manufacturer's product data and installation instructions.

### **PART 2 - PRODUCTS**

#### 2.01 PIPE AND FITTINGS:

- A. General: Furnish fittings of same type and class of materials as pipe.
- B. PVC Non-Pressure Pipe: ASTM D3034 or ASTM D3033, strength requirement SDR 35, push-on joints ASTM D3212, gaskets ASTM F-477.
- C. Underdrain: Polyethylene perforated pipe, AASHTO M190.

#### 2.02 MISCELLANEOUS:

- A. Flexible Adaptors: Neoprene sleeve with stainless steel bands equal to those manufactured by Fernco, Calder Couplings.
- B. Manhole Seals: Segmented neoprene seal with stainless steel bolts equal to "Link-Seal" as manufactured by Thunderline Corp.

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C. Insulation: Equal to Styrofoam SM by Dow Chemical Co., sheet size 2' by 4' by 2" thick.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION OF GRAVITY PIPE AND FITTINGS:**

- A. Methods: Install in accordance with manufacturer's recommendations using a laser beam for line and grade. Secure each length of pipe with bedding before placing next length. Plug open ends when work is suspended. Bed pipe as shown on drawings.
- B. Grade and Line: Lay pipe to line and grade shown on the drawings. If grade is not shown, determine elevations of start and finish points for each run of pipe. Lay pipe to a uniform grade between these points.
- C. Conditions: Lay pipe in the dry. Do not use installed pipe to remove water from work area.
- D. Cleaning: Flush all pipe and remove debris.
- E. Connections to Manholes: Provide short length of pipe so that joints are located within 3 feet of inside surface of manholes.

#### **3.02 INSULATION:**

- A. Install as shown on Drawings.

#### **3.03 CONNECTION TO EXISTING STRUCTURES:**

- A. Where connections to existing manholes and catchbasins are required, core the existing structure and seal with Manhole Seals or Flexible Adaptors.

#### **3.04 TESTING:**

- A. General: Test all pipes after backfilling. Install all house service leads on main line before testing. Perform tests in presence of Engineer or authorized representative of the Sewer District or Public Works Department.
- B. Gravity Sewer-Leakage Tests: Use low-pressure air test as follows:
  - 1. Plug ends of section to be tested.
  - 2. Supply air slowly to the pipe to be tested until the air pressure inside the pipe is 4.0 psi greater than the average back-pressure of any groundwater submerging the pipe.
  - 3. Disconnect air supply and allow a minimum of two minutes for stabilization of pressure.
  - 4. Following stabilization period, measure drop in pressure over a 6-minute test period.



5. Acceptable Drop: No more than 1.0 psi.
- C. Repair and retest: Repair all pipes not passing tests using materials and methods approved by the Engineer, and retest.

\* END OF SECTION 33 30 00 \*

## **SECTION 33 39 00 – MANHOLES AND CATCHBASINS**

### **PART 1 - GENERAL**

#### 1.01 DESCRIPTION OF WORK:

A. Provide manholes as shown on the drawings. This section includes:

- Precast Manholes
- Masonry Inverts
- Frames and Covers
- Precast Catchbasin and Concrete Masonry Catch Basins

B. Earthwork: Section 31 20 00

C. Sewers and Drains: Section 33 30 00

D. Concrete: Section 03 30 00

#### 1.02 QUALITY ASSURANCE:

A. General: Provide complete manhole and catchbasin structures capable of supporting AASHTO H2O loading.

B. Precast Manhole and Catchbasin Components: ASTM C478

C. Comply with the City of Portland Standards.

#### 1.03 SUBMITTALS:

A. Shop Drawings: Submit for precast manholes. Show components to be used, elevations of top, base and pipe inverts, location of pipe penetrations, steps, etc.

B. Product Data: Manufacturers' product data and installation instructions for frames, grates, precast items, manhole sleeves, and joint sealants for precast sections.

### **PART 2 - PRODUCTS**

#### 2.01 MANHOLES:

A. Base Sections: Precast monolithic construction to a joint 16" minimum above crown of highest incoming pipe, with steps.

B. Barrel Sections: Precast with steps.

- C. Top Sections: Precast eccentric cone with steps. Use flat cover only if shown on drawings.
- D. Steps: Aluminum alloy 6061-T6 or polypropylene reinforced with steel rod. Meet OSHA requirements, minimum width 16". Coat aluminum to be cast into concrete with bituminous paint.
- E. Pipe to Manhole Connections: Pipe sizes 6" or larger: Flexible manhole sleeves equal to CP series manufactured by Interpace Corp. size to fit diameter and type of pipe without use of gaskets.  
  
Pipe sized less than 6": schedule 40 galvanized steel pipe sleeve with segmented rubber seal equal to "Link-Seal" by Thunderline Corp.
- F. Joints Between Precast Sections: Watertight, shiplap type; seal with two rings of 1" diameter butyl rubber sealant.
- G. Dampproofing: Bituminous coating on exterior of precast sections and parged brick.

#### 2.02 CATCH BASINS AND OUTLET STRUCTURES:

- A. Base Sections: Precast.
- B. Barrel Sections: Precast.
- C. Top Sections: Precast eccentric cone or flat cover if required by grade.
- D. Joints between precast sections: Shiplap type sealed with one ring of 1" diameter or square butyl rubber sealant.
- E. Pipe to Catchbasin Connections: For pipe sizes 6" or larger, use flexible manhole sleeves equal to CP series manufactured by Interpace Corp., sized to fit diameter and type of pipe without use of gaskets.
- F. Dampproofing: Bituminous coating on exterior of precast barrel block sections.

#### 2.03 MASONRY MATERIALS:

- A. Sewer Brick: ASTM C32, Grade SS, hard brick.
- B. Concrete Masonry Units: ASTM C139.
- C. Mortar: Type M, ASTM C270. Use Type II Portland cement, Type S lime.  
  
1 part Portland cement, ¼ part hydrated lime. 3 to 3 ¾ parts sand.

2.04 FRAMES, GRATES, AND COVERS:

A. General:

1. Coatings for All Frames, Grates, and Covers: Two coats coal tar pitch varnish applied after sandblasting to provide a smooth, tough, non-brittle, non-scaling finish. Repair damage to coatings to the satisfaction of the Engineer.
2. Cast Iron: ASTM A48 Class 30.

B. Manhole Frames and Covers:

1. General: Minimum 22" dia. opening, minimum weight 350 pounds, labeled with "SEWER" in 3" high raised letters on cover.
2. Standard Frames and Covers: Equal to:  
  
LC258-2 frame and L25C5 cover by E.L. Lebaron Foundry, Model R1760 frame and Type C cover with self-sealing application by Neenah Foundry, or Equivalent
3. Catchbasin Frames and Grates: Equal to:  
  
Model R2504-D frame and type C grate by Neenah Foundry, Model M72 x 7G by Etheridge Foundry.

2.05 MISCELLANEOUS:

- A. Dampproofing: Provide bituminous coating equal to Dehydrate No. 4 Dampproof by W.R. Grace or Bitumastic Super Service Black by Koppers Co. for field application.

**PART 3 - EXECUTION**

3.01 INSTALLATION OF MANHOLES:

- A. Placement: Place bases on compacted bedding material so catchbasin structure is plumb and pipe inverts are at proper elevations. Place barrel and top sections in the appropriate height combinations. Plug all lifting holes inside and out with non-shrink mortar.
- B. Joints: Follow manufacturer's instructions for sealing joints between precast sections. Point joints with non-shrinking mortar.
- C. Frames and Covers: Set to final grade as shown on the drawings or set flush with pavement grade in paved areas. Provide adequate temporary covers to prevent accidental entry until final placement of frame and grate is made.

- D. Inverts: Construct smooth channels using sewer brick with semi-circular bottoms that match inside surface of pipes to be connected. Where changes in direction of flow are made, fit pipes flush to inside surfaces of manholes and form channel with as large a radius as possible.

Slope bench 1/8 inch per foot from channel up to manhole wall.

- E. Dampproofing: Repair damage to dampproofing and apply dampproofing to masonry as shown on drawings.

### 3.02 INSTALLATION OF CATCHBASINS:

- A. Placement: Place bases on compacted bedding material so that structure is plumb and pipe inverts are at proper elevations.
- B. Plug: lifting holes inside and out, fill spaces between pipes and catch basin walls with mortar and/or masonry and trowel smooth.
- C. Concrete Masonry Construction: Construct walls in horizontal courses with vertical joints broken. Lay units in mortar, fill all joints completely with mortar. Parge inside and out with 1/2" parge coat of mortar.
- D. Frames and Grates: Set to grade as shown on the Drawings.
- E. Dampproofing: Repair damage to dampproofing and apply dampproofing to masonry as shown on the drawings.

### 3.03 MANHOLE TESTING:

- A. General: Use vacuum test or exfiltration test for all sanitary sewer manholes. Perform tests before constructing invert or backfilling. No allowance will be made for absorption during the 8-hour exfiltration test period. No allowance will be made for leakage at test plugs.
- B. Retests: Retest unacceptable manholes following repairs until acceptable leakage rate is attained.
- C. Vacuum Test:

- 1. Plug pipes into and out of MH and seal MH opening.
- 2. Draw a vacuum of 10 inches of Hg and hold for duration specified below:

MH diameter (ft)	Duration (seconds)
4	60
5	75
6	90

3. Acceptable Vacuum Drop: Not more than 1 inch of Hq over the specified timeframe.

D. Exfiltration Test:

1. Plug pipes into and out of manhole and secure plugs.
2. Lower groundwater table (GWT) to below manhole. Maintain GWT at this level throughout test. Provide means of determining GWT level at any time throughout test.
3. Fill manhole with water to top of cone.
4. Allow a period of time for absorption (determined by Contractor).
5. Refill to top of cone.
6. Determine volume of leakage in an 8-hour minimum test period and calculate rate.
7. Acceptable Leakage Rate: Not more than 1 gallon per vertical foot per 24 hours.

3.04 REPAIRS:

- A. Determine causes of all leaks and repair them. Perform the necessary earthwork if manhole has been backfilled.
- B. Perform repairs using methods and material approved by the Engineer. Remove and replace or reconstruct manhole if necessary. Remove and replace defective sections if required by Engineer.

\* END OF SECTION 33 39 00 \*